PowerWater

DRINKING WATER QUALITY REPORT 2018

PowerWater

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FROM THE CHIEF EXECUTIVE

The Power and Water Corporation is committed to enriching the future for our community, our customers and each other. Drinking water quality and effectively managing drinking water supplies has been a big focus this year.

Having access to safe, reliable drinking water is the key to life in the Northern Territory and we will remain ever-vigilant on this most important aspect of our commitment to our customers.

The Department of Health regulates the important public health outcomes that drinking water brings to our customers. Power and Water works closely with the Department of Health under a memorandum of understanding, to achieve best practice drinking water quality management throughout the Northern Territory.

The Drinking Water Quality Report 2017-18 is a record of Power and Water's service delivery across the Northern Territory, under the framework of the Australian Drinking Water Guidelines. The preventative, risk management approach of the guideline covers all aspects of delivering drinking water – from the catchment to the consumer. Power and Water continued development on a structured Drinking Water Quality Management System based on the guideline framework.

Power and Water experienced the worst cyclone to hit Darwin since Cyclone Tracey, when Cyclone Marcus hit the NT coastline on March 17, 2018. It is a credit to the Water Services team that despite a precautionary boil water notice issued, the boil water notice was lifted within 24 hours, and the Water Services team worked hard to ensure minimal disruption to customers supply. Considering the scale of this weather event it was a commendable effort.

Michael Thomson
Chief Executive

OPERATE AT LEAST AS EFFICIENTLY AS ANY COMPARABLE BUSINESS
STRATEGIC OBJECTIVE

DRINKING WATER QUALITY REPORT 2017-18

The annual Drinking Water Quality Report for 2017-18 ('the report') contains drinking water quality information for 92 Northern Territory communities from 1 July 2017 to 30 June 2018.

The report describes drinking water quality activities to the wider Northern Territory public and allows the Department of Health (DoH) to make public health assessments in a transparent way.

Section 1 explains the preventive water quality management activities undertaken in this period.

Section 2 describes the characteristics of the drinking water quality supplied to consumers, with the statistics presented in the Appendices. This section is broken into two parts:

- Part A - Major and minor urban centres
- Part B - Remote communities

Operating context

Power and Water is responsible for delivering safe drinking water services to its customers in the Northern Territory (NT). This responsibility is established under the *Power and Water Corporation Act 2002*, the *Government Owned Corporations Act 2001* for urban centres and by agreement with the Northern Territory Government for remote centres.

The Power and Water Board of Directors is responsible to the Shareholding Minister for the corporation's performance and is required to provide a Statement of Corporate Intent (SCI) each financial year. The SCI sets out the organisational objectives and strategies over a four-year period.

Power and Water's strategic objectives as articulated in the SCI 2017-18 financial year were to:

- operate at least as efficiently as any comparable business
- maximise the sustainable return to the Northern Territory Government (NTG) on its investment in the corporation.

Power and Water is on the path of major change in line with our long term vision of becoming a best practice multi-utility that is commercially and customer focused contributing to the Northern Territory economy.

In this reporting period the organisational structure used to achieve the drinking water goals included a centralised business services unit and two drinking water operational units.

The Water Services operational unit has responsibility for five major and 14 minor urban centres. The Regions and Remote Operations operational unit is responsible for 72 remote Indigenous communities. Centralised functional support is provided for such aspects as customer service, people/culture, information technology, finance, communications, governance, strategy, pricing/economic analysis, regulatory, risk and compliance.

SECTION 1: FRAMEWORK FOR DRINKING WATER QUALITY MANAGEMENT

AUSTRALIAN DRINKING WATER GUIDELINES (ADWG)

The ADWG is the primary reference on drinking water quality in Australia and the Northern Territory. It is designed to provide an authoritative reference on what defines safe, good quality drinking water as well as how it can be achieved and assured. The ADWG is published by the National Health and Medical Research Council in collaboration with the Natural Resource Management Ministerial Council.

The ADWG is developed based on the best available scientific evidence regarding both the health and aesthetic aspects of drinking water quality. The ADWG are the adopted standards and provide a common benchmark for assessing the acceptability of drinking water supplied to consumers across Australia.

The ADWG describes a preventative, risk management approach that encompasses all steps in water production - from catchment to consumer. The ADWG Framework for Management of Drinking Water Quality defines this preventative, integrated approach.

The framework outlines four general areas for ensuring the provision of safe drinking water:

- organisational commitment to drinking water quality management
- system analysis and management
- supporting requirements
- review processes for continual improvement.

Across these four areas, the framework outlines 12 elements considered good practice for the integrated management of drinking water supplies. Together, these elements comprise a proactive approach for ensuring safe and reliable drinking water to the community.

There are rolling revisions to ensure the ADWG represents the latest scientific evidence on good quality drinking water. All assessments made in this report are made against version 3.4, updated in October 2017.

1

IN FEBRUARY 2018, 14 REFRESHED POLICY STATEMENTS WERE APPROVED BY THE BOARD

COMMITMENT TO DRINKING WATER QUALITY MANAGEMENT

Effective drinking water quality management is built from organisational support and a long-term commitment of senior executive.

In this reporting period Power and Water has refreshed the policy statement structure and progressed a cultural journey. Along with building open, collaborative and mutually beneficial working relationships with our stakeholders based on trust and respect.

Power and Water's policy statements

In this reporting period a policy statement structure was developed to simplify the organisational commitment to the corporate SCI objectives. In February 2018, 14 refreshed policy statements were approved by the board.

The Drinking Water Quality Policy Statement commits Power and Water to deliver ongoing safe drinking water and to continual improvement. To deliver this commitment Power and Water has continued to develop its Drinking Water Quality Management System (DWQMS) based on the ADWG Framework for Management of Drinking Water Quality.

All the policy statements support the DWQMS and commit the organisation to effective management of drinking water quality in all areas of the business (e.g. that water quality has appropriate staffing, training of employees, provision of adequate financial resources, active participation and reporting to the board or chief executive).

Power and Water's cultural journey

To achieve the objectives in the SCI and policy commitments in this reporting period, Power and Water continued on with a culture and leadership program. This program is designed to foster an environment of continual improvement while cultivating employee responsibility and motivation. In this year the project worked on constructive and positive behaviours through leadership and team training, to bring about culture change.

Partnerships

Power and Water collaborates with stakeholders for the provision of safe drinking water to all customers and the protection of public health. This is primarily achieved by building effective partnerships with multiple governmental agencies.

Power and Water has a primary responsibility for providing urban customers with safe drinking water in accordance with its Operating Licence through the *Water Supply and Sewerage Services Act 2000* (NT), its remote customers under the *Power and Water Corporation Act 2002* (NT) and *Indigenous Essential Services Agreement* and sound commercial practices.

Power and Water began monitoring for PFAS in customers' drinking water in October 2016. The results are reported on the Power and Water website, PFAS in the Territory and to the Northern Territory and Federal Departments of Health. PFAS results are not reported in this annual report.

Power and Water has provided an important role in monitoring and reducing PFAS in the Katherine water supply, as described on the website.

Further information about PFAS results and investigations can be found on the following websites:

Power and Water PFAS information
https://www.powerwater.com.au/networks_and_infrastructure/water_services/pfas

Australian Government Department of Health PFAS Information
http://www.health.gov.au/internet/main/publishing.nsf/Content/ohp-pfas.htm

Northern Territory Department of Health Media release
http://mediareleases.nt.gov.au/mediaRelease/21535

Department of Defence Hotline 1800 316 813 PFAS investigations
http://www.defence.gov.au/Environment/PFAS/

The Northern Territory Per- and poly-Fluorinated Alkyl Substances Interagency Working Group
https://ntepa.nt.gov.au/waste-pollution/compliance/pfas-investigation

Northern Territory Government Departments

The NTG agencies partnering with Power and Water in protecting water quality are:

Department of Health (DoH)

The Memorandum of Understanding between the Department of Health and the Power and Water Corporation for drinking water (MoU), formalises the public health accountabilities and responsibilities.

DoH has important responsibilities in protecting public health under the *Public and Environmental Health Act 2011* (NT) and other relevant legislation. The MoU defines the regulatory role of the DoH for drinking water quality in the NT.

A working group compromising officers from the DoH and Power and Water worked in this reporting period to progress the redrafting of the MoU.

Department of Local Government, Housing and Community Development (DLGHCD)

The Power and Water subsidiary, Indigenous Essential Services (IES), provides electricity, water and wastewater services to remote communities and outstations in the Northern Territory under an agreement with the DLGHCD. This agreement commits both entities to delivering safe drinking water and to continual improvement via referencing the commitments in the MoU.

Department of Environment and Natural Resources (DENR)

DENR performs a regulatory role to control pollution and leads the development of the NTG regulatory framework for water.

The Department of Infrastructure, Planning and Logistics (DIPL)

DIPL protects water quality through appropriate land use planning and the regulation of private plumbing.

The Department of Primary Industry and Resources (DPIR)

DPIR undertakes independent analyses of water samples in Darwin and Alice Springs laboratories.

Northern Territory PFAS response

Power and Water has been working to understand the impact to public drinking water supplies from the historical use of firefighting foams.

The Northern Territory Per- and poly-Fluorinated Alkyl Substances (PFAS) interagency working group was formed to coordinate the response across the Northern Territory. Power and water is an active member of any response to contaminated site investigations, by helping to understand the impact on public water supplies.

POWER AND WATER BEGAN MONITORING FOR PFAS IN CUSTOMER'S DRINKING WATER IN OCTOBER 2016

2

ASSESSMENT OF THE DRINKING WATER SUPPLY SYSTEM

Risk management forms the basis of Power and Water's strategic and operational processes. The proactive identification, disclosure and management of potential threats are encouraged across all levels of Power and Water. This is an attitude that aligns to the ADWG philosophy and principles of good corporate governance.

In this reporting period Power and Water developed the barrier risk assessment process, so that drinking water quality risks can be integrated into the multi-utility business processes. Using Power and Water's risk management matrix, the level of risk for a water quality hazard was estimated and assessed against the barriers that are currently in place to control the hazard. This barrier risk assessment was applied to the 92 drinking water systems.

The process considers 10 drinking water quality hazards and the barriers in place to control them. The process has the ability to support more detailed long term assessment, like a sanitary survey, the disinfection reliability assessment and the health based target assessment. The process was documented to provide guidance so that hazards and barriers are consistently assessed into the future.

Water operations

The Water Services business unit provides technical services to maintain the five major urban centres with larger and more complex infrastructure. These major urban centres function as technical and administrative hubs, extending support services to 15 minor urban centres, as illustrated in Figure 1.

The Regions and Remote Operations business unit manages the water supply systems in each of the 72 remote communities illustrated in Figure 2. The remoteness presents challenges that are managed through technical support from the regional major urban centres and daily operations support provided by Essential Services Officers (ESOs) at the centres.

Garawa drinking water quality is included in this report as Power and Water continues to assist the Mabunji Aboriginal Resource Centre and the DLGHCD. Power and Water does not formally own the assets and supports Mabunji in providing emergency support and sampling of the system. Responsibility for Town Camps has been transferred from the Federal government to the NTG in 2008.

RESPONSIBILITY FOR TOWN CAMPS HAS BEEN TRANSFERRED FROM THE FEDERAL GOVERNMENT TO THE NTG IN 2008

Water sources

All major and minor urban centres serviced by Power and Water are either in part, or completely reliant upon groundwater for their drinking water supply. Most remote community drinking water supplies are from groundwater sources. Local subsurface aquifers, at a range of depths and in a variety of geological environments, are used. The groundwater is pumped to the surface through production bores.

Some drinking water sources are better protected than others, such as 'closed' catchments like Darwin River Reservoir. However, even the protected water sources are still vulnerable to a broad range of potential hazards and require active management to maintain water quality.

Table 1 Summary of drinking water sources in major and minor urban centres

CENTRE	TYPE	TERRITORY REGION	SOURCE
Adelaide River	Minor	Northern	Groundwater
Alice Springs	Major	Southern	Groundwater (Roe Creek Borefield)
Batchelor	Minor	Northern	Groundwater
Borroloola1	Minor	Katherine	Groundwater
Cox Peninsula	Minor	Northern	Groundwater
Daly Waters	Minor	Katherine	Groundwater
Darwin	Major	Northern	Surface water (Darwin River Reservoir) + groundwater (10%)
Elliott	Minor	Barkly	Groundwater
Gunn Point	Minor	Northern	Groundwater
Katherine	Major	Katherine	Surface water (Katherine River) + groundwater (20%)
Kings Canyon	Minor	Southern	Groundwater
Larrimah	Minor	Katherine	Groundwater
Mataranka	Minor	Katherine	Groundwater
Newcastle Waters	Minor	Barkly	Groundwater
Pine Creek	Minor	Katherine	Surface water (Copperfield Reservoir – emergency) + groundwater (100%)
Tennant Creek	Major	Barkly	Groundwater (Kelly Well, Kelly Well West and Cabbage Gum Borefields)
Timber Creek	Minor	Katherine	Groundwater
Ti Tree	Minor	Southern	Groundwater
Yulara	Major	Southern	Groundwater

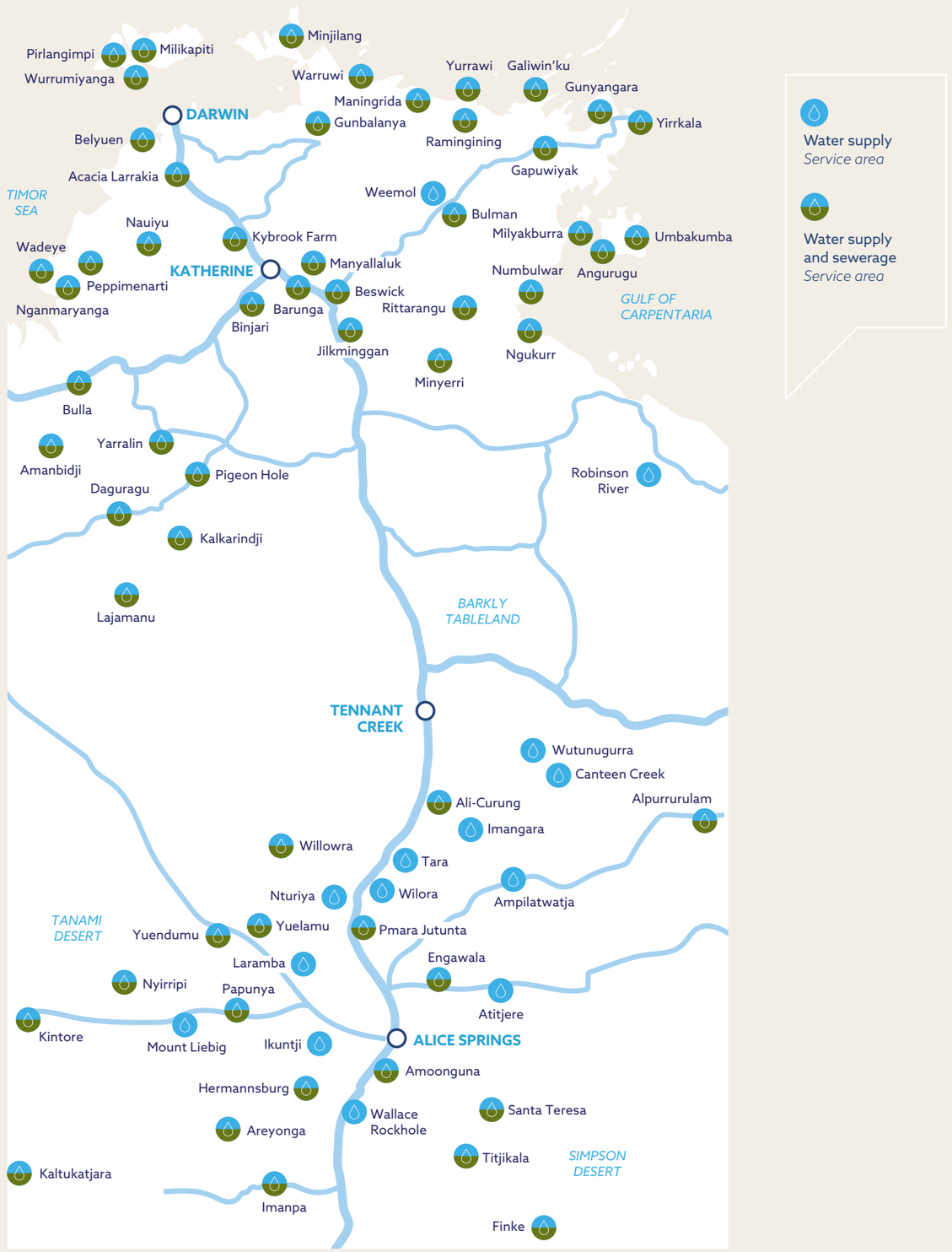
[1] The water source for the Borroloola town camps Garawa1 and 2 is groundwater and is separate from the Borroloola source

Table 2 Summary of drinking water sources in remote communities

CENTRE	TERRITORY REGION	SOURCE	CENTRE	TERRITORY REGION	SOURCE
Acacia Larrakia	Northern	Groundwater	Milikapiti	Northern	Groundwater
Ali Curung	Southern	Groundwater	Milingimbi	Northern	Groundwater
Alpurrurulam	Southern	Groundwater	Milyakburra	Northern	Groundwater
Amanbidji	Katherine	Groundwater	Minjilang	Northern	Groundwater
Amoonguna	Southern	Groundwater	Minyerri	Katherine	Groundwater
Ampilatwatja	Southern	Groundwater	Mt Liebig	Southern	Groundwater
Angurugu	Northern	Groundwater	Nauiyu	Northern	Groundwater
Areyonga	Southern	Groundwater	Nganmarriyanga	Northern	Groundwater
Atitjere	Southern	Groundwater	Ngukurr	Katherine	Groundwater
Barunga	Katherine	Surface water	Nturiya	Southern	Groundwater
Belyuen	Northern	Groundwater	Numbulwar	Northern	Groundwater
Beswick	Katherine	Groundwater	Nyirripi	Southern	Groundwater
Binjari	Katherine	Groundwater	Papunya	Southern	Groundwater
Bulla	Katherine	Surface + Groundwater	Peppimenarti	Northern	Groundwater
Bulman	Katherine	Groundwater	Pigeon Hole	Katherine	Groundwater
Canteen Creek	Southern	Groundwater	Pirlangimpi	Northern	Surface Water
Daguragu	Katherine	Groundwater	Pmara Jutunta	Southern	Groundwater
Engawala	Southern	Groundwater	Ramingining	Northern	Groundwater
Finke	Southern	Groundwater	Rittarangu	Katherine	Groundwater
Galiwinku	Northern	Groundwater	Robinson River	Katherine	Groundwater
Gapuwiyak	Northern	Groundwater	Santa Teresa	Southern	Groundwater
Gunbalanya	Northern	Groundwater	Tara	Southern	Groundwater
Gunyangara	Northern	Groundwater	Titjikala	Southern	Groundwater
Haasts Bluff	Southern	Groundwater	Umbakumba	Northern	Groundwater
Hermannsburg	Southern	Groundwater	Wadeye	Northern	Groundwater
Imangara	Southern	Groundwater	Wallace Rockhole	Southern	Groundwater
Imanpa	Southern	Groundwater	Warruwi	Northern	Groundwater
Jilkminggan	Katherine	Groundwater	Weemol	Katherine	Groundwater
Kalkarindji	Katherine	Groundwater	Willowra	Southern	Groundwater
Kaltukatjara	Southern	Groundwater	Wilora	Southern	Groundwater
Kintore	Southern	Groundwater	Wurrumiyanga	Northern	Groundwater
Kybrook Farm	Katherine	Groundwater	Wutunugurra	Southern	Groundwater
Lajamanu	Katherine	Groundwater	Yarralin	Katherine	Groundwater
Laramba	Southern	Groundwater	Yirrkala	Northern	Groundwater
Maningrida	Northern	Groundwater	Yuelamu	Southern	Groundwater
Manyallaluk	Katherine	Groundwater	Yuendumu	Southern	Groundwater

Figure 1 Drinking water supply system - Water Services

Figure 2 Drinking water supply system - Regions and Remote



3

PREVENTATIVE MEASURES FOR DRINKING WATER QUALITY MANAGEMENT

Barriers act to control or stop contaminants from entering a drinking water supply system. A barrier can be physical, or a process or tool, such as the protection of the water supply catchment (controlling what can or cannot be done in the area).

A multiple barrier approach

The ADWG outlines how to protect drinking water. It recommends 'catchment to consumer' management of water quality, using a preventative risk based and multiple barrier approach. A similar approach is recommended by the World Health Organisation.

The strength of multiple barriers is that a failure of one barrier may be compensated for by the remaining barriers, minimising the likelihood of contaminants passing through the entire treatment system. The placement of barriers in a conventional multiple barrier system is shown in Figure 3 below.

Protecting the source

Keeping a clean catchment and water source is a fundamental principle of Power and Water's Drinking Water Quality Policy. Implementing effective measures to protect source waters from contamination avoids the need for expensive, complicated treatment to treat the water.

In this reporting period Power and *Water's Catchment and Water Source Protection Strategy* was realigned, with the policy statement work, to become part of the Drinking Water Quality Management System. The key principles of understanding and protecting source waters remain the same.

THE STRENGTH OF MULTIPLE BARRIERS IS THAT A FAILURE OF ONE BARRIER MAY BE COMPENSATED FOR BY THE REMAINING BARRIERS

Power and Water adopts a multiple barrier approach to control drinking water quality. This approach is recognised globally as the foundation for ensuring safe drinking water.

Barriers act to control or stop contaminants from entering a drinking water supply system. A barrier can be physical, or a process or tool, such as the protection of the water supply catchment (controlling what can or cannot be done in the area).

Figure 3 Typical multiple barrier system

From catchment to consumer multiple barriers to ensure safe drinking water

In 2017-18 reporting period detailed sanitary surveys and vulnerability assessments occurred at all the major and minor urban centres. In remote centres a desktop spatial analysis tool was developed to identify potential contamination risks by identifying land use activities that present contamination hazards to source water.

Water treatment and disinfection

Microbiological water quality is the highest priority at Power and Water. Ensuring water supplies are continuously disinfected is essential to reducing consumers' exposure to disease-causing micro-organisms.

In conjunction with other barriers to protect the water source, chlorination is a vital defence against microbiological contamination. Chlorine is the preferred purifier as it is simple to use, destroys pathogenic micro-organisms effectively and provides protection through the distribution system.

Power and Water proactively guards against risks presented by opportunistic pathogens such as *Naegleria fowleri* and *Burkholderia pseudomallei* by means of maintaining a set minimum free chlorine residual of 0.5 mg/L in all supplies at all times (0.3 mg/L for Southern region remote communities).

The effectiveness of this control is assessed by monitoring, recording and acting on incidents where the level falls below the set targets.

In addition to potential microbiological contamination, the interaction between water stored for long periods in deep aquifers, and the surrounding geology can result in a wide range of naturally occurring minerals and deposits in the water, causing the water chemistry to become 'rich'. In some communities the physical and chemical characteristics of the water can exceed the levels recommended in the ADWG.

To ensure that drinking water supply meets the ADWG in three high risk communities (Ali Curung, Kintore and Yuelamu), Power and Water operates an Advanced Water Treatment (AWT) plant at each community. The AWT reduce levels of naturally occurring nitrate, fluoride and uranium, as well as salinity and hardness.

Across the major and minor urban centres barriers in place are shown in Table 3.

Table 3 Water quality barriers in major and minor urban centres

	CATCHMENT PROTECTION	DETENTION IN RESERVOIRS AND AQUIFERS	BORE HEAD PROTECTION ZONE	BORE HEAD INTEGRITY	COAGULATION, FILTRATION OR MEMBRANE FILTRATION	DISINFECTION	STORAGE TANK INTEGRITY AND CLEANING	MAINTENANCE OF POSITIVE PRESSURE IN RETICULATION	BACK-FLOW PREVENTION IN RETICULATION	DISINFECTION RESIDUAL TO CUSTOMER'S METER
Adelaide River		■	■	■	■	■	■	■	■	■
Alice Springs	■	■	■	■		■	■	■	■	■
Batchelor		■	■	■		■	■	■	■	■
Borroloola		■	■	■		■	■	■	■	■
Cox Peninsula	■	■	■	■		■	■	N/A	N/A	■
Daly Waters	■	■	■	■		■	■	■	■	■
Darwin - groundwater	■	■	■	■		■	■	■	■	■
Darwin - surface water	■	■	N/A	N/A		■	■	■	■	■
Elliott		■	■	■		■	■	■	■	■
Gunn Point		■	■	■		■	■	■	■	■
Katherine - groundwater		■	■	■		■	■	■	■	■
Katherine - surface water			N/A	N/A	■	■	■	■	■	■
Kings Canyon	■	■	■	■		■	■	■	■	■
Larrimah	■	■	■	■		■	■	■	■	■
Mataranka		■	■	■		■	■	■	■	■
Newcastle Waters	■	■	■	■		■	■	■	■	■
Pine Creek - groundwater		■	■	■		■	■	■	■	■
Pine Creek - surface water			N/A	N/A		■	■	■	■	■
Tennant Creek		■	■	■		■	■	■	■	■
Timber Creek		■	■	■		■	■	■	■	■
Ti Tree	■	■	■	■		■	■	■	■	■
Yulara	■	■	■	■	■	■	■	■	■	■

MICROBIOLOGICAL WATER QUALITY IS THE HIGHEST PRIORITY AT POWER AND WATER

Enhancing the water supply

In this reporting period Power and Water has undertaken work to improve the multiple barriers in place across the Regions and Remote centres including:

- launching a Sodium Hypochlorite Disinfection Barrier Project to standardise sodium hypochlorite installation to 33 chlorine dosing sites across the Darwin and Katherine region
- equipping the new production bores at Ngukurr, Robinson River, and Barunga to provide safe water sources to the communities
- replacement of the old failing asbestos cement water main with PVC mains in Wadeye
- Aerial Electromagnetic survey (AEM) in Milingimbi to monitor groundwater salinity
- Aerial Electromagnetic survey at Warruwi to optimise the Aquifer Storage and Recovery system
- the upgrade of Numbulwar water storage tank
- a dual pump chlorination systeminstalled at Pirlangimpi
- chlorine analysers installed at Beswick
- upgrades to the sodium hypochlorite system at Minyerri.

4

OPERATIONAL PROCEDURES AND PROCESS CONTROL

POWER AND WATER STRENGTHENED THE CORRECTIVE ACTION PLANS LINKED TO CRITICAL OPERATIONAL POINTS

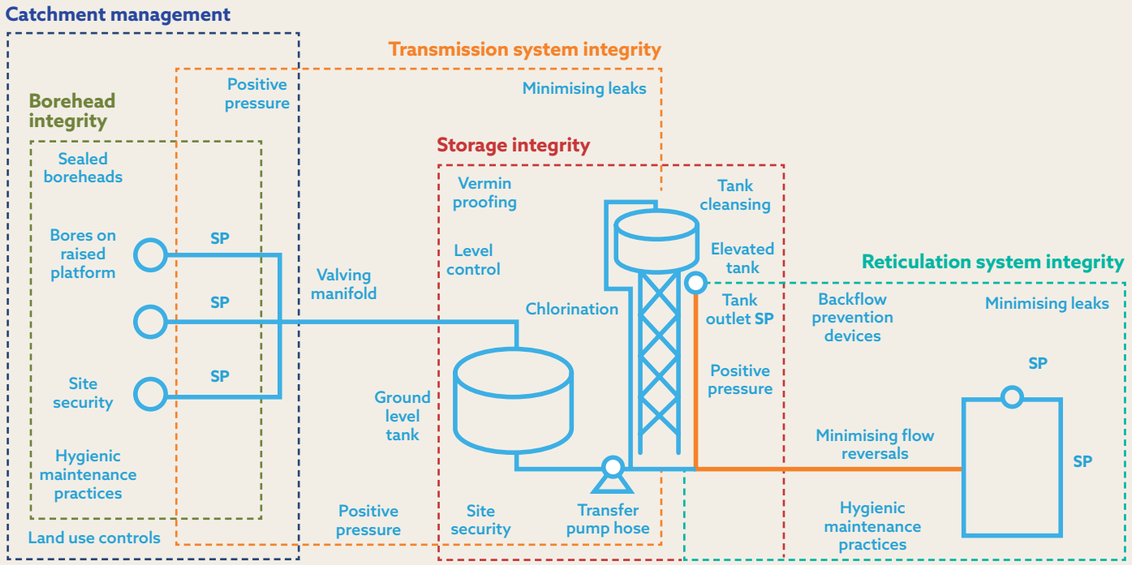
To consistently provide good quality water and to achieve a reliable water supply, Power and Water maintains effective control over processes and activities.

The configuration of the infrastructure at each urban centre and remote community determines the exact process control methods required. Table 4 and Figure 4 represent the infrastructure configuration common in most minor urban centres and remote communities.

Table 4 Water Infrastructure in major and minor urban centres

WATER SOURCE	WATER TREATMENT	WATER STORAGE	WATER DISTRIBUTION SYSTEM
Typically, water is extracted from underground aquifers via bores. Surface water sources, such as dams, rivers and springs, are used to supply drinking water in a few communities.	Water treatment is primarily through disinfection such as sodium hypochlorite, chlorine gas and UV disinfection. Other treatment systems such as sand filters and clarifiers are used in communities that also use surface water sources, and Power and Water is investing in more advanced treatment in some communities.	The water is then stored in tanks, typically consisting of at least one large tank on the ground and a smaller tank elevated on a stand. The water is transferred from the ground level tank to the elevated tank using transfer pumps. Some communities have pressure pumps in place of elevated tanks.	Underground pipes and rising mains distribute the drinking water throughout the community to consumers' taps. Typically, these are gravity systems and are inspected through manholes and flushed using water hydrants.

Figure 4 Typical minor urban centre and remote community water supply configuration



SP = Sample Point

Water supply process control

For process control Power and Water uses Industrial Control Systems (ICS) to monitor and control the processes that exist in the physical world. Typical ICS system used are the Supervisory Control and Data Acquisition (SCADA) system.

Power and Water's SCADA system monitors control points in water supplies using a range of online monitoring systems in each centre. Apart from monitoring the status and performance of infrastructure, this system provides continuous monitoring for specific water quality parameters such as chlorine, fluoride, conductivity, turbidity and pH levels. Infield sampling or measurements, such as temperature and chlorine residuals, help to identify performance issues and provide direction for corrective actions.

Power and Water continues to plan for the introduction of online monitoring at critical water supply points within remote communities, allowing notifications to be sent to operators as problems occur. This is being done through a program to install and upgrade SCADA systems. Online monitoring significantly reduces response times, enabling staff to identify and address problems without necessarily having to travel to a site.

Operational procedures

Established procedures and water quality information are made readily available to all employees via Power and Water's intranet site and via the Water Safety Plans. During 2017-18, a number of operational procedures and plans were updated in line with the document management system, see Element 10.

A key operational active procedure that was updated this year is the daily scheduled call work instruction.

To ensure the safe provision of essential services in the remote communities, including the supply of safe drinking water to the community, a designated employee calls each community each morning to obtain the free chlorine residual readings from the reticulation system in the community.

Corrective actions

In this reporting period, Power and Water strengthened the corrective action plans linked to critical operational points. A Trigger Action Response Plan (TARP) for each of the critical quality control points was included into the Water Safety Plans for each water supply. TARPS aim to ensure the chlorination process is always controlled within strict limits, so that disinfection of the water occurs.

Materials and chemicals

Materials used by Power and Water that contact potable water must normally comply with AS/NZS 4020:2005, *Testing of products for use in contact with drinking water* or other relevant standards.

Chemical suppliers used by Power and Water are required to provide an analysis report of the chemical to be supplied. Chemicals must comply with the relevant ANSI/ AWWA standard, and the management system at the site of manufacture of the chemical must be certified to ISO 9001.

5

VERIFICATION OF DRINKING WATER QUALITY

A central aspect of the Power and Water approach to manage water quality is the use of monitoring to confirm and improve the understanding of drinking water quality. Final water quality is verified through monitoring consumer satisfaction and the microbial, physical, chemical, and radiological characteristics of the water.

POWER AND WATER CONDUCTS CUSTOMER SATISFACTION SURVEYS AND ENCOURAGES CUSTOMERS TO SUBMIT FEEDBACK

Customer satisfaction

Monitoring of consumer comments and complaints provides valuable information on potential problems, which may not have been identified by operational monitoring. The ADWG recommends that water suppliers evaluate customer complaints.

Specific water quality complaints made by Power and Water customers during the reporting period can be found in Section 2 of this report. This includes a summary of drinking water quality complaints by type (e.g. clarity/ dirtiness/ particles, alleged illness, taste and other) for the Darwin water supply between 2017 and 2018.

Power and Water conducts customer satisfaction surveys and encourages customers to submit feedback. The information is collated and evaluated in preparation for submission to the National Performance Report (NPR).

Water quality monitoring

A monitoring program was developed in consultation with the Department of Health (DoH) and approved by the Chief Health Officer in 2017. Power and Water managed the monitoring program so that samples were collected, delivered to laboratories for testing and results reported. In this reporting period 96 per cent of the scheduled samples were collected in the urban centres.

The extensive monitoring program requires the collection of thousands of operational and verification samples across the Northern Territory. Water is routinely sampled at specific locations in the water supply system and then sent to laboratories for analysis.

Remote community water samples were collected by Essential Services Operators's and then Power and Water chartered small planes to collect the samples from each of the remote communities and deliver them to accredited testing laboratories in Darwin and Alice Springs.

Operational monitoring

Operational monitoring is used to trigger immediate short-term corrective action or to inform long term planning or evaluations. Source water and treatment performance monitoring are important components of operational monitoring as they provide an indication of disinfection performance. Detailed studies and investigations help Power and Water to increase the understanding of the drinking water quality at each supply. The extensive data and information from the operational monitoring is not reported here.

Verification (compliance) monitoring

Verification monitoring of water quality parameters is the final check that the barriers and preventative measures implemented to protect public health are working effectively. Verification data is used for assessing conformance with the ADWG, compliance with agreed levels of service and as a trigger for short-term corrective action, if required.

Section 2 of this report provides more details and an assessment of the verification data collected for this reporting period.

THE AESTHETIC QUALITY WILL AFFECT THE ACCEPTANCE OF DRINKING WATER

Water quality indicators

It is not practical for all potential water contaminants to be monitored in a drinking water quality monitoring program, so indictors are used to verify the water quality.

The key indicator parameters used to determine the water quality for the reporting period are described in the following sections. Section 2 of this report provides an assessment of the data found in the appendices.

Microbiological parameters

Disease-causing organisms, or pathogens, pose an immediate risk to public health. The risk from pathogens in water supplies can vary significantly in a short period of time, therefore frequent microbiological monitoring is required for an assessment.

The analytical procedures used to detect pathogens are complex and specific for each pathogen. Indicator organisms are used to determine if contamination has occurred.

Power and Water monitored the following indicator organisms:

- *Escherichia coli (E. coli)* indicates faecal contamination from warm-blooded animals, including humans and hence, the potential for the presence of disease-causing micro-organisms
- Total coliforms indicate the range of bacteria found in many soil and aquatic environments and can provide a measure of disinfection and the cleanliness of the drinking water supply more generally.

The ADWG performance requirements stipulate that no E. coli should be detected in drinking water. The guidelines also include the requirement that rigorous corrective action be undertaken and documented in response to an *E. coli* detection, to prevent potential recurrences of faecal contamination.

Power and Water also continued to monitor for the presence of *Naegleria fowleri (N. fowleri)*, a free-living amoeboflagellate found in soil and aquatic environments in the Northern Territory. *N. fowleri* is almost harmless to drink and not associated with faecal contamination. This pathogen causes a rapid and usually fatal infection, primary amoebic meningoencephalitis, acquired when contaminated water is forced into the nasal passages.

Power and Water aims to maintain a level of chlorine in all distribution systems to control *N. fowleri*. The ADWG recommends controlling *N. fowleri* by maintaining a minimum free chlorine level of 0.5 mg/L.

Power and Water has continued to investigate for the presence of the pathogen *Burkholderia pseudomallei*, the agent responsible for the disease melioidosis. Power and Water works closely with the Menzies School of Health Research to identify drinking water characteristics likely to be at risk.

The results of monitoring for these indicator organisms and pathogens are presented in Section 2.

Chemical parameters (Health)

Power and Water monitored numerous chemical parameters to indicate the water quality supplied to customers. A wide range of measurable characteristics, compounds or constituents can be found in water and may affect its quality. The results for the typical health related chemical parameters are presented in tables in the appendices.

Organic chemicals

It is neither necessary, nor feasible for all potential organic chemical contaminants to be monitored in Power and Water's drinking water quality monitoring program. The program remains responsive to emerging potential risks as they become known, as described in Section 1 Power and Water's PFAS response.

PFAS results are not reported in this annual report, with further results and investigations found on the website.

Other organic chemicals of interest include:

Trihalomethanes

Chlorine introduced into a water supply as a disinfectant will also react with naturally occurring organic matter in the water to produce by-products of disinfection such as trihalomethanes (THMs). All major and minor urban centres were monitored for THMs. Results can be found in tables in the appendices.

Pesticides

The use of restricted chemical products is managed by the various government Departments. Pesticides (insecticides and herbicides) are used in our catchments. DoH requires testing for these chemicals when there is the potential for water supply contamination. Our pesticide monitoring program focuses on 46 commonly used pesticides including organochlorine, organophosphate and triazine pesticides, insecticides and acidic herbicides.

Chemical and physical parameters (aesthetic)

Aesthetic parameters are the chemical and physical characteristics of water quality that pose no threat to human health, however can affect drinking water appearance, taste, feel and odour. This includes total dissolved solids (TDS), hardness (calcium and magnesium carbonates and sulfates), colour, pH and a few common metals.

The aesthetic quality will affect the acceptance of drinking water and is usually the first change in water quality observed. Results for the annual assessment of aesthetic parameters are shown in tables in the appendices.

Radionuclides

Low levels of radioactivity are occasionally detected in drinking water supplies in the Northern Territory. The radionuclides responsible for this radioactivity are natural and a characteristic of the local hydrogeology.

Details of the radiological assessment are reported in Section 2. Results are shown in tables in the Appendices.

6

MANAGEMENT OF INCIDENTS AND EMERGENCIES

Power and Water is prepared for the management of incidents that could compromise water quality.

Power and Water's role and responsibility in the event of a water quality emergency are defined by agreements with various government agencies. Agreements are based on the quick management of issues and designed not to impede on regulator independence. The MoU defines the role of Power and Water as the service provider and the Department of Health (DoH) as the regulator.

The nature of any event is clearly defined in the document, *Protocol for the Notification by Power and Water Corporation of Drinking Water Quality and Supply Reportable Incidents and Events to the Department of Health.*

This protocol defines emergency scenarios, the communication and the established procedures to respond.

In this reporting period Power and Water established a procedure for drinking water quality reporting, which details the internal and external reporting requirements for incidents and emergencies.

Incidents and emergencies that occurred during this reporting period are discussed in Section 2 Part A for major and minor urban centres and Section 2 Part B for remote communities.

7

EMPLOYEE AWARENESS AND TRAINING

POWER AND WATER IS COMMITTED TO GAINING INDUSTRY TRAINING TO EITHER CERTIFICATE III OR IV FOR ALL WATER OPERATORS

Power and Water has been focused on developing an organisation with a professional, capable, accountable and diverse workforce, this includes a range of formal and informal training opportunities for all staff.

Training programs implemented during this reporting period include formal training courses accredited by a national training body, in house training, on the job experience, mentor programs, workshops, demonstrations, seminars, courses and conferences.

Organisational development

In this reporting period Power and Water has been developing its people and growing team skills. A culture and leadership program focuses on behaviours to cultivate employee responsibility and motivation. The training is targeted to embed a more constructive and positive working culture.

Industry training

Power and Water is committed to gaining industry training to either Certificate III or IV for all Water Operators. Certificates III and IV in Water Operations provide training for operators in the water industry and the opportunity for specialisations in water and wastewater treatment, water supply distribution (network), trade waste, catchment operations, irrigation, dam safety and operations and source protection, river groundwater diversions and licensing, and construction and maintenance.

Essential Services Operators (ESO) Training and Competency Framework

Power and Water's focus in this reporting period has been on support, coaching and mentoring of ESO's and contractors. Workshops held in Alice Springs in 2018 helped to improve the ESO Competency Framework and its supporting ESO Competency Assurance Program.

ESOs have a crucial role in a remote community drinking water supply. The role brings with it significant accountability and a high level of expectation from community residents. ESOs, employed by contractors, have regular direct interaction with Power and Water employees in their day to day roles.

The ESO Competency Framework provides a high level framework to identify the components required to ensure a competent, reliable and skilled ESO, who has the appropriate access to information, is well supervised and supported.

The framework defines key competency components including:

- recruitment
- induction
- training
- information
- active supervision
- skill maintenance
- feedback and support.

The ESO Competency Assurance Program outlines the processes and actions that will ensure the framework is implemented throughout the term of the contract.

Without any one of these components, ESO competency could be compromised, increasing the risk for the ESO, the contractor, the residents and Power and Water.

Water in the Bush

Power and Water employees continue to participate in professional and industry events such as the annual Water in the Bush conference. This event brings together Northern Australia water professionals, the community and industry to share knowledge on issues affecting water. The 2017 event included the keynote presentation of 'The Power and Water drinking water quality management system'.

8

COMMUNITY INVOLVEMENT AND AWARENESS

Our customers are at the heart of everything we do and involving the community is vitally important to delivering quality drinking water. Growing community interest in water quality issues in this reporting period was met with innovative community engagement and award winning customer service by Power and Water.

Engaging with our community

Collaboration

The design and planning of the Borroloola water treatment plant project included a strong focus on collaboration with the community. Local businesses are involved in construction, while youth and artists developed the artwork that will be used on the facility buildings. The project was completed in late 2018 and is delivering improved drinking water quality for one of the most remote northern Australian townships..

Customer Service

Power and Water's Katherine customer service coordinator Jenny Mackie was the proud recipient of a Chief Minister's Award for Excellence Medal in November 2017.The Chief Minister's Awards for Excellence in the Public Sector medals, recognise individual's commitment to excellence. The prestigious award acknowledges an individual's outstanding and commendable public service.

Communication

Power and Water's online presence helps to make it easier for customers to contact us and delivers a range of informative, educational and engaging content.

Providing online information about our Katherine customer's drinking water has become important to the community. The results from PFAS testing were continuously updated as results came back from interstate laboratories. Power and Water's full response to PFAS is available online, PFAS in the Territory.

Making a contribution

Power and Water supports community events and promotes awareness of water quality. Examples in recent years include:

- sponsoring the Water in the Bush conference hosted by the Northern Territory branch of Australian Water Association (AWA)
- presenting at major regional events and shows
- supporting cultural and local community events such as the desertSMART EcoFair and the Desert Harmony Festival and the Darwin Festival
- sponsor the Group Training NT awards, supporting the School Based Apprentice of the Year award.

Water smart programs

The leak detection program helps to remind customers of their water responsibilities from the meter to the tap. Fixing leaks reduces water wastage and helps to maintain the quality from the meter to the tap.

The Living Water Smart's community leak program was launched in 2017. In what is a first for utilities in Australia a mobile application to detect leaks and manage repairs was used. The program was recognised for its innovation by winning the Australian Water Association's Program Innovation Award. In Darwin the program saved more than one billion litres of water from leaking.

The Katherine community reduced water demand by 20 per cent when water conservation measures were introduced in this reporting period. The reduced demand helped reducing PFAS in the Katherine water supply, as described on the website.

In Remote communities, smart water meters were installed in Galiwinku, Milingimbi, Gunbalanya, Kybrook Farm, Yuendumu, Santa Teresa, Ali Curung, Yuelamu and Epenarra during this reporting period.

The collaborative water charging agreement between smart water meters customer in Milingimbi and Department of Housing and Community Development reduced the overall bulk water demand by 30 per cent. In comparison, the water conservation program without water smart meters was only able to reduce demand by 10 per cent.

9

THE PROJECT OUTCOMES WILL CONTRIBUTE TO SOLVING WATER SUPPLY PROBLEMS IN REMOTE COMMUNITIES

RESEARCH AND DEVELOPMENT

Research and development activities help to ensure continual improvement and the ongoing capability to meet drinking water quality requirements. Power and Water is a member of various water industry groups that undertake research work.

WaterRA projects

Power and Water is an industry member of Water Quality Research Australia Limited (WaterRA), a not for profit organisation that conducts collaborative and relevant research on water quality issues of national importance. WaterRA aims to ensure that knowledge gained from this research is transferred to industry by bringing together key water research groups and industry members across Australia.

As an active member of WaterRA, Power and Water participates and contributes funding to numerous research and development initiatives and workshops. Water Quality Officers from Power and Water attended the WaterRA workshop held in Darwin in March 2017, on *Burkholderia pseudomallei*, the bacterium responsible for meliodoisis.

The following projects progressed in this reporting period:

Project # 1109: Good Practice Guide to Sanitary Surveys and Operational Monitoring to Support the Assessment and Management of Drinking Water Catchments

Power and Water participated in workshops to help with the development of guidelines for operational monitoring of catchment hygienic condition and controls for catchment management.

Australian Research Council Linkage Project

Project # LP150100588: Cross-cultural management of fresh water on resource-constrained islands

This project aims to develop a methodology for community-led adaptive water management on resource-constrained islands and involves Indigenous communities in the development of predictive groundwater models. The project plans to apply three dimensional participatory mapping, a stakeholder engagement process led and owned by the communities on Milingimbi Island in the Northern Territory. The extension of the participatory mapping with a subsurface component will then support the conceptualisation and development of a numerical model of the island's groundwater system. The predictive model and community engagement processes are expected to provide a more robust methodology for evaluating future water management plans. The project outcomes will contribute to solving water supply problems in remote communities in Australia and overseas.

The Occurrence and Management of Opportunistic Pathogens and Biofilms in Water Supplies of Northern Australia

The purpose of the study is to improve the understanding with the occurrence of opportunistic pathogens such as *Burkholderia pseudomallei* in drinking water supplies. Developing improvements to controls management of the hazard in engineered systems and risk communication.

10

POWER AND WATER PRODUCES A NUMBER OF DRINKING WATER-RELATED REPORTS FOR VARIOUS STAKEHOLDERS

DOCUMENTATION AND REPORTING

Power and Water is a government owned corporation so business information is managed consistent with whole of government requirements. Throughout 2017 and 2018 work continued on improving the organisations document management framework, which included the documentation from the drinking water quality management system.

Controlled documentation

Document control and management is undertaken by a central business function at Power and Water. In this reporting period the team developed a number of tools and enhancements to streamline accessing documentation.

These changes have helped Water Services and Regions and Remote Operations deliver the Drinking Water Quality Policy Statement and its supporting documents. In total, 103 controlled drinking water quality documents were approved for publishing in the reporting period including the 92 water safety plans that were developed in 2016/2017.

Drinking water quality reporting

Power and Water continued to develop systematic water quality reporting processes in 2017/2018. A drinking water quality reporting procedure was finalised and describes the internal and external reporting requirements.

Reporting to stakeholders and regulators

In this reporting period Power and Water produced an annual report that was tabled in the Northern Territory Legislative Assembly. This report is a mechanism for Power and Water's Shareholding Minister and Northern Territory Parliament to transparently receive information. It also provides information for others who have an interest in the provision of water, sewerage and electricity services in the Northern Territory.

Power and Water produces a number of drinking water-related reports for various stakeholders including:

Department of Health

- Reportable incidents or events that have the potential to effect public health.
- Notifiable events for exceedances to health or aesthetic characteristics.
- Monthly compliance reporting.

Department of Housing and Community Development

- Annual Water Source Status Report
- Annual Traffic Light Report

Bureau of Meteorology

- Groundwater reports.

Department of Environment

- Extraction licences compliance reports.

Customers

- Annual Drinking Water Quality Report

Annual Drinking Water Quality Report

By producing an annual drinking water quality report, Power and Water provides an objective account of the quality of the drinking water supplied to customers.

Power and Water also reports on its drinking water management progress and achievements through other channels including social media.

Power and Water continues to make comprehensive and quality information available to the public via its website or on request. This includes technical information, guides about water conservation and media releases.

Information provided in this Annual Drinking Water Quality Report forms part of a national reporting obligation and provides the Northern Territory and the public with a reliable and transparent source of information on water utilities.

11

EVALUATION AND AUDIT

Long term evaluation of drinking water quality results and audit of drinking water quality management are required to determine whether preventative strategies are effective and whether they are being implemented appropriately. These reviews enable performance to be measured against objectives and help to identify opportunities for improvement.

Audit plan development

A detailed audit program and schedule has been developed as part of the Drinking Water Quality Management System project. This includes audit forms, an assessment procedure and an audit program to be implemented over the 2018-2020 timeframe.

Disinfection reliability assessments

A Disinfection Reliability Audit was completed for all major and minor centres and remote communities in the 2016-2017 reporting period. During 2017-18, a number of remedial actions were prioritised, planned and carried out as a result of the prior audit.

These included:

- upgrade of key urban sites that were identified through the audit
- a standardised disinfection system has been implemented at a range of sites, with more robust dual injection and dual analysers
- a large investment in Southern region urban sites to improve visibility of schemes has been made. This includes chlorine analysers in distribution tanks, SCADA visibility of remote sites, Pi coverage of remote sites, hardware upgrades
- for remote sites, a detailed program has been prioritised and planned, and we are awaiting funding to implement all planned upgrades.

Audit completed of DWQMS

A high level audit was completed by an external consultant of progress on the DWQMS, and results were presented back to the executive committee for drinking water quality. The audit allows reflection on developments achieved and allows improvement plans to be targeted and further refined.

12

REVIEW AND CONTINUAL IMPROVEMENT

Senior executive support, commitment and ongoing involvement are essential to the continual improvement of the organisation's activities relating to drinking water quality.

During this reporting period, Power and Water has undertaken work to quantify our current scheme risks and put in place associated improvement plans. In addition to this, Power and Water has made significant progress in respect to developing a systematic and embedded approach to managing drinking water quality.

Drinking Water Quality Management System review

As part of its commitment to continual improvement, Power and Water executive management has maintained focus on implementation of the Drinking Water Quality Management System (DWQMS) Project. The project focus has continued to be on strengthening the management system via development of a range of key documentation including key governance, reporting and auditing procedures.

The governance structure for water quality developed as part of the DWQMS project remains, which ensures senior management has direct oversight of all water quality issues, and takes responsibility to drive cultural, organizational and process water quality improvements. This involvement and review by senior executives is key to ensure commitment to water quality is ongoing and continual striving for water quality improvements.

Further to this, Water Safety Plans (WSP's) have been developed and finalised for all 92 communities. The WSP form an essential control point for the DWQMS and on a site by site basis, to ensure the safety of drinking water through the use of a comprehensive risk assessment and risk management approach. Gaps identified through the Water Safety Plans were collated into water quality improvement plans.

SECTION 2:
DRINKING WATER QUALITY AND PERFORMANCE

PART A

MAJOR AND MINOR CENTRES

MICROBIOLOGICAL RESULTS

Bacteria

Monitoring objective

Bacterial indicators are used for verifying the effectiveness of treatment and to assess the microbiological cleanliness of the water. Monitoring for indicator bacteria provides a useful communication tool to verify that the barriers to protect public health are working effectively.

Monitoring program

Power and Water's drinking water monitoring programs require that samples, representative of the quality of water supplied to consumers, be collected and analysed for *E. coli* at a minimum frequency. The results from this monitoring are used to demonstrate compliance and are reported as verification of the microbiological quality.

Operational monitoring for bacteria provides the detailed information needed to maintain a treatment process within defined parameters (process control). This information is not reported here.

The drinking water monitoring programs required a total of 3,687 samples to be collected for bacteriological verification assessment from 20 centres across the Northern Territory over the reporting period. A total of 4,038 samples were taken. The sample collection performance for individual urban centres for the recent period 2017-18 is presented in Table 12 and Table 13 in the Appendices.

Limitations of monitoring

Microbiological verification monitoring is not intended to provide an absolute measure of safety because of the inherent sampling and analysis limitations. Samples only ever represent a small percentage of the total water consumed. Analytical methods take substantial time to produce a result, which means the water is already consumed before a result is received.

Compliance performance

Performance can be regarded as satisfactory if over the preceding 12 months:

- at least the minimum number of programmed samples has been tested for *E. coli*
- samples tested are representative of the quality of water supplied to consumers
- no *E. coli* is detected in 100 per cent of samples as per the ADWG (this excludes repeat or special purpose samples).

For the 2017-18 reporting period, 98 per cent of scheduled samples were collected across all communities. Further information is detailed in Appendix B Tables 15 to18.

During the 2017-18 reporting period, the 100 per cent *E. coli* free target was achieved in all major urban centres in the Northern Territory. A graph showing the percentage of samples taken in major urban centres between 2013 and 2018 in which no *E. coli* were detected can be found in Figure 5.

The majority of minor urban centres also achieved the 100 per cent *E. coli* free targets (see Figure 6). A summary of the incidents that occurred during the monitoring period can be found in Table 8.

Figure 5 Percentage of samples taken in major urban centres in which no E. coli was detected for monitoring program periods 2013-18

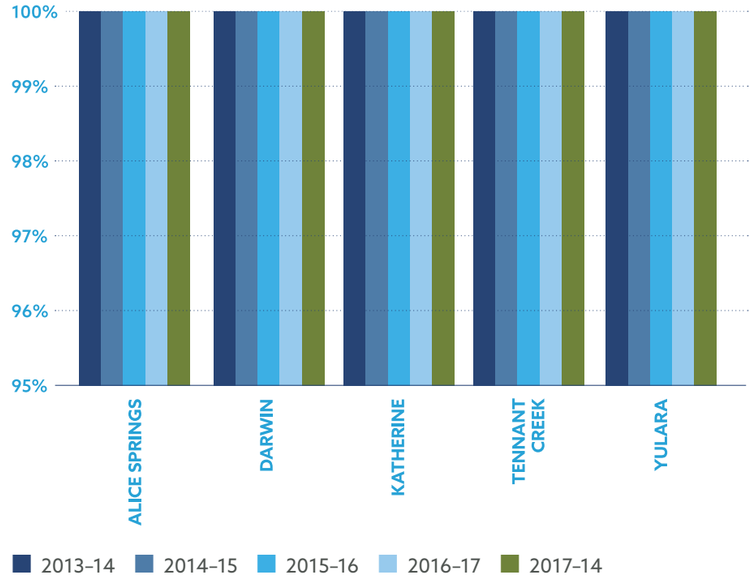
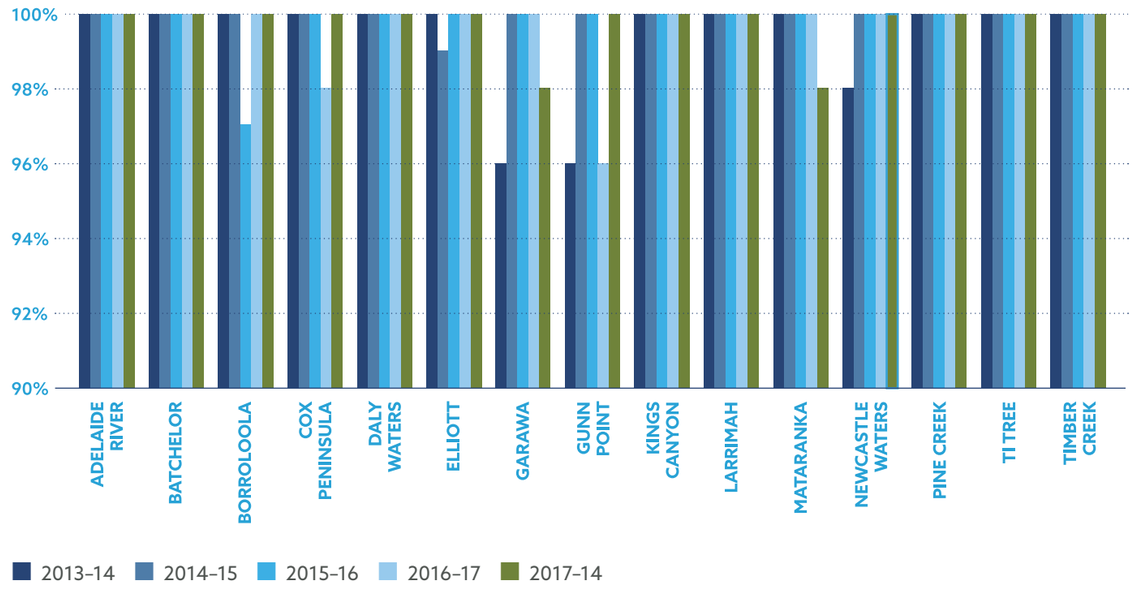


Figure 6 Percentage of samples taken in minor urban centres in which no E. coli was detected for monitoring program periods 2013-18



Naegleria fowleri

The detection of *N. fowleri* in the Darwin distribution system in 2005 prompted Power and Water to undertake extensive monitoring of water supplies and to implement procedures to control this amoeba.

An effective chlorine residual maintained throughout the distribution system provides protection and limits the regrowth of *N. fowleri*. Free chlorine at 0.5 mg/L or higher will control *N. fowleri*, provided the disinfectant persists at that concentration throughout the water supply system. Power and Water requires all water supplies to maintain minimum free chlorine residual of not less than 0.5 mg/L throughout the entire supply.

During the reporting period, Power and Water conducted the *N. fowleri* monitoring program, collecting 371 samples from across the Northern Territory. Investigation sampling of tank sediments continued during tank cleaning.

The results from the 2017-18 *N. fowleri* monitoring program can be found in Table 5.

Table 5 Thermophilic Amoeba detections, monitored supplies and investigation 2017-18

CENTRE ROUTINE MONITORING	Samples Collected	ACANTHAMOEBA GROUP III (/L)	AMOEBAE - TOTAL (/L)	AMOEBAE - TOTAL (SOLIDS) G DRY WEIGHT	HARTMANNELLA (/L)	NAEGLERIA - TOTAL (/L)	NAEGLERIA - TOTAL (SOLIDS) G DRY WEIGHT	NAEGLERIA FOWLERI (/L)	NAEGLERIA LOVANIENSIS (/L)	WILLAERTIA MAG (/L)
		Positive Samples								
Alice Springs Investigative – distribution system	6	0	0	0	0	0	0	0	0	0
Katherine Investigative – distribution system	28	0	0	0	0	0	0	0	0	0
Darwin Verification – distribution system	207	0	6	0	5	0	0	0	0	0
Darwin Operational – raw water (surface and groundwater)	25	1	2	0	0	1	0	0	1	0
Total samples	**266**									

CENTRE ROUTINE MONITORING	Samples Collected	ACANTHAMOEBA GROUP III (/L)	AMOEBAE - TOTAL (/L)	AMOEBAE - TOTAL (SOLIDS) G DRY WEIGHT	HARTMANNELLA (/L)	NAEGLERIA - TOTAL (/L)	NAEGLERIA - TOTAL (SOLIDS) G DRY WEIGHT	NAEGLERIA FOWLERI (/L)	NAEGLERIA LOVANIENSIS (/L)	WILLAERTIA MAG (/L)
		Positive Samples								
Tennant Creek Investigative	47	1	2	0	1	2	0	1	2	1
Yulara Investigative	8	0	0	0	0	0	0	0	0	0
Gunn Point Investigative	50	0	14	0	7	9	0	0	9	0
Total samples	**105**									

Burkholderia pseudomallei

B. pseudomallei is the agent responsible for melioidosis and despite being ubiquitous in the tropics, the understanding in a drinking water context is limited. Appropriate chlorination controls this pathogen with recent research helping to identify water supplies at risk of contamination.

Power and Water's drinking water monitoring programs have included *B. pseudomallei* as an investigative and research activity since its detection in Darwin rural private supplies in 2010. Power and Water works closely with the Menzies School of Health Research to identify water supplies at risk.

Between the period 2017-18 *B. pseudomallei* was detected in treatment plant sediments, filter sand and filter backwash water from Katherine.

CHEMICAL AND PHYSICAL RESULTS

The results of monitoring water quality parameters are presented in this report as statistical values.

Health related parameters are reported as a 95th percentile where statistically adequate data is available. If data is limited, values are reported as the maximum value. As specified by the Australian Drinking Water Guidelines, aesthetic and other parameters are reported as a mean value.

Table 13 and Table 14 in the appendices show the results of the health, aesthetic and other parameters for each major and minor urban centre respectively.

Radiological results

All water supplies are examined to gain an initial screening level of gross alpha and gross beta activity concentrations. The Annual Radiological Dose (ARD) is calculated only for supplies that had one or more samples above the screening level.

To comply with the ADWG, the radiological data used in the calculation of the total annual radiation dose must be no more than two years outside the reporting period for groundwater supplies and no more than five years for surface water. Data covers the period: 2013-18 (5 years) for surface water and 2016-18 (2 years) groundwater.

Annual assessment

All water supplies passed the annual ADWG radiological limit of 1 mSv/yr in 2017-18. As shown in Table 6, the majority of water supplies complied with the ADWG screening level, with gross alpha and gro ss beta radioactivity levels below 0.5 Bq/L ('PASS') during reporting periods. Results for the radiological assessment of all supplies for 2017-18 are shown in Table 13 in the Appendices.

Kings Canyon's water supply has higher levels of radionuclides than other Northern Territory water supplies and as a result is intensely monitored. Kings Canyon radiological dose passes the guideline limit during the reporting period 2017-2018.

THE RESULTS OF MONITORING ARE PRESENTED IN THIS REPORT AS STATISTICAL VALUES

Table 6 Summary of annual radiological assessments

REPORTING YEAR		2014-15	2015-16	2016-17	2017-18
Total number of centres sampled[1]		20	20	20	20
		11	12	12	12
Number of centres that comply to the screening level (0.5Bq/L)	*Major*	3	3	2	4
	Minor	11	12	12	12
Number of centres exceed the annual guideline value (1.0 mSv/year)	*Major*	None	None	None	None
	Minor	1	1	None	None

[1] The town camps Garawa1 and 2 are provided emergency support and monitoring.

Chemical health parameters

Trihalomethanes (THMs)

During the 2017-18 monitoring period, all water supplies were assessed for THMs. The concentration of THMs for water supplies ranged during the period 2017-18 from <0.004 to 0.094mg/L, all well below ADWG health guideline limit of 0.25 mg/L, Table 13 in the appendices.

THM levels remain similar to those measured in previous years. The low levels of THMs measured in Northern Territory water supplies is due to the low level of total organic carbon, the precursors of THMs, in these waters.

Pesticides

The pesticide monitoring program focuses on 46 commonly used pesticides, including organochlorine, organophosphate and triazine pesticides, insecticides and acidic herbicides.

Although monitored for several years, pesticides have rarely been detected in Northern Territory water supplies, despite use in some areas. Due to these results, pesticide monitoring during 2017-18 was restricted to Darwin and Katherine water supplies. These supplies are considered potentially vulnerable to pesticide contamination with agricultural activities close to production bores and surface water sources.

Good management of surface water sources and bores reduces the risk of drinking water becoming contaminated with pesticides. Bores are required to be constructed to standards that ensure bore head integrity and prevent surface water (potentially containing pesticides) from entering the bore. Pesticide use is strictly controlled in catchments for surface waters, such as reservoirs and rivers.

Nitrate

Nitrate concentrations in Northern Territory groundwater come from a variety of natural sources. Termite mounds, nitrogen fixing bacteria and plants contribute to the soil nitrate levels.

The ADWG recommends that nitrate concentrations between 50 -100 mg/L are a health consideration for infants younger than three months, although levels up to 100 mg/L can be safely consumed by adults.

Ti Tree drinking water typically has nitrate levels on or around 50 mg/L and less than 100 mg/L. The DoH gives regular advice to Ti Tree customers that the water should not be used when bottle feeding infants.

Lead

The presence of lead in household plumbing is a problem worldwide, as any lead in brass fittings is dissolved into the water. Lead is not found in the source water used for public water supplies. Instead, lead can enter tap water when plumbing materials containing lead start to corrode.

Lead was not detected from most of the water samples taken in the Territory, however where the sample site plumbing has started to corrode lead can be detected as occurred at a sample tap in Garawa, see recorded emergencies on page 47.

CUSTOMER SATISFACTION

AS WITH MANY WATER SUPPLY RESERVOIRS, DARWIN RIVER RESERVOIR IS SUBJECT TO SEASONAL WATER QUALITY CHANGES

Water quality customer complaints

Complaints from consumers concerning the quality of their drinking water mostly focus on the aesthetic aspects of appearance, taste and odour. Like other Australian drinking water providers, Power and Water records all water quality complaints made by its customers and reports them to the National Water Commission.

Number of complaints

Table 7 shows the total number of complaints specific to water quality made by customers between 2014 and 2018. An increase in the number of water quality complaints occurred in the 2017-18 reporting period. The largest increase has been seen in Darwin in the months following tropical cyclone Marcus.

A month by month breakdown of Darwin water quality complaints is shown in Figure 7 and reflects a discernible pattern between complaints in water quality and seasonality. The main water complaint was discoloured water such as clarity and particles. Seasonal changes to temperature and wind cause water quality changes in Darwin River Reservoir and flow changes in the distribution.

As with many water supply reservoirs, Darwin River Reservoir is subject to seasonal water quality changes. Stratification is the development of distinct layers of water of different temperature or density at various depths in a water body. Stratification develops when the upper layers of the reservoir are heated faster than the heat can disperse into the lower depths of the reservoir. The differences between the layers limit circulation between them and leads to significantly different aesthetic water qualities.

Once the reservoir has stratified, a large amount of energy is required to disrupt the layered structure and mix the reservoir again. Destratification occurs once the surface temperature cools during a monsoonal event or when the dry season trade wind and cool nights arrive. The layers mix to produce discoloured water throughout the reservoir. Low quality anoxic water from the depths of the reservoir mix in with the surface water and it is drawn into the supply.

Iron and manganese entering the distribution system oxidise and will precipitate out of solution, creating discoloured water. This pattern corresponds with the comparatively high number of complaints received in the late wet season and early dry season shown in Figure 7.

Power and Water strives to minimise the impact of these seasonal variations. If a customer reports discoloured water, the mains supplying the customer's residence is flushed. In addition, water quality is monitored at a number of locations in the Darwin water supply to gauge the extent of discoloured water and determine when widespread flushing is required.

Table 7 Water quality complaints

REGION	PROPERTIES (2017-18)	2013-14	2014-15	2015-16	2016-17	2017-18
Adelaide River	95	1	6	0	0	0
Alice Springs	12,498	5	4	4	0	9
Darwin	60,731	154	208	212	117	127
Katherine	2,222	4	2	4	0	3
Tennant Creek	1,228	0	0	0	0	0
Total	**76,774**	**164**	**220**	**220**	**117**	**139**
Complaints per 1000 properties (for the water supply system specified)	*Properties based on number of meters*	*2.18*	*2.93*	*2.93*	*1.56*	*1.81*

Figure 7 Monthly drinking water quality complaints received for Darwin 2017-18

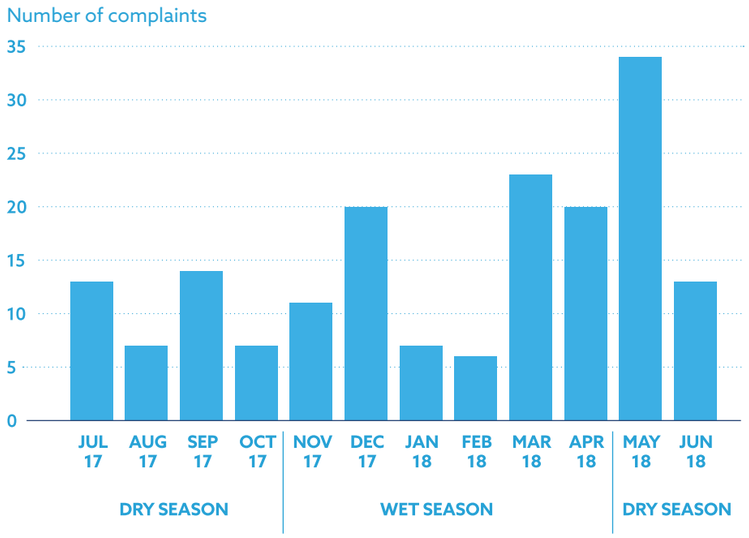
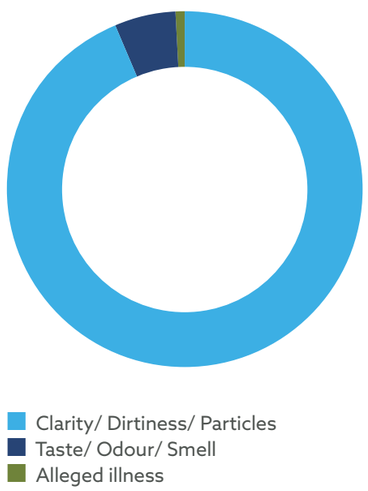


Figure 8 Customer complaints for Darwin 2017-18 by complaint type



Types of complaints

Nighty-four per cent of Darwin's customer complaints related to discoloured water. The majority of discoloured water is normally a destratification event at the reservoir or flow changes dislodging sediments in the distribution pipes.

Milkiness or cloudiness is most commonly due to the re-pressurising of water pipes. This causes trapped air to dissolve in the water and minute air bubbles form when the tap is turned on, creating a milky appearance, which clears if the water is left to stand.

Customer complaints about odour are attributable to free chlorine residuals. Chlorine is maintained at a minimum of 0.5 mg/L and at this level it can be objectionable to some customers. This level is required as a response to the detection of N. fowleri in some Northern Territory water supplies.

If there is doubt as to the cause of a water quality problem, an investigation is carried out and when necessary, water samples are taken and analysed.

NINETY-FOUR PER CENT OF DARWIN'S CUSTOMER COMPLAINTS RELATED TO DISCOLOURED WATER

RECORDED EMERGENCIES/INCIDENTS

ALL INCIDENTS HAD REMEDIAL ACTIONS UNDERTAKEN AS A PRIORITY

During the 2017-18 reporting period the following incidents occurred:

- a 'boil water' alert for Darwin and the greater Darwin region, including Palmerston
- *E. coli* detection at Garawa and
- *E. coli* detection at Mataranka
- Lead detection in Garawa.

All incidents had remedial actions undertaken as a priority and were investigated to prevent recurrences.

E. coli detections

During the reporting period, a total of two incidents of *E. coli* were recorded from verification water samples, see Table 8. In all incidents remedial actions were given priority and the Department of Health (DoH) was notified to help determine the most effective corrective actions. Investigations were conducted to determine the likely causes and identified preventive corrective actions.

The Garawa *E. coli* detection in December 2017 was at the tank outlet. The primary response was to ensure adequate chlorination of the tank and water supply, followed by an investigation into the cause of the contamination. Corrective actions were taken quickly so consequently DoH did not need to issue alerts in response to the *E. coli* detection. Samples were collected after the corrective actions and showed that the water was free of *E. coli*. The investigation found that the chlorination system was unreliable and planning to improve was started.

The Mataranka *E. coli* detection in December 2017 was from one verification drinking water sample. The primary response was to ensure adequate chlorination of the water supply, followed by an investigation into the cause of the contamination. Corrective actions were taken quickly so consequently DoH did not need to issue alerts in response to the *E. coli* detection. Samples were collected after the corrective actions and showed that the water was free of *E. coli*. The Investigation showed the positive detection was due to a fault in the sampling point and it was not representative of the distribution system.

The Darwin region endured a category 2 tropical cyclone weather event on 17 March 2018. During this event water supply infrastructure was affected in several locations and water quality compromised. DoH issued precautionary boil water alert for Darwin and the greater Darwin region, including Palmerston. Samples were taken to confirm that the corrective actions were successful and the boil water alert was lifted the following day.

Lead was detected from a single sample site in Garawa and a precautionary alert was issued. An investigation concluded internal plumbing was the cause and repairs have since resolved the issue.

Table 8 *E. coli* incidents during the drinking water quality monitoring program period 2017-18

YEAR	SUPPLY	SAMPLES WITH *E. COLI* DETECTIONS	COLLECTION DATE	NUMBER OF *E. COLI* DETECTED IN SAMPLE (MPN/100 ML)
2017-18	Garawa	2	6 December 2017	43 and 109
	Mataranka	1	12 December 2017	45

PART B

REMOTE COMMUNITIES

MICROBIOLOGICAL PARAMETERS

The ADWG recommends that for the long term evaluation of health and aesthetic parameters:

- one year of data be used
- for health related parameters, the maximum value (or 95th percentile where there are greater than 30 data points) and significant figure should be used for the reporting period
- for aesthetic parameters, the average value for data in the reporting period should be reported
- for radiological analysis, two years of data should be used for ground water sources, and five years of data for surface water sources. The reported value should be the maximum result for the reporting period.

Monitoring objective

Bacterial indicators are used for verifying the effectiveness of treatment and to assess the microbiological cleanliness of the water. Monitoring for indicator bacteria provides a useful communication tool to verify that the barriers to protect public health are working effectively.

Monitoring program

Power and Water's drinking water monitoring programs require that samples, representative of the quality of water supplied to consumers, be collected and analysed for *E. coli* at a minimum frequency. The results from this monitoring are used to demonstrate compliance and are reported as verification of the microbiological quality.

Operational monitoring for bacteria provides the detailed information needed to maintain a treatment process within defined parameters (process control). This information is not reported here.

The sample collection performance for individual Remote centres for the recent period 2017-18 is presented in Table 15 to Table 17 in the appendices.

Limitations of monitoring

Microbiological verification monitoring is not intended to provide an absolute measure of safety because of the inherent sampling and analysis limitations. Samples only ever represent a small percentage of the total water consumed. Analytical methods take substantial time to produce a result, which means the water is already consumed before a result is received.

Compliance performance

Performance can be regarded as satisfactory if over the preceding 12 months:

- at least the minimum number of programmed samples has been tested for *E. coli*
- samples tested are representative of the quality of water supplied to consumers
- no *E. coli* is detected in 100 per cent of samples as per the ADWG (this excludes repeat or special purpose samples).

For the 2017-18 reporting period, 98 per cent of scheduled samples were collected across all remote communities. Further information is detailed in Appendix B Tables 15 to18.

During the 2017-18 reporting period, the 100 per cent *E. coli*free target was achieved in all Remote centres in the Northern Territory. Gunbalanya, Numbulwar and Pirlangimpi had *E. coli* detections however these incidents were due to error collecting the sample - see recorded emergencies section and table 10.

DURING THE 2017-18 REPORTING PERIOD, THE 100 PER CENT *E. COLI* FREE TARGET WAS ACHIEVED IN ALL REMOTE CENTRES

CHEMICAL AND PHYSICAL PARAMETERS

The results of monitoring water quality parameters are presented in this report as statistical values.

Health related parameters are reported as a 95th percentile where statistically adequate data is available. If data is limited, values are reported as the maximum value. As specified by the Australian Drinking Water Guidelines, aesthetic and other parameters are reported as a mean value.

Tables 20 to 27 in the appendices show the results of the health, aesthetic and other parameters for all remote communities.

Radiological results

All water supplies are examined to gain an initial screening level of radioactivity. Communities that had one or more samples above the screening level have the annual radiological dose (ARD) calculated.

To comply with the ADWG, the radiological data used in the calculation of the total annual radiation dose should be no more than two years outside the reporting period for ground water supplies, and no more than five years for surface water.

As shown in Table 9, all water supplies passed the annual guideline limit of 1 mSv/yr in 2017-18. The majority of water supplies pass the ADWG screening level during reporting periods.

The annual radiation dose is calculated only for supplies that had one or more samples failing the screening level. Results for the radiological assessment of all supplies for 2017-18 are shown in Table 19, 21, 23 and 25 in the appendices.

Table 9 Summary of annual radiological assessments

REGION	PROPERTIES (2017-18)	2013-14
Total number of centres sampled		71
Number of communities that comply to the screening level (0.5Bq/L)	*Northern region*	22
	Katherine region	17
	Southern region	3
	Southern region	12
Number of communities exceed the annual guideline value (1.0 mSv/year)		None

Health parameters

Physical and chemical health parameters are water quality characteristics that may present a risk if the consumer is exposed to concentrations above ADWG levels over a lifetime. An assessment of the data for this reporting period can be found in the appendices.

Antimony concentrations in drinking water are recommended by the ADWG to not exceed 0.003 mg/L.

For this reporting period antimony concentrations ranged between 0.005 mg/L and 0.007 mg/L in Beswick's water supply. Samples are collected on a quarterly basis to monitor the levels. Antimony occurs naturally in the ground and through the dissolution of minerals and ores in the water.

Arsenic concentrations in drinking water are recommended by the ADWG to not exceed 0.01 mg/L. Arsenic occurs naturally in groundwater through the dissolution of minerals and ores.

Elevated levels of arsenic are known in some groundwater sources, particularly in the Katherine region. Drinking water in this region is monitored on a regular basis to ensure water supplied does not exceed ADWG.

Barium concentrations in drinking water are recommended by ADWG to not exceed 2 mg/L.

For this reporting period barium levels ranged between 4 mg/L and 10 mg/L. in Bulla's water supply. Barium is naturally high in the groundwater so Power and Water blend this water with low barium water from the river when it is available, for the drinking supply. Engineering options to lower barium are being considered and include finding alternative water sources or for water treatment.

Fluoride concentrations in drinking water are recommended by ADWG to not exceed 1.5 mg/L.

Fluoride is one of the most abundant elements in the Earth's crust. It naturally occurs in groundwater supplies and is present in most food and beverage products and toothpaste.

The concentration of natural fluoride in Northern Territory groundwater supplies depends on the type of soil and rock that the water comes into contact with. Generally, surface water sources have low natural fluoride concentrations (around <0.1 to 0.5 mg/L) whereas groundwater sources may have relatively high levels (range from 1.0 to 10 mg/L).

In the correct amounts, fluoride in drinking water helps build strong, healthy teeth that resist decay. The minimum fluoride for protection against dental caries is about 0.5 mg/L, although about 1.0 mg/L is optimal in temperate climates.

The majority of communities in the Barkly and southern regions have fluoride levels between 0.5 mg/L and 1.5 mg/L. Maximum fluoride values recorded of 1.7mg/L,1.8mg/L, and 1.6mg/L at Alpurrurulam, Nyirripi, and Yuelamu respectively for the 2017-18 reporting year (Figure 9).

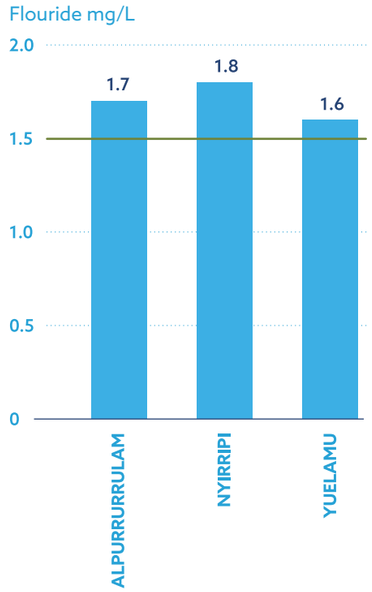
In contrast, most water supplies in the northern and Katherine regions have naturally low fluoride levels due to the nature of the shallow groundwater supplies and use of surface water supplies in some communities.

Nitrate levels in Northern Territory drinking water supplies have been partially attributed to nitrogen fixing by native vegetation and cyanobacteria crusts on soils. Termite mounds appear to be a significant nitrate source, possibly due to the presence of nitrogen-fixing bacteria in many termite species and the nitrogen-rich secretions used to build mounds.

The ADWG recommends that nitrate levels between 50-100 mg/L are a health consideration for infants younger than three months, although levels up to 100 mg/L can be safely consumed by adults.

Power and Water has installed Advanced Water Treatment systems at Ali Curung, Yuelamu and Kintore to reduce nitrate levels to below the guideline of 50mg/L. Centres that remain around 50 mg/L include Pmara Jutunta, (as well as Ti Tree Water Services centre) and Nturiya. The DoH gives regular advice to Pmara Jutunta customers that the water should not be used when bottle feeding infants.

Figure 9 Communities with maximum fluoride levels greater than 1.5 mg/L



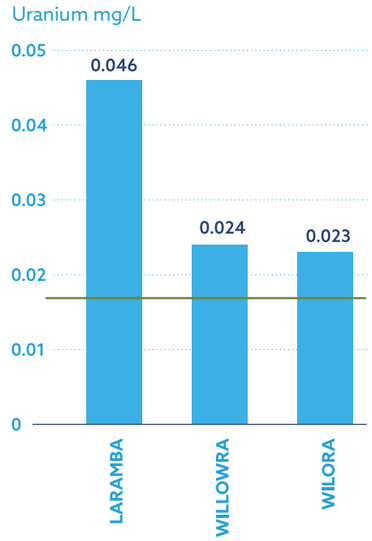
Uranium concentrations in drinking water are recommended by ADWG to not exceed 0.017 mg/L.

Uranium is present in the southern communities of Willowra, Wilora and Laramba at concentrations above 0.017mg/L. Power and Water is investigating viable options to achieve uranium concentrations within ADWG, and water quality improvement projects are being prioritised strategically.

Uranium is widely distributed in geological formations, where it is found in groundwater aquifers surrounded by granite rocks and in sedimentary rock like sandstone.

Power and Water understands that the uranium occurs as three naturally occurring isotopes and under appropriate conditions can become soluble and therefore present in the region's groundwater. The transport of uranium in groundwater varies widely according to the aquifer conditions

Figure 10 Communities with maximum uranium levels greater than 0.0017 mg/L



Aesthetic parameters

Aesthetic parameters are characteristics associated with the acceptability of water to the consumer in terms of appearance, taste and odour of the water.

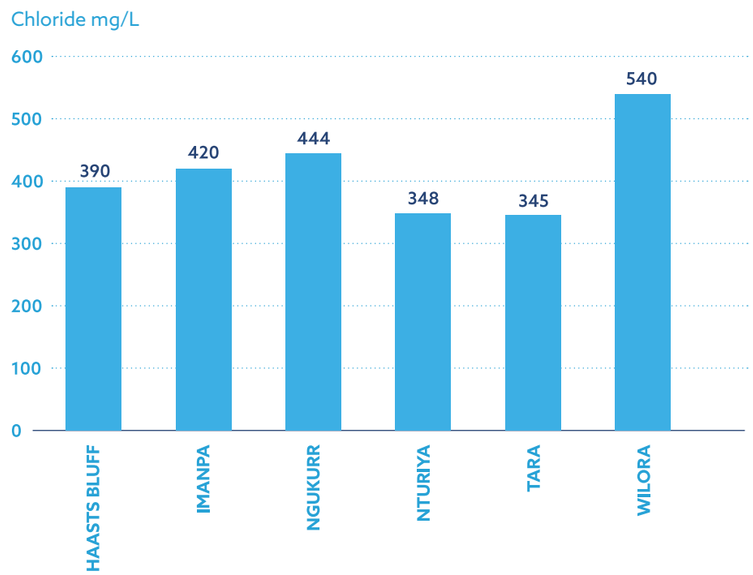
Chloride is recommended by ADWG to not exceed 250 mg/L to avoid salty tasting water. The taste threshold of chloride in water is dependent on the associated cation and is in the range 200-300 mg/L. The chloride content of water can affect corrosion of pipes and fittings.

Typical values depend to a large extent on local conditions, however concentrations of 150 mg/L are not uncommon in some areas. Chloride is present in natural waters from the dissolution of salt deposits in soil and rock.

Communities with elevated levels of chloride in the water supply recorded during the reporting period are shown in Figure 11.

Chlorine is used as disinfectants for drinking water supplies. Based on health considerations, the guideline value for total chlorine in drinking water is 5mg/L. Free chlorine has an odour threshold in drinking water about 0.6mg/L, however some people are particularly sensitive and can detect amount as low as 0.2mg/L. At some points in a water supply the odour threshold value of 0.6mg/L is exceeded, in order to maintain an effective disinfectant residual within other parts of the supply.

Figure 11 Communities with average chloride levels greater than 250 mg/L



Hardness is primarily the amount of calcium and magnesium ions in water and is expressed as a calcium carbonate (CaCO3) equivalent. High hardness requires more soap to achieve lather and may lead to excessive scaling in hot water pipes and fittings.

Soft water or water low in total calcium and magnesium ions may also cause corrosion in pipes, although this will depend on other physical and chemical characteristics such as pH, alkalinity and dissolved oxygen. The ADWG recommends hardness levels below 200 mg/L to minimise scaling in hot water systems.

Hard water or water with calcium carbonate levels above 500mg/L (Figure 12) may lead to excessive scaling of pipes and fittings, which can impact on infrastructure service life and indirectly impact health through impeding access to water.

Typically across the Northern Territory groundwater supplies close to the coast are described as 'soft', as the water is drawn from relatively shallow aquifers with naturally low pH and hardness levels. Inland water supplies are often described as 'hard', as the water is stored for longer periods in deeper aquifers resulting in 'rich' water chemistry.

Iodine has a taste threshold of 0.15 mg/L in water. The element iodine is present naturally in seawater, nitrate minerals and seaweed, mostly in the form of iodide salts. It may be present in water due to leaching from salt and mineral deposits. It is considered as an essential trace element for humans.

Figure 12 Communities with average hardness levels greater than 500 mg/L

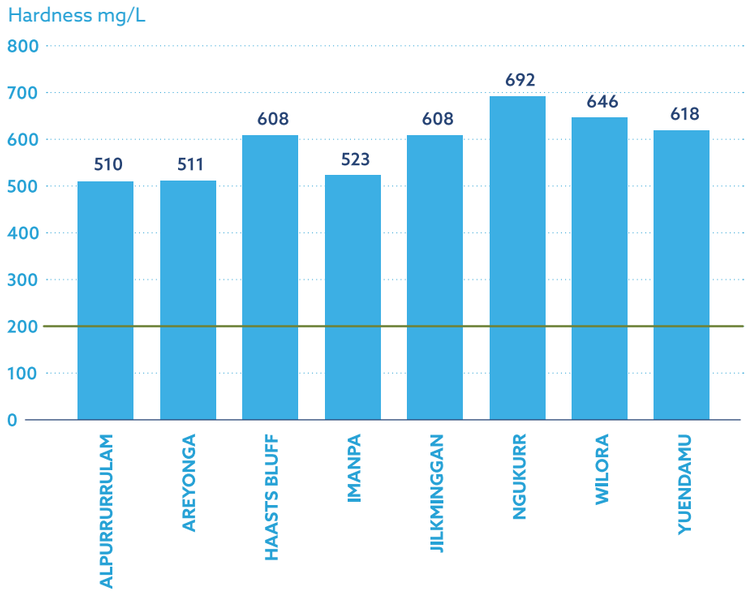
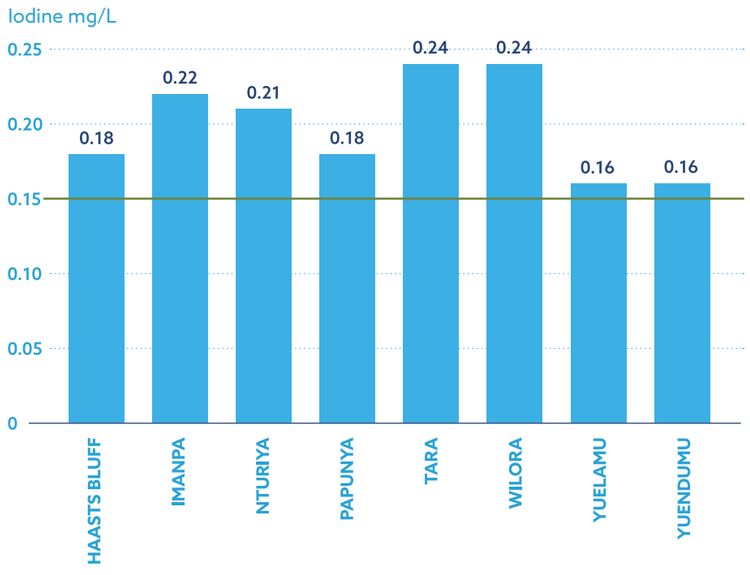


Figure 13 Communities with average iodine levels greater than 0.15 mg/L



Iron has a taste threshold of about 0.3 mg/L in water and becomes objectionable above 3 mg/L.

High iron concentrations give water a rust-brown appearance and can cause staining of laundry and plumbing fittings and blockages in irrigation systems. The concentration of iron at the tap can also be influenced by factors such as rusting iron pipes.

Economically viable options to reduce iron levels are being investigated. Some options include infrastructure changes to maximise iron oxidation and settling, altering the operation of the production bores to maximise the use of those with reduced iron levels, and also preliminary assessments of water treatment plants. Peppimenarti and Numbulwar have both had infrastructure installed within the ground level storage tanks that maximise iron fallout, therefore providing cleaner water within the community.

Communities regularly monitored for iron levels above 0.3 mg/L can be seen (Figure 14).

Manganese imparts an undesirable taste to water and stains plumbing fixtures and laundry. The ADWG recommends concentrations not exceed 0.5 mg/L for health considerations and 0.1 mg/L for aesthetic considerations.

Manganese occurs naturally in the ground and through the dissolution of minerals and ores in the groundwater.

For the 2017-18 reporting year, elevated aesthetic manganese levels are present in Nauiyu, Nganmarriyanga, Numbulwar, Bulla and Minyerri as shown in Figure 15.

pH levels below 6.5 are likely to cause corrosion of pipes and fittings while levels above 8.5 can cause scaling, particularly on hot water systems. The ADWG recommend pH levels in drinking water should be between 6.5 and 8.5.

Typically, Territory communities that rely on groundwater supplies near the coast are described as 'corrosive', as the water is drawn from relatively shallow aquifers and has naturally low pH and hardness levels.

Figure 14 Communities with average iron concentration greater than 0.3 mg/L

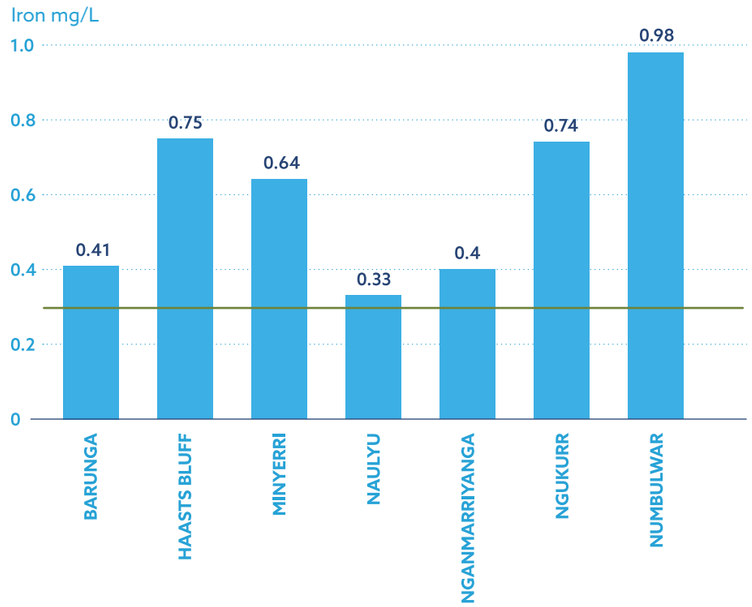
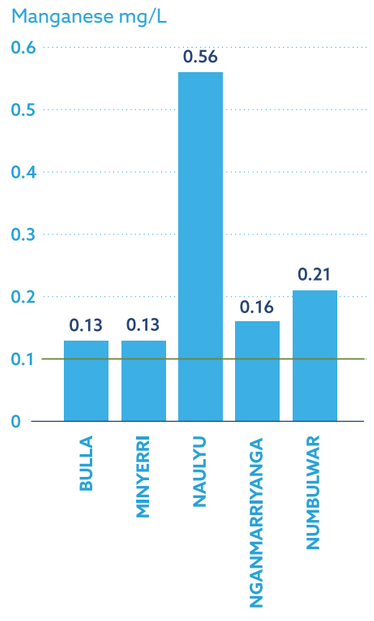


Figure 15 Communities with average manganese concentration greater than 0.1 mg/L



Part B Remote Commnities

Silica forms scale on surfaces, the ADWG recommend not exceeding 80 mg/L to avoid this. Elevated silica levels have been identified in Lajamanu, Kintore, Laramba, Nyirripi, and Pmara Jutunta as shown in Figure 16.

Sodium is recommended by ADWG to not exceed180 mg/L to avoid salty tasting water. The sodium ion is widespread in water due to the high solubility of sodium salts and the abundance of mineral deposits.

Total dissolved solids (TDS) affect how the water tastes. TDS comprise sodium, potassium, calcium, magnesium, chloride, sulphate, bicarbonate, carbonate, silica, organic matter, fluoride, iron, manganese, nitrate and phosphate.

Water with low TDS can taste flat, while water with TDS above 500 mg/L could cause scaling in taps, pipes and hot water systems. Levels greater than 900 mg/L significantly affect taste and may also cause moderate to severe scaling.

Based on taste, the ADWG recommend TDS levels below 600 mg/L.

Figure 16 Communities with average silica level greater than 80 mg/L

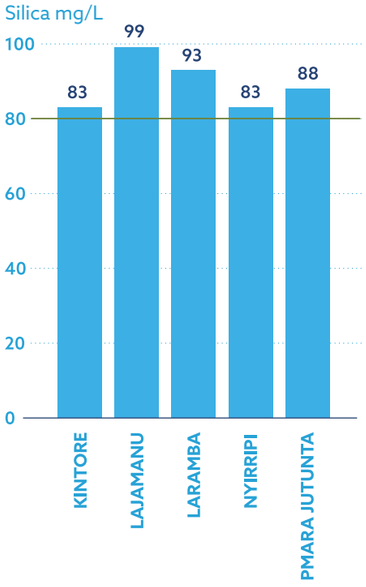


Figure 17 Communities with average sodium concentration greater than 180 mg/L

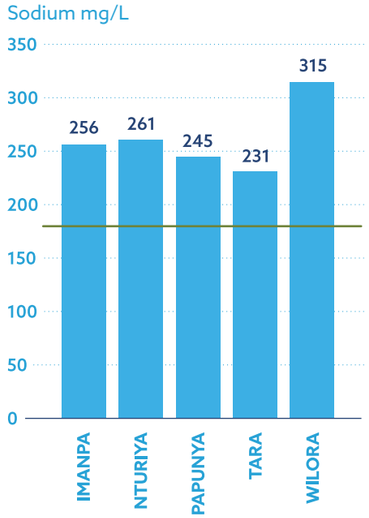
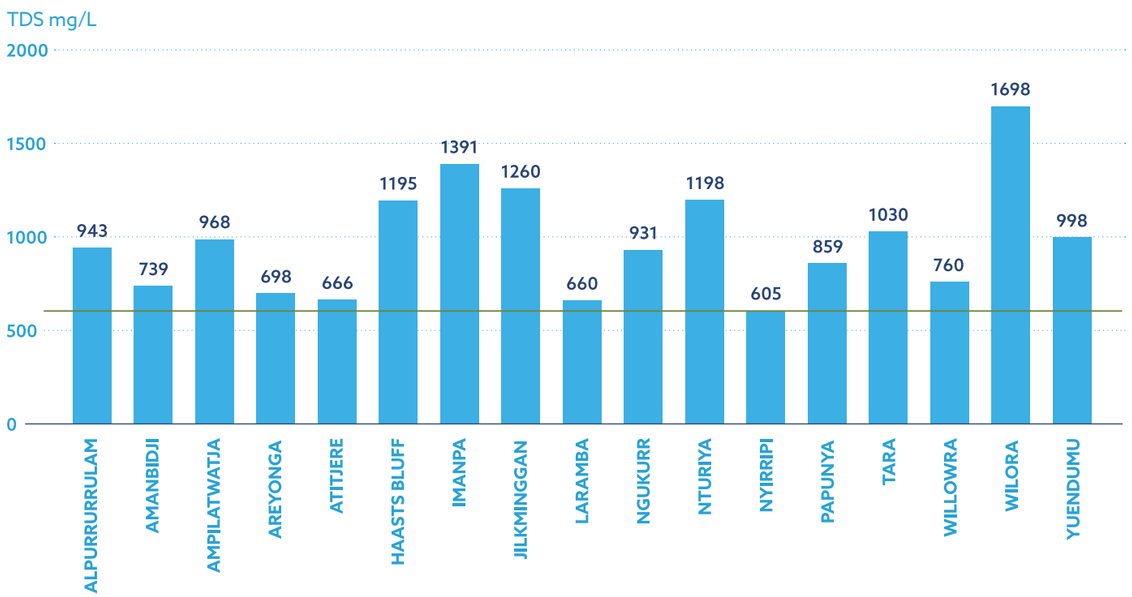


Figure 18 Communities with levels of TDS greater than 600 mg/L



More information is also available from the Power and Water website:
http://www.powerwater.com.au/news_and_publications/publications/remote_communities
The results of water quality testing for each of the communities are provided in the tables Appendix B.

NO HEALTH ALERTS ISSUED WITH THREE OF THE INCIDENTS

RECORDED EMERGENCIES/INCIDENTS

Power and Water responds immediately to emergencies or incidents, with the primary response being to ensure adequate disinfection of the water supply, followed by reporting to the Department of Health (DoH). During the 2017-18 reporting period, five incidents occurred.

Three detections of *E. coli* were recorded in Gunbalanya, Numbulwar and Pirlangimpi. An investigation into the cause found these were due to sample contamination during the collection, so the DoH had no need to issue alerts or advice.

Two precautionary Boil Water Alerts were issued by DoH for incidents that occurred at Ngukurr and Belyuen on 20 December 2017 and 19 March 2018 respectively.

In Ngukurr, the water usage outstripped the available water supply from the bores and Power and Water were required to switch over Ngukurr's water source to the Roper River. This change reduces the effectiveness of disinfection, so DoH issued a Boil Water Alert, which remained in place until 9 February 2018.

At Belyuen, tropical cyclone Marcus affected the disinfection of the water supply. Power and Water was unable to undertake any maintenance at the community for a number of days following the cyclone consequently a Boil Water Alert was issued. Once safe to do so corrective actions were taken and the Boil Water Alert was lifted on 21 March 2018.

Table 10 *E. coli* incidents during the drinking water quality monitoring program period 2017-18

YEAR	SAMPLES WITH *E. COLI* DETECTIONS	SAMPLES WITH *E. COLI* DETECTIONS	COLLECTION DATE	NUMBER OF *E. COLI* DETECTED IN SAMPLE (MPN/100 ML)
2017-18	Gunbalanya	1	2 January 2018	70
	Numbulwar	1	29 November 2017	2
	Pirlangimpi	1	5 September 2017	36

GLOSSARY OF ACRONYMS

ADWG	Australian Drinking Water Guidelines 2011
ANSI	American National Standards Institute
ARD	Annual Radiological Dose
AS/NZS	Australian/New Zealand Standards
AWA	Australian Water Association
AWT	Advance Water Treatment
AWWA	American Water Works Association
DENR	Department of Environment and Natural Resources
DIPL	Department of Infrastructure, Planning and Logistics
DoH	Department of Health
DPIR	Department of Primary Industry and Resources
DWQMS	Drinking Water Quality Management System
ESO	Essential Service Operator
FC/TC	Free chlorine/Total chlorine ratio
FIS	Facilities Information System
GOC	Government Owned Corporation
IBM	International Business Machines
ICS	Industrial Control System
IES	Indigenous Essential Services
ISO	International Organisation for Standardisation
MoU	Memorandum of understanding
MSHR	Menzies School of Health Research
N/A	Not applicable
NHMRC	National Health and Medical Research Council
NPR	National Performance Report
NRMMC	National Resources Management Council
NT	Northern Territory
NTG	Northern Territory Government
PAM	Primary amoebic meningoencephalitis
PI System	Process information system
PWC	Power and Water Corporation
RM8	Record Manager 8
SA	South Australia
SCADA	Supervisory control and data acquisition
TDS	Total dissolved solids
THMs	Trihalomethanes
UV	Ultraviolet
WIOA	Water Industry Operators Association
WaterRA	Water Quality Research Australia

UNITS OF MEASUREMENT

Bq/L	becquerels per litre
mg/L	milligrams per litre
MPN/100mL	most probable number per 100 millilitre
mSv/yr	millisieverts per year
ML	mega litres
µS/cm	micro Siemens per centimetre
HU / CU	Hazen unit/ colour unit

LEGEND: RESULTS TABLE (APPENDICES A AND B)

Health parameters	Assessments are reported as the 95th percentile for large data sets (30 or more samples) and maximum value for small data sets. Data covers the period 2017-18. Exceedances are shown bold.
Aesthetic parameters	Assessments are reported as the mean. Data covers the period 2017-18. Exceedances are shown bold.
Other parameters	Assessments are reported as the mean. Data covers the period 2017-18. Exceedances are shown bold.
No guideline value applicable	millisieverts per year
<	All values reported proceeded by "<" indicate the value is below the level of detection of the analytical method.

APPENDIX A
DRINKING WATER QUALITY: MAJOR AND MINOR CENTRES

Table 11 Bacteriological Monitoring in Major Centres 2017-18

CENTRE	PARAMETER (MPN/100ML)	TARGET LEVEL	TOTAL NO. SAMPLES REQUIRED	TOTAL NO. SAMPLES COLLECTED	TOTAL EXCEEDANCES (NO.)	SAMPLES PASSING REPORTING LEVEL (%)
Alice Springs	*E. coli*	No *E. coli* in 100% samples	170	173	0	100%
	Total Coliforms	<10 in 95% of samples	170	173	0	100%
Katherine	*E. coli*	No *E. coli* in 100% samples	234	234	0	100%
	Total Coliforms	<10 in 95% of samples	234	234	0	100%
Darwin	*E. coli*	No *E. coli* in 100% samples	585	585	0	100%
	Total Coliforms	<10 in 95% of samples	585	585	0	100%
Tennant Creek	*E. coli*	No *E. coli* in 100% samples	208	209	0	100%
	Total Coliforms	<10 in 95% of samples	208	209	0	100%
Yulara	*E. coli*	No *E. coli* in 100% samples	52	52	0	100%
	Total Coliforms	<10 in 95% of samples	52	52	0	100%

Table 12 Bacteriological Monitoring in Minor Centres 2017-18

CENTRE	PARAMETER (MPN/100ML)	TARGET LEVEL	TOTAL NO. SAMPLES REQUIRED	TOTAL NO. SAMPLES COLLECTED	TOTAL EXCEEDANCES (NO.)	SAMPLES PASSING REPORTING LEVEL (%)
Adelaide River	*E. coli*	No *E. coli* in 100% samples	104	99	0	100%
	Total Coliforms	<10 in 95% of samples	104	99	0	100%
Batchelor	*E. coli*	No *E. coli* in 100% samples	104	103	0	100%
	Total Coliforms	<10 in 95% of samples	104	103	0	100%
Cox Peninsula	*E. coli*	No *E. coli* in 100% samples	52	50	0	100%
	Total Coliforms	<10 in 95% of samples	52	50	0	100%
Borroloola	*E. coli*	No *E. coli* in 100% samples	156	152	0	100%
	Total Coliforms	<10 in 95% of samples	156	152	0	100%
Garawa[1]	*E. coli*	No *E. coli* in 100% samples	**104**	**98**	**2**	**98%**
	Total Coliforms	<10 in 95% of samples	**104**	**98**	**1**	**99%**
Daly Waters	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Elliott	*E. coli*	No *E. coli* in 100% samples	156	150	0	100%
	Total Coliforms	<10 in 95% of samples	156	150	0	100%
Gunn Point	*E. coli*	No *E. coli* in 100% samples	26	26	0	100%
	Total Coliforms	<10 in 95% of samples	26	26	0	100%
Kings Canyon	*E. coli*	No *E. coli* in 100% samples	156	151	0	100%
	Total Coliforms	<10 in 95% of samples	156	151	0	100%
Larrimah	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Mataranka	*E. coli*	No *E. coli* in 100% samples	**48**	**48**	**1**	**98%**
	Total Coliforms	<10 in 95% of samples	**48**	**48**	**1**	**98%**
Newcastle Waters	*E. coli*	No *E. coli* in 100% samples	36	37	0	100%
	Total Coliforms	<10 in 95% of samples	36	37	0	100%
Pine Creek	*E. coli*	No *E. coli* in 100% samples	156	156	0	100%
	Total Coliforms	<10 in 95% of samples	156	156	0	100%
Ti Tree	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Timber Creek	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%

[1] Water Services support Mabunji in providing emergency support and operation of the Garawa system.

Appendix A

Table 13 Health parameters in major and minor centres 2017-18

	ANTIMONY	ARSENIC	BARIUM	BERYLLIUM	BORON	CADMIUM	CHLORINE (TOTAL)	CHROMIUM	COPPER	FLUORIDE	LEAD	MANGANESE	MERCURY	MOLYBDENUM	NICKEL	NITRATE	RADIOLOGICAL	SELENIUM	SILVER	THMS	URANIUM
ADWG Units	0.003 mg/L	0.01 mg/L	2 mg/L	0.06 mg/L	4 mg/L	0.002 mg/L	5 mg/L	0.05 mg/L	2 mg/L	1.5 mg/L	0.01 mg/L	0.5 mg/L	0.001 mg/L	0.05 mg/L	0.02 mg/L	50 mg/L	1 mSv/yr	0.01 mg/L	0.1 mg/L	0.25 mg/L	0.017 mg/L
Community	Health parameters – 95th percentile or maximum values																				
Alice Springs	<0.0002	<0.0005	0.1	<0.001	0.1	<0.0002	1	<0.005	0.1	0.56	0.002	0.01	<0.0001	<0.005	0.002	8	0.1	0.001	<0.01	0.01	0.0093
No. samples collected	8	8	8	8	8	8	172	8	8	8	8	8	8	8	8	8	18	8	8	4	8
Darwin	<0.0002	<0.0005	<0.05	<0.001	0.02	<0.0002	2	<0.005	0.1	0.75	0.002	0.03	<0.0001	<0.005	<0.002	0.5	PASS	<0.001	<0.01	0.094	0.00004
No. samples collected	18	18	18	18	18	18	585	18	18	70	18	18	18	18	18	18	11	18	18	12	18
Katherine	<0.0002	<0.0005	<0.05	<0.001	<0.02	<0.0002	2	<0.005	0.2	0.75	0.001	<0.005	<0.0001	<0.005	0.004	1	PASS	<0.001	<0.01	0.048	0.00009
No. samples collected	16	16	16	16	16	16	233	16	16	58	16	16	16	16	16	6	2	16	16	6	16
Tennant Creek	<0.0002	0.002	0.1	<0.001	1	<0.0002	1	<0.005	0.02	1.4	<0.001	<0.005	<0.0001	<0.005	<0.002	50	PASS	0.003	<0.01	0.022	0.0096
No. samples collected	4	4	4	4	4	4	208	4	4	56	4	4	4	4	4	4	13	4	4	4	4
Yulara	<0.0002	<0.0005	<0.05	<0.001	1	0.0002	1	<0.005	<0.01	<0.10	<0.001	<0.005	<0.0001	<0.005	<0.002	30	PASS	<0.001	<0.01	0.006	<0.00001
No. samples collected	5	5	5	5	5	5	52	5	5	5	5	5	5	5	5	5	6	5	5	2	5
Adelaide River	<0.0002	0.003	<0.05	<0.001	0.02	<0.0002	2	<0.005	0.1	0.39	0.006	0.2	<0.0001	<0.005	<0.002	1	PASS	<0.001	<0.01	0.017	0.00003
No. samples collected	23	23	23	23	23	23	98	23	23	4	23	23	23	23	23	4	5	23	23	2	23
Batchelor	<0.0002	<0.0005	<0.05	<0.001	<0.02	<0.0002	2	<0.005	0.04	0.11	<0.001	<0.005	<0.0001	<0.005	<0.002	2	PASS	<0.001	<0.01	<0.004	0.00021
No. samples collected	6	6	6	6	6	6	103	6	6	6	6	6	6	6	6	6	1	6	6	3	6
Cox Peninsula	<0.0002	<0.0005	<0.05	<0.001	0.04	<0.0002	2	<0.005	0.1	0.14	0.004	<0.005	<0.0001	<0.005	<0.002	0.4	PASS	<0.001	<0.01	<0.004	0.00002
No. samples collected	3	3	3	3	3	3	47	3	3	2	3	3	3	3	3	2	5	3	3	1	3
Borroloola	<0.0002	<0.0005	<0.05	<0.001	0.04	<0.0002	2	<0.005	0.03	<0.10	0.004	0.1	<0.0001	<0.005	<0.002	1	0.3	<0.001	<0.01	<0.004	0.00033
No. samples collected	6	6	6	6	6	6	143	6	6	6	6	6	6	6	6	6	5	6	6	2	6
Garawa	<0.0002	<0.0005	<0.05	<0.001	0.04	<0.0002	3	<0.005	0.01	0.11	<0.001[1]	<0.005	<0.0001	<0.005	<0.002	1	PASS	<0.001	<0.01	<0.004	0.00013
No. samples collected	3	3	3	3	3	3	92	3	3	3	3	3	1	3	3	3	1	3	3	1	3
Daly Water	<0.0002	0.001	0.1	<0.001	0.3	<0.0002	1	<0.005	0.1	0.18	0.003	0.1	<0.0001	<0.005	0.006	10	PASS	0.002	<0.01	0.005	0.0028
No. samples collected	8	8	8	8	8	8	36	8	8	8	8	8	8	8	8	8	3	8	8	2	8
Elliott	<0.0002	<0.0005	0.2	<0.001	0.3	<0.0002	2	<0.005	<0.01	0.88	<0.001	<0.005	<0.0001	<0.005	<0.002	20	PASS	0.001	<0.01	0.006	0.0064
No. samples collected	6	6	6	6	6	6	145	6	6	6	6	6	6	6	6	6	4	6	6	3	6
Gunn Point	0.001	<0.0005	<0.05	<0.001	0.02	**0.003**	2	<0.005	<0.01	0.85	0.009	0.03	<0.0001	<0.005	0.004	0.5	PASS	<0.001	<0.01	<0.004	0.00007
No. samples collected	2	2	2	2	2	2	28	2	2	2	2	2	2	2	2	2	1	2	2	1	2
Kings Canyon	<0.0002	0.002	<0.05	<0.001	0.4	<0.0002	1	<0.005	0.03	0.53	0.002	<0.005	0.0004	<0.005	0.006	5	1	0.002	<0.01	0.006	0.0024
No. samples collected	4	4	4	4	4	4	151	4	4	4	4	4	4	4	4	4	82	4	4	2	4
Larrimah	<0.0002	<0.0005	0.1	<0.001	0.3	<0.0002	2	<0.005	0.03	0.21	<0.001	<0.005	<0.0001	<0.005	<0.002	3	PASS	0.002	<0.01	0.005	0.0026
No. samples collected	4	4	4	4	4	4	36	4	4	4	4	4	4	4	4	4	2	4	4	2	4
Mataranka	<0.0002	<0.0005	0.1	<0.001	0.1	<0.0002	1	<0.005	0.3	0.28	<0.001	<0.005	<0.0001	<0.005	<0.002	1	PASS	<0.001	<0.01	0.005	0.00065
No. samples collected	4	4	4	4	4	4	47	4	4	4	4	4	4	4	4	4	2	4	4	2	4
Newcastle Waters	<0.0002	0.001	0.3	<0.001	0.3	<0.0002	1	<0.005	0.03	0.9	0.002	<0.005	<0.0001	<0.005	<0.002	9	PASS	<0.001	<0.01	0.007	0.0051
No. samples collected	6	6	6	6	6	6	31	6	6	6	6	6	6	6	6	6	2	6	6	3	6
Pine Creek	<0.0002	0.006	<0.05	<0.001	0.1	<0.0002	2	<0.005	0.2	0.53	0.002	0.04	<0.0001	<0.005	0.002	0.8	PASS	<0.001	<0.01	<0.004	0.00084
No. samples collected	36	36	36	36	36	36	156	36	36	3	36	36	36	36	36	3	12	36	36	3	36
Ti Tree	<0.0002	0.002	0.1	<0.001	0.4	<0.0002	1	<0.005	<0.01	0.91	<0.001	<0.005	<0.0001	<0.005	<0.002	**60**	PASS	0.002	<0.01	0.005	0.0088
No. samples collected	6	6	6	6	6	6	36	6	6	36	6	6	6	6	6	36	4	6	6	2	6
Timber Creek	<0.0002	0.001	1	<0.001	0.1	<0.0002	1	<0.005	0.1	1.3	0.004	<0.005	<0.0001	<0.005	0.006	1	PASS[2]	<0.001	<0.01	0.007	0.0022
No. samples collected	12	12	12	12	12	12	32	12	12	12	12	12	12	12	12	12	2	12	12	2	12

Numbers in **bold** exceed the guideline value.

[1] anomalous lead result excluded

[2] radiological data from 2016

Appendix A

Table 14 Aesthetic and other parameters in major and minor centres 2017-18

	ALUMINIUM	CHLORIDE	CHLORINE (FREE)	COPPER	COLOUR (TRUE)	HARDNESS AS CACO3	IRON	MANGANESE	PH	SILICA	SODIUM	SULFATE	TDS	TURBIDITY	ZINC	ALKALINITY AS CACO3	BROMIDE	CALCIUM	ELECTRICAL CONDUCTIVITY	IODINE	MAGNESIUM	POTASSIUM	TIN
ADWG Units	0.2 mg/L	250 mg/L	0.6 mg/L	1 mg/L	15 CU	200 mg/L	0.3 mg/L	0.1 mg/L	6.5-8.5 pH unit	80 mg/L	180 mg/L	250 mg/L	600 mg/L	5 NTU	3 mg/L	mg/L	mg/L	mg/L	µS/cm	0.15 mg/L	mg/L	mg/L	mg/L
Community	Aesthetic parameters – mean values															Other parameters – mean values							
Alice Springs	<0.02	73	**0.9**	0.04	<2	**215**	<0.02	<0.005	7.8	17	85	43	444	0.1	0.02	238	0.28	48.1	823	0.02	22.96	5.99	<0.01
No. samples collected	8	8	172	8	8	8	8	8	8	8	8	8	8	8	8								
Darwin	<0.02	6	**1.3**	0.02	4	30	0.09	0.022	7.3	12	3	<0.3	49	0.7	<0.01	24	0.03	6.3	76	<0.01	3.61	0.62	<0.01
No. samples collected	18	18	585	18	18	18	18	18	18	18	18	18	18	18	18								
Katherine	<0.02	5	**1.3**	0.04	<2	67	<0.02	<0.005	7.4	14	4	2	99	<0.1	<0.01	63	0.02	16.3	157	<0.01	6.46	0.63	<0.01
No. samples collected	16	7	234	16	7	7	16	16	7	7	7	7	7	7	16								
Tennant Creek	<0.02	128	**0.9**	0.01	<2	**206**	<0.02	<0.005	7.7	**84**	131	37	**674**	<0.1	<0.01	273	0.66	32.7	1125	0.13	30.23	32.08	<0.01
No. samples collected	4	4	208	4	4	4	4	4	4	4	4	4	4	4	4								
Yulara	<0.02	41	**0.8**	<0.01	<2	4	<0.02	<0.005	7.3	5	35	2	111	<0.1	0.03	<20	0.18	1.1	210	<0.01	0.28	4.18	<0.01
No. samples collected	5	5	52	5	5	5	5	5	5	5	5	5	5	5	5								
Adelaide River	<0.02	24	**1.2**	0.01	<2	113	<0.02	0.011	8.1	26	55	<0.3	241	0.3	<0.01	198	0.09	16.8	455	<0.01	17.25	1.25	<0.01
No. samples collected	23	4	99	23	4	4	23	23	4	4	4	4	4	4	23								
Batchelor	<0.02	5	**1.2**	0.02	<2	159	<0.02	<0.005	7.5	20	4	<0.3	165	0.1	<0.01	157	0.02	17.2	318	<0.01	28.05	0.23	<0.01
No. samples collected	6	6	102	6	6	6	6	6	6	6	6	6	6	6	6								
Cox Peninsula	<0.02	7	**1.1**	0.02	<2	4	<0.02	<0.005	6.7	22	6	0.4	44	<0.1	0.06	<20	0.02	0.9	47	<0.01	0.35	1.4	<0.01
No. samples collected	3	2	50	3	2	2	3	3	2	2	2	2	2	2	3								
Borroloola	0.06	11	**1.1**	0.02	<2	66	0.1	**0.32**	6.8	14	6	<0.3	95	2	<0.01	63	0.03	24.5	165	<0.01	1.08	1.05	<0.01
No. samples collected	9	8	143	9	8	8	9	9	8	8	8	8	8	8	9								
Garawa	0.06	13	**1.2**	0.09	2	10	0.25	**0.109**	**5.9**	14	9	<0.3	35	3.1	0.03	<20	0.03	1.8	70	<0.01	1.21	1.21	<0.01
No. samples collected	8	7	92	8	7	7	8	8	7	7	7	7	7	7	8								
Daly Water	0.04	**290**	**1**	0.04	3	**572**	**0.35**	0.016	7.3	32	175	126	**1,121**	3.9	0.01	415	0.96	140.4	1,963	0.04	53.64	18.69	<0.01
No. samples collected	8	8	36	8	8	8	8	8	8	8	8	8	8	8	8								
Elliott	<0.02	125	**1.2**	<0.01	<2	**405**	<0.02	<0.005	7.7	44	77	22	**706**	<0.1	<0.01	392	0.41	93.2	1,233	0.04	41.68	20.4	<0.01
No. samples collected	6	6	145	6	6	6	6	6	6	6	6	6	6	6	6								
Gunn Point	<0.02	9	**0.7**	<0.01	2	87	0.06	0.018	7.5	10	5	<0.3	120	0.5	3.4	90	0.02	16.6	205	<0.01	11.15	0.75	<0.01
No. samples collected	2	2	28	2	2	2	2	2	2	2	2	2	2	2	2								
Kings Canyon	<0.02	243	**0.9**	0.02	<2	**361**	0.07	<0.005	7	21	115	149	**804**	0.1	0.07	130	0.96	73.1	1,425	0.12	43.28	23.68	<0.01
No. samples collected	4	4	151	4	4	4	4	4	4	4	4	4	4	4	4								
Larrimah	<0.02	213	**1.1**	0.02	<2	**537**	0.09	<0.005	7.6	40	136	96	**969**	0.2	0.01	443	0.97	126.3	1,750	0.05	53.83	12.93	<0.01
No. samples collected	4	4	36	4	4	4	4	4	4	4	4	4	4	4	4								
Mataranka	<0.02	25	**1.2**	0.08	<2	**338**	<0.02	<0.005	7.5	28	18	<0.3	391	0.1	<0.01	333	0.14	82.1	738	<0.01	32.38	5.83	<0.01
No. samples collected	4	4	47	4	4	4	4	4	4	4	4	4	4	4	4								
Newcastle Waters	0.02	42	**1.1**	0.01	<2	**313**	<0.02	<0.005	7.7	55	50	7	530	0.1	0.01	383	0.18	71.5	890	0.03	32.63	29.38	<0.01
No. samples collected	9	6	31	9	6	6	9	9	6	6	6	6	6	6	9								
Pine Creek	<0.02	8	**1.3**	0.05	<2	96	0.03	0.018	7	51	25	<0.3	192	0.1	0.01	140	0.1	12.7	303	<0.01	15.73	1	<0.01
No. samples collected	36	3	156	36	3	3	36	36	3	3	3	3	3	3	36								
Ti Tree	<0.02	69	**1**	<0.01	<2	**226**	<0.02	<0.005	8.2	**90**	68	28	529	<0.1	<0.01	214	0.42	53	819	0.1	22.67	19.26	<0.01
No. samples collected	6	36	36	6	36	36	6	6	36	36	36	36	36	36	6								
Timber Creek	<0.02	35	**1.1**	0.03	<2	**451**	<0.02	<0.005	7.2	22	22	<0.3	451	0.1	0.03	434	0.16	72.1	915	<0.01	65.7	6.98	<0.01
No. samples collected	12	12	36	12	12	12	12	12	12	12	12	12	12	12	12								

Numbers in **bold** exceed the guideline value.

APPENDIX B
DRINKING WATER QUALITY: REMOTE COMMUNITIES

Table 15 Bacteriological monitoring in Northern region communities 2017-18

CENTRE	PARAMETER (MPN/100ML)	TARGET LEVEL	TOTAL NO. SAMPLES REQUIRED	TOTAL NO. SAMPLES COLLECTED	TOTAL EXCEEDANCES (NO.)	SAMPLES PASSING REPORTING LEVEL (%)
Acacia Larrakia	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	1	97%
Angurugu	*E. coli*	No *E. coli* in 100% samples	156	**130**	0	100%
	Total Coliforms	<10 in 95% of samples	156	**130**	0	100%
Belyuen	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Galiwinku	*E. coli*	No *E. coli* in 100% samples	208	**200**	0	100%
	Total Coliforms	<10 in 95% of samples	208	**200**	0	100%
Gapuwiyak	*E. coli*	No *E. coli* in 100% samples	156	**150**	0	100%
	Total Coliforms	<10 in 95% of samples	156	**150**	0	100%
Gunbalanya	*E. coli*	No *E. coli* in 100% samples	156	**154**	1	99%
	Total Coliforms	<10 in 95% of samples	156	**154**	1	99%
Gunyangara	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Maningrida	*E. coli*	No *E. coli* in 100% samples	260	**255**	0	100%
	Total Coliforms	<10 in 95% of samples	260	**255**	0	100%
Milikapiti	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Milingimbi	*E. coli*	No *E. coli* in 100% samples	156	**151**	0	100%
	Total Coliforms	<10 in 95% of samples	156	**151**	0	100%
Milyakburra	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Minjilang	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Nauiyu	*E. coli*	No *E. coli* in 100% samples	48	59	0	100%
	Total Coliforms	<10 in 95% of samples	48	59	0	100%
Nguiu	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Nganmarriyanga	*E. coli*	No *E. coli* in 100% samples	156	162	1	99%
	Total Coliforms	<10 in 95% of samples	156	162	4	97%
Numbulwar	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Peppimenarti	*E. coli*	No *E. coli* in 100% samples	36	37	1	97%
	Total Coliforms	<10 in 95% of samples	36	37	1	97%
Pirlangimpi	*E. coli*	No *E. coli* in 100% samples	208	**204**	0	100%
	Total Coliforms	<10 in 95% of samples	208	**204**	0	100%
Ramingining	*E. coli*	No *E. coli* in 100% samples	36	39	0	100%
	Total Coliforms	<10 in 95% of samples	36	39	1	97%
Umbakumba	*E. coli*	No *E. coli* in 100% samples	260	**254**	0	100%
	Total Coliforms	<10 in 95% of samples	260	**254**	1	100%
Wadeye	*E. coli*	No *E. coli* in 100% samples	156	**153**	0	100%
	Total Coliforms	<10 in 95% of samples	156	**153**	0	100%
Warruwi	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Yirrkala	*E. coli*	No *E. coli* in 100% samples	156	**145**	0	100%
	Total Coliforms	<10 in 95% of samples	156	**145**	0	100%

* Numbers in **bold** indicate fewer than required samples collected in the monitoring program.

Appendix B

Table 16 Bacteriological monitoring in Katherine region communities 2017-18

CENTRE	PARAMETER (MPN/100ML)	TARGET LEVEL	TOTAL NO. SAMPLES REQUIRED	TOTAL NO. SAMPLES COLLECTED	TOTAL EXCEEDANCES (NO.)	SAMPLES PASSING REPORTING LEVEL (%)
Amanbidji	*E. coli*	No *E. coli* in 100% samples	36	30	0	100%
	Total Coliforms	<10 in 95% of samples	36	30	1	97%
Barunga	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Beswick	*E. coli*	No *E. coli* in 100% samples	36	**35**	0	100%
	Total Coliforms	<10 in 95% of samples	36	**35**	0	100%
Binjari	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Bulla	*E. coli*	No *E. coli* in 100% samples	36	39	0	100%
	Total Coliforms	<10 in 95% of samples	36	39	1	97%
Bulman	*E. coli*	No *E. coli* in 100% samples	36	**33**	0	100%
	Total Coliforms	<10 in 95% of samples	36	**33**	0	100%
Daguragu	*E. coli*	No *E. coli* in 100% samples	24	24	0	100%
	Total Coliforms	<10 in 95% of samples	24	24	0	100%
Jilkminggan	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Kalkarindji	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Kybrook Farm	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	1	97%
Lajamanu	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Manyallaluk	*E. coli*	No *E. coli* in 100% samples	36	**33**	0	100%
	Total Coliforms	<10 in 95% of samples	36	**33**	0	100%
Minyerri	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Ngukurr	*E. coli*	No *E. coli* in 100% samples	156	**150**	0	100%
	Total Coliforms	<10 in 95% of samples	156	**150**	0	100%
Pigeon Hole	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Rittarangu	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Robinson River	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Weemol	*E. coli*	No *E. coli* in 100% samples	36	**35**	0	100%
	Total Coliforms	<10 in 95% of samples	36	**35**	0	100%
Yarralin	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%

*Number in **bold** letter indicate samples collected less than required in the monitoring program.

Table 17 Bacteriological monitoring in Barkly region communities 2017-18

CENTRE	PARAMETER (MPN/100ML)	TARGET LEVEL	TOTAL NO. SAMPLES REQUIRED	TOTAL NO. SAMPLES COLLECTED	TOTAL EXCEEDANCES (NO.)	SAMPLES PASSING REPORTING LEVEL (%)
Ali Curung	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Alpurrurulam	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Canteen Creek	*E. coli*	No *E. coli* in 100% samples	36	**36**	0	100%
	Total Coliforms	<10 in 95% of samples	36	**36**	0	100%
Imangara	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Nturiya	*E. coli*	No *E. coli* in 100% samples	36	39	1	97%
	Total Coliforms	<10 in 95% of samples	36	39	3	92%
Tara	*E. coli*	No *E. coli* in 100% samples	36	**35**	0	100%
	Total Coliforms	<10 in 95% of samples	36	**35**	0	100%
Willowra	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Wilora	*E. coli*	No *E. coli* in 100% samples	24	26	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Wutunugurra	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%

*Numbers in **bold** indicate fewer than required samples collected in the monitoring program.

Appendix B

Table 18 Bacteriological monitoring in Southern region communities 2017-18

CENTRE	PARAMETER (MPN/100ML)	TARGET LEVEL	TOTAL NO. SAMPLES REQUIRED	TOTAL NO. SAMPLES COLLECTED	TOTAL EXCEEDANCES (NO.)	SAMPLES PASSING REPORTING LEVEL (%)
Amoonguna	*E. coli*	No *E. coli* in 100% samples	36	51	0	100%
	Total Coliforms	<10 in 95% of samples	36	51	0	100%
Ampilatwatja	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Areyonga	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Atitjere	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Engawala	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Finke	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Haasts Bluff	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Hermannsburg	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Imanpa	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Kaltukatjara	*E. coli*	No *E. coli* in 100% samples	36	**35**	0	100%
	Total Coliforms	<10 in 95% of samples	36	**35**	0	100%
Kintore	*E. coli*	No *E. coli* in 100% samples	36	38	0	100%
	Total Coliforms	<10 in 95% of samples	36	38	1	97%
Laramba	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Mt Liebig	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Nyirripi	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Papunya	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Pmara Jutunta	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%

Table 18 continued Bacteriological monitoring in Southern region communities 2017-18

Santa Teresa	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Titjikala	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Wallace Rockhole	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Yuelamu	*E. coli*	No *E. coli* in 100% samples	36	**35**	0	100%
	Total Coliforms	<10 in 95% of samples	36	**35**	0	100%
Yuendumu	*E. coli*	No *E. coli* in 100% samples	36	**35**	0	100%
	Total Coliforms	<10 in 95% of samples	36	**35**	1	97%

*Numbers in **bold** indicate fewer than required samples collected in the monitoring program.

Appendix B

Table 19 Drinking water quality in Northern region communities (Health parameters)

Numbers in **bold** exceed the guideline value.

	ANTIMONY	ARSENIC	BARIUM	BERYLLIUM	BORON	CADMIUM	CHROMIUM	COPPER	FLUORIDE	LEAD	MANGANESE	MERCURY	MOLYBDENUM	NICKEL	NITRATE	RADIOLOGICAL	SELENIUM	SILVER	URANIUM
ADWG Units	0.003 mg/L	0.01 mg/L	2 mg/L	0.06 mg/L	4 mg/L	0.002 mg/L	0.05 mg/L	2 mg/L	1.5 mg/L	0.01 mg/L	0.5 mg/L	0.001 mg/L	0.05 mg/L	0.02 mg/L	50 mg/L	1 mSv/yr	0.01 mg/L	0.1 mg/L	0.017 mg/L
Community	Health parameters – 95th percentile or maximum values																		
Acacia Larrakia	<0.0002	0.001	<0.05	<0.001	<0.02	<0.0002	<0.005	<0.01	0.12	<0.001	0.005	<0.0001	<0.005	<0.002	1	PASS	<0.001	<0.01	0.00045
No. Samples	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Angurugu	<0.0002	<0.0005	<0.05	<0.001	<0.02	<0.0002	<0.005	0.09	1.1	0.005	0.01	<0.0001	<0.005	<0.002	0.6	PASS	<0.001	<0.01	0.00004
No. Samples	2	2	2	2	2	2	2	2	89	2	2	2	2	2	2	3	2	2	2
Belyuen	<0.0002	<0.0005	<0.05	<0.001	<0.02	<0.0002	<0.005	<0.01	0.14	0.001	0.02	<0.0001	<0.005	<0.002	0.4	PASS	<0.001	<0.01	0.0011
No. Samples	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	6	2	2	2
Galiwinku	<0.0002	<0.0005	<0.05	<0.001	<0.02	<0.0002	<0.005	0.02	<0.10	<0.001	<0.005	<0.0001	<0.005	<0.002	1	PASS	<0.001	<0.01	0.00003
No. Samples	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	2	2	2
Gapuwiyak	<0.0002	<0.0005	<0.05	<0.001	<0.02	<0.0002	<0.005	0.01	<0.10	0.003	<0.005	<0.0001	<0.005	<0.002	3	PASS	<0.001	<0.01	0.00003
No. Samples	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2
Gunbalanya	<0.0002	<0.0005	<0.05	<0.001	<0.02	<0.0002	<0.005	0.03	<0.10	<0.001	0.005	<0.0001	<0.005	<0.002	0.7	PASS	<0.001	<0.01	0.00003
No. Samples	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	13	2	2	2
Gunyangara	<0.0002	<0.0005	<0.05	<0.001	<0.02	<0.0002	<0.005	0.01	<0.10	<0.001	<0.005	<0.0001	<0.005	<0.002	0.5	Not Tested	<0.001	<0.01	0.00002
No. Samples	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	0	2	2	2
Maningrida	<0.0002	<0.0005	<0.05	<0.001	0.02	<0.0002	<0.005	0.01	0.8	<0.001	0.02	<0.0001	<0.005	<0.002	0.6	PASS	<0.001	<0.01	0.00007
No. Samples	2	2	2	2	2	2	2	2	102	2	2	2	2	2	2	5	2	2	2
Milikapiti	<0.0002	<0.0005	<0.05	<0.001	<0.02	<0.0002	<0.005	0.05	<0.10	0.003	<0.005	<0.0001	<0.005	<0.002	0.9	PASS	<0.001	<0.01	0.00001
No. Samples	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	5	2	2	2
Milingimbi	<0.0002	<0.0005	<0.05	<0.001	0.04	<0.0002	<0.005	0.03	<0.10	0.003	0.01	<0.0001	<0.005	0.002	6	PASS	<0.001	<0.01	0.00016
No. Samples	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	2	2	2
Milyakburra	<0.0002	<0.0005	<0.05	<0.001	0.06	<0.0002	<0.005	0.06	<0.10	0.003	0.03	<0.0001	<0.005	<0.002	0.4	PASS	<0.001	<0.01	0.00003
No. Samples	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Minjilang	<0.0002	<0.0005	<0.05	<0.001	0.04	<0.0002	<0.005	0.02	<0.10	0.004	<0.005	<0.0001	<0.005	<0.002	1	PASS	<0.001	<0.01	0.00011
No. Samples	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2
Nauiyu	0.0004	0.006	<0.05	<0.001	0.02	<0.0002	<0.005	<0.01	0.43	<0.001	**2**	<0.0001	<0.005	<0.002	5	PASS	<0.001	<0.01	0.00007
No. Samples	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	4	6	2	6
Nganmarriyanga	<0.0002	0.002	0.2	<0.001	0.02	<0.0002	<0.005	0.01	0.29	<0.001	0.3	<0.0001	<0.005	<0.002	0.3	PASS	<0.001	<0.01	<0.00001
No. Samples	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	14	2
Numbulwar	<0.0002	0.003	0.4	<0.001	0.06	<0.0002	<0.005	<0.01	0.16	<0.001	**0.7**	<0.0001	<0.005	<0.002	3	PASS	<0.001	<0.01	0.00009
No. Samples	14	14	14	14	14	14	14	14	11	14	14	14	14	14	11	9	14	8	14
Peppimenarti	<0.0002	0.001	0.2	<0.001	0.04	<0.0002	<0.005	<0.01	0.62	<0.001	0.3	<0.0001	<0.005	<0.002	7	PASS	<0.001	<0.01	0.00036
No. Samples	8	8	8	8	8	8	8	8	8	8	8	8	8	8	7	3	8	2	8
Pirlangimpi	<0.0002	<0.0005	<0.05	<0.001	<0.02	<0.0002	<0.005	<0.01	<0.10	<0.001	<0.005	<0.0001	<0.005	<0.002	0.4	PASS	<0.001	<0.01	<0.00001
No. Samples	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2
Ramingining	<0.0002	<0.0005	<0.05	<0.001	<0.02	<0.0002	<0.005	<0.01	<0.10	<0.001	<0.005	<0.0001	<0.005	<0.002	1	PASS	<0.001	<0.01	0.00003
No. Samples	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	3
Umbakumba	<0.0002	<0.0005	<0.05	<0.001	0.02	<0.0002	<0.005	0.2	0.67	0.002	0.04	<0.0001	<0.005	<0.002	0.9	PASS	<0.001	<0.01	0.00001
No. Samples	2	2	2	2	2	2	2	2	12	2	2	2	2	2	2	7	2	3	2
Wadeye	<0.0002	<0.0005	<0.05	<0.001	<0.02	<0.0002	<0.005	0.04	0.93	<0.001	0.03	<0.0001	<0.005	0.004	0.5	PASS	<0.001	<0.01	0.00015
No. Samples	3	3	3	3	3	3	3	3	105	3	3	3	3	3	3	4	3	2	3
Wurrumiyanga	<0.0002	<0.0005	<0.05	<0.001	<0.02	<0.0002	<0.005	0.04	0.72	0.002	<0.005	<0.0001	<0.005	<0.002	0.3	PASS	<0.001	<0.01	<0.00001
No. Samples	2	2	2	2	2	2	2	2	103	2	2	2	2	2	2	9	2	2	2
Warruwi	<0.0002	<0.0005	<0.05	<0.001	0.02	<0.0002	<0.005	0.02	<0.10	<0.001	<0.005	<0.0001	<0.005	<0.002	0.7	PASS	<0.001	<0.01	0.00005
No. Samples	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	8	2	2	2
Yirrkala	<0.0002	<0.0005	<0.05	<0.001	<0.02	<0.0002	<0.005	0.1	<0.10	<0.001	<0.005	<0.0001	<0.005	<0.002	0.5	PASS	<0.001	<0.01	0.00011
No. Samples	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

Appendix B

Table 20 Drinking water quality in Northern region communities (Aesthetic and other parameters)

Numbers in **bold** exceed the guideline value.

	ALUMINIUM	CHLORIDE	FREE CHLORINE (ODOUR THRESHOLD)	COPPER	COLOUR (TRUE)	HARDNESS (AS CACO3)	IRON	MANGANESE	PH	SILICA	SODIUM	SULFATE	TDS	TURBIDITY	ZINC	ALKALINITY (AS CACO3)	BROMINE	CALCIUM	ELECTRICAL CONDUCTIVITY	IODINE (TASTE THRESHOLD)	POTASSIUM	TIN
ADWG Units	0.2 mg/L	250 mg/L	0.6 mg/L	1 mg/L	15 CU	200 mg/L	0.3 mg/L	0.1 mg/L	6.5-8.5 pH unit	80 mg/L	180 mg/L	250 mg/L	600 mg/L	5 NTU	3 mg/L	mg/L	mg/L	mg/L	µS/cm	0.15 mg/L	mg/L	mg/L
Community	Aesthetic parameters – mean values															Other parameters – mean values						
Acacia Larrakia	0.03	9	**0.8**	<0.01	<2	**225**	0.07	<0.005	7.7	21	4	<0.3	239	3.4	<0.01	220	0.01	45.9	440	<0.01	1.6	<0.01
No. Samples	2	2	36	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Angurugu	0.03	11	**0.9**	0.06	<2	12	0.04	0.01	**5.4**	13	6	<0.3	47	<0.1	0.03	<20	0.02	3.7	47	<0.01	0.2	<0.01
No. Samples	2	2	65	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Belyuen	<0.02	5	**1.1**	<0.01	2.5	6	0.05	0.01	6.6	40	5	<0.3	65	<0.1	0.01	<20	0.01	1.6	58	<0.01	4.25	<0.01
No. Samples	2	2	33	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2
Galiwinku	<0.02	12	**1.2**	0.02	<2	4	0.05	<0.005	**5.8**	13	8	1	33	<0.1	<0.01	<20	0.02	0.4	63	<0.01	0.55	<0.01
No. Samples	2	2	200	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Gapuwiyak	<0.02	9	**1**	<0.01	<2	5	0.11	<0.005	**5.9**	11	7	<0.3	27	0.2	0.26	<20	0.02	0.8	50	<0.01	0.3	<0.01
No. Samples	2	2	150	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Gunbalanya	0.04	4	**1.1**	0.02	2.5	3	0.05	<0.005	**5.3**	13	2	<0.3	17	1.1	0.01	<20	0.02	0.5	22	<0.01	0.2	<0.01
No. Samples	2	2	154	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Gunyangara	<0.02	12	**1.3**	0.01	<2	6	0.14	<0.005	7	10	7	<0.3	39	0.3	<0.01	<20	0.01	1.6	54	<0.01	0.2	<0.01
No. Samples	2	2	33	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Maningrida	<0.02	9	**1.1**	<0.01	<2	4	<0.02	0.01	**5.3**	15	5	0	32	<0.1	0.02	<20	0.02	0.4	44	<0.01	1.15	<0.01
No. Samples	2	2	244	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Milikapiti	<0.02	9	**1**	0.04	<2	3	0.13	<0.005	**5.2**	11	5	<0.3	44	0.2	0.06	<20	0.02	0.3	39	<0.01	0.08	<0.01
No. Samples	2	2	36	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Milingimbi	0.03	100	**1**	0.02	<2	50	0.03	0.01	**6**	20	54	9	201	0.2	0.04	<20	0.16	9.7	420	<0.01	1.05	<0.01
No. Samples	2	2	145	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Milyakburra	<0.02	66	**1**	0.06	2	17	0.06	0.02	**5.7**	16	37	2	137	0.3	0.03	<20	0.07	2.8	265	0.02	0.35	<0.01
No. Samples	2	2	36	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Minjilang	0.14	20	**1**	0.02	<2	8	<0.02	<0.005	**5.5**	12	13	2	58	0.4	0.1	<20	0.05	2	94	<0.01	0.1	<0.01
No. Samples	2	2	36	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Nauiyu	<0.02	5	**1.2**	<0.01	2.5	114	0.33	0.56	7.5	36	16	3	161	**11.6**	0.01	132	0.02	26.5	287	<0.01	0.92	<0.01
No. Samples	6	6	48	6	6	6	6	6	6	6	6	6	6	6	6	7	6	7	7	6	7	7
Nganmarriyanga	<0.02	30	**1**	<0.01	<2	84	0.4	0.16	7.8	44	43	12	239	1.2	<0.01	130	0.06	25.3	390	<0.01	6	<0.01
No. Samples	2	2	36	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Numbulwar	<0.02	28	**1.3**	<0.01	4.1	320	0.98	0.21	8.1	17	23	119	421	**14.5**	<0.01	170	0.08	102.4	687	<0.01	2.38	<0.01
No. Samples	14	11	149	14	11	11	14	14	11	11	11	11	11	11	14	11	14	11	11	14	11	14
Peppimenarti	<0.02	16	**1**	<0.01	3	130	0.24	0.08	7.3	43	17	1	194	1.2	<0.01	134	0.03	27.1	324	<0.01	3.44	<0.01
No. Samples	8	8	33	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Pirlangimpi	0.05	8	**1.2**	<0.01	4.5	1	0.05	<0.005	6.5	9	6	<0.3	26	0.6	0.02	<20	0.01	0.1	33	<0.01	0.05	<0.01
No. Samples	2	2	36	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Ramingining	<0.02	9	**1.3**	<0.01	<2	9	<0.02	<0.005	**6.1**	15	6	<0.3	36	<0.1	<0.01	<20	0.01	2	58	<0.01	0.2	<0.01
No. Samples	3	3	146	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Umbakumba	<0.02	39	**0.8**	0.08	<2	13	0.03	0.04	**5.6**	12	22	2	91	0.3	<0.01	<20	0.07	1.2	165	<0.01	0.5	<0.01
No. Samples	2	2	33	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Wadeye	<0.02	6	**0.9**	0.02	1	2	<0.02	0.01	**5.3**	16	4	0.15	37	<0.1	<0.01	10	0.01	0.17	33	<0.01	0.15	<0.01
No. Samples	3	3	253	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
Wurrumiyanga	<0.02	7	**1.1**	0.04	<2	18	<0.02	<0.005	**5.8**	14	4	<0.3	34	0.1	0.01	<20	0.02	6.4	54	<0.01	0.08	<0.01
No. Samples	2	2	150	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Warruwiyanga	0.06	36	**1.1**	0.01	<2	16	<0.02	<0.005	**5.3**	10	19	3	74	<0.1	0.01	<20	0.09	1	150	<0.01	0.05	<0.01
No. Samples	2	2	36	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Yirrkala	0.04	12	**1.1**	0.09	<2	10	0.04	<0.005	**5.9**	11	8	1	37	0.5	<0.01	<20	0.02	2.6	66	<0.01	0.5	<0.01
No. Samples	2	2	130	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

Appendix B

Table 21 Drinking water quality in Katherine region communities (Health parameters)

	ANTIMONY	ARSENIC	BARIUM	BERYLLIUM	BORON	CADMIUM	CHROMIUM	COPPER	FLUORIDE	LEAD	MANGANESE	MERCURY	MOLYBDENUM	NICKEL	NITRATE	RADIOLOGICAL	SELENIUM	SILVER	URANIUM
ADWG Units	0.003 mg/L	0.01 mg/L	2 mg/L	0.06 mg/L	4 mg/L	0.002 mg/L	0.05 mg/L	2 mg/L	1.5 mg/L	0.01 mg/L	0.5 mg/L	0.001 mg/L	0.05 mg/L	0.02 mg/L	50 mg/L	1 mSv/yr	0.01 mg/L	0.1 mg/L	0.017 mg/L
Community	Health parameters – 95th percentile or maximum values																		
Amanbidji	0.0004	0.002	0.2	<0.001	0.6	<0.0002	<0.005	0.05	0.32	0.006	0.1	<0.0001	<0.005	0.01	2	PASS	<0.001	<0.01	0.0012
No. Samples	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	4	7	7	7
Barunga	<0.0002	<0.0005	<0.05	<0.001	<0.02	<0.0002	<0.005	0.02	<0.10	<0.001	0.005	<0.0001	<0.005	<0.002	<0.1	PASS	<0.001	<0.01	0.00002
No. Samples	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	5	2	2	2
Beswick	**0.007**	0.007	0.2	<0.001	0.02	<0.0002	<0.005	0.2	0.14	<0.001	<0.005	0.0002	<0.005	<0.002	0.2	PASS	<0.001	<0.01	0.0004
No. Samples	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	2	8	8	8
Binjari	<0.0002	0.002	0.2	<0.001	0.02	<0.0002	<0.005	0.05	0.42	<0.001	<0.005	<0.0001	<0.005	<0.002	0.4	0.3	<0.001	<0.01	0.0013
No. Samples	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	6	2	2	2
Bulla	<0.0002	0.002	**10**	<0.001	0.2	<0.0002	<0.005	<0.01	1.5	<0.001	0.4	<0.0001	<0.005	<0.002	0.4	0.1	<0.001	<0.01	0.00011
No. Samples	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	2	8	8	8
Bulman	<0.0002	<0.0005	<0.05	<0.001	0.02	<0.0002	<0.005	<0.01	0.14	<0.001	<0.005	<0.0001	<0.005	<0.002	0.3	PASS	<0.001	<0.01	0.00025
No. Samples	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Daguragu	0.002	0.002	0.05	<0.001	0.1	<0.0002	<0.005	0.1	0.27	<0.001	<0.005	<0.0001	<0.005	<0.002	4	PASS	<0.001	<0.01	0.0016
No. Samples	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2
Jilkminggan	<0.0002	<0.0005	<0.05	<0.001	0.4	<0.0002	<0.005	0.01	0.53	<0.001	0.07	<0.0001	<0.005	<0.002	0.3	PASS	<0.001	<0.01	0.011
No. Samples	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2
Kalkarindji	<0.0002	0.001	0.1	<0.001	0.1	<0.0002	<0.005	0.03	0.31	<0.001	<0.005	<0.0001	<0.005	<0.002	5	PASS	<0.001	<0.01	0.0017
No. Samples	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Kybrook Farm	<0.0002	0.003	<0.05	<0.001	0.02	<0.0002	<0.005	0.01	0.72	0.001	0.02	<0.0001	<0.005	<0.002	<0.1	PASS	<0.001	<0.01	0.00048
No. Samples	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	2	2	2
Lajamanu	<0.0002	<0.0005	0.05	<0.001	0.2	<0.0002	<0.005	0.04	0.39	<0.001	<0.005	<0.0001	<0.005	<0.002	4	PASS	<0.001	<0.01	0.0007
No. Samples	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	5	2	2	2
Manyallaluk	<0.0002	<0.0005	<0.05	<0.001	<0.02	<0.0002	<0.005	0.02	<0.10	0.003	<0.005	<0.0001	<0.005	<0.002	0.6	PASS	<0.001	<0.01	0.00008
No. Samples	2	2	2	2	2	2	2	2	3	2	2	2	2	2	3	2	2	2	2
Minyerri	<0.0002	0.003	0.4	<0.001	0.2	<0.0002	<0.005	0.06	0.36	0.001	0.4	<0.0001	<0.005	<0.002	0.1	PASS	<0.001	<0.01	<0.00001
No. Samples	8	8	8	8	8	8	8	8	5	8	8	8	8	8	5	8	8	8	8
Ngukurr	<0.0002	0.0005	1	<0.001	0.08	<0.0002	0.01	<0.01	0.28	0.003	0.1	0.0001	<0.005	0.002	2	PASS	<0.001	<0.01	0.0011
No. Samples	9	9	9	9	9	9	9	9	8	9	9	9	9	9	8	7	9	9	9
Pigeon Hole	<0.0002	<0.0005	<0.05	<0.001	0.08	<0.0002	<0.005	<0.01	0.28	<0.001	<0.005	<0.0001	<0.005	<0.002	20	PASS	<0.001	<0.01	0.0023
No. Samples	1	1	1	1	1	1	1	1	2	1	1	1	1	1	2	2	1	1	1
Rittarangu	<0.0002	<0.0005	0.3	<0.001	0.04	<0.0002	<0.005	<0.01	<0.10	<0.001	<0.005	<0.0001	<0.005	<0.002	1	PASS	<0.001	<0.01	0.00046
No. Samples	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	2	2	2
Robinson River	0.0004	<0.0005	1	<0.001	0.1	<0.0002	<0.005	0.01	1.1	0.003	0.1	<0.0001	<0.005	<0.002	20	PASS	<0.001	<0.01	0.0028
No. Samples	11	11	11	11	11	11	11	11	10	11	11	11	11	11	10	8	11	11	11
Weemol	<0.0002	<0.0005	<0.05	<0.001	0.04	<0.0002	<0.005	<0.01	0.17	<0.001	<0.005	<0.0001	<0.005	<0.002	0.1	PASS	<0.001	<0.01	0.00037
No. Samples	2	2	2	2	2	2	2	2	1	2	2	2	2	2	1	2	2	2	2
Yarralin	<0.0002	0.002	0.8	<0.001	0.1	<0.0002	<0.005	<0.01	0.14	<0.001	0.09	<0.0001	<0.005	<0.002	7	PASS	<0.001	<0.01	0.002
No. Samples	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	6	2	2	2

Numbers in **bold** exceed the guideline value.

Appendix B

Table 22 Drinking water quality in Katherine region communities (Aesthetic and other parameters)

	ALUMINIUM	CHLORIDE	FREE CHLORINE (ODOUR THRESSHOLD)	COPPER	COLOUR (TRUE)	HARDNESS (AS CACO3)	IRON	MANGANESE	PH	SILICA	SODIUM	SULFATE	TDS	TURBIDITY	ZINC	ALKALINITY (AS CACO3)	BROMINE	CALCIUM	ELECTRICAL CONDUCTIVITY	IODINE (TASTE THRESHOLD)	POTASSIUM	TIN
ADWG	0.2	250	0.6	1	15	200	0.3	0.1	6.5-8.5	80	180	250	600	5	3					0.15		
Units	mg/L	mg/L	mg/L	mg/L	CU	mg/L	mg/L	mg/L	pH unit	mg/L	mg/L	mg/L	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	µS/cm	mg/L	mg/L	mg/L
Community	Aesthetic parameters – mean values															Other parameters – mean values						
Amanbidji	<0.02	89	**0.9**	0.01	<2	**383**	0.06	0.06	7.9	33	131	83	**739**	0.7	0.08	443	0.16	55.3	1286	<0.01	3.81	<0.01
No. Samples	7	7	30	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Barunga	0.04	8	**1.1**	0.01	14	4	**0.41**	<0.005	**6.2**	19	7	<0.3	51	1.7	0.01	<20	0.03	0.7	44	<0.01	0.6	<0.01
No. Samples	2	2	36	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Beswick	0.03	6	**1.1**	0.14	3	**323**	<0.02	<0.005	7.4	22	5	<0.3	320	0.6	0.18	313	0.02	65.4	595	<0.01	1.84	<0.01
No. Samples	8	8	35	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Binjari	<0.02	8	**0.9**	0.03	<2	**328**	0.05	<0.005	7.5	26	8	<0.3	339	<0.1	0.02	310	0.04	76.6	625	<0.01	4.65	<0.01
No. Samples	2	2	36	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Bulla	<0.02	56	**0.8**	<0.01	2	**239**	0.3	**0.13**	8.2	17	39	<0.3	343	1.8	0.01	253	0.15	46.5	661	<0.01	7.7	<0.01
No. Samples	8	8	36	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Bulman	<0.02	8	**1.1**	<0.01	<2	**336**	<0.02	<0.005	7.7	23	7	<0.3	352	0.2	0.01	335	0.02	67.7	610	<0.01	2.5	<0.01
No. Samples	2	2	33	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Daguragu	<0.02	20	**0.9**	0.07	<2	**286**	<0.02	<0.005	7.9	25	29	<0.3	336	0.3	<0.01	300	0.06	57	615	<0.01	4.3	<0.01
No. Samples	2	2	24	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Jilkminggan	<0.02	250	**1.1**	<0.01	<2	**608**	<0.02	0.05	7.8	50	180	173	**1260**	0.4	<0.01	500	0.91	102.5	2200	0.14	23.8	<0.01
No. Samples	2	2	33	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Kalkarindji	<0.02	25	**0.9**	0.02	<2	**272**	<0.02	<0.005	7.7	22	31	<0.3	329	0.1	<0.01	280	0.08	58.3	605	0.01	5.25	<0.01
No. Samples	2	2	36	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Kybrook Farm	<0.02	7	**0.9**	<0.01	<2	145	0.1	0.01	7.3	38	45	<0.3	276	0.9	<0.01	230	0.04	24.9	470	<0.01	1.55	<0.01
No. Samples	2	2	36	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Lajamanu	<0.02	41	**0.8**	0.02	<2	192	<0.02	<0.005	7.6	**99**	47	<0.3	390	0.1	0.02	220	0.24	29.1	575	0.05	6.05	<0.01
No. Samples	2	2	36	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Manyallaluk	<0.02	6	**0.8**	0.02	<2	3	0.11	<0.005	**5**	23	5	<0.3	36	0.2	<0.01	<20	0.01	0.2	33	<0.01	0.47	<0.01
No. Samples	2	3	13	2	3	3	2	2	3	3	3	3	3	3	2	3	2	3	3	2	3	2
Minyerri	<0.02	14	**1**	0.01	3	105	**0.64**	**0.13**	7.3	32	24	7	185	**5.7**	0.04	130	0.05	22.6	328	<0.01	5.54	<0.01
No. Samples	8	5	36	8	5	5	8	8	5	5	5	5	5	5	8	5	8	5	5	8	5	8
Ngukurr	0.06	**444**	**0.9**	<0.01	<2	**692**	**0.74**	0.02	7.6	23	103	12	**931**	2.1	0.03	341	1.11	122.9	2013	<0.01	6.7	<0.01
No. Samples	9	8	143	9	8	8	9	9	8	8	8	8	8	8	9	8	10	8	8	10	8	10
Pigeon Hole	<0.02	13	**1**	<0.01	<2	**305**	<0.02	<0.005	7.3	54	27	<0.3	432	<0.1	<0.01	350	0.06	67.6	720	<0.01	1.95	<0.01
No. Samples	1	2	36	1	2	2	1	1	2	2	2	2	2	2	1	2	1	2	2	1	2	1
Rittarangu	<0.02	25	**0.8**	<0.01	<2	**299**	<0.02	<0.005	7.5	21	13	<0.3	327	0.3	<0.01	290	0.07	59.7	600	<0.01	3.3	<0.01
No. Samples	2	2	33	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Robinson River	0.04	32	**1.2**	<0.01	2	**436**	0.09	0.02	8.1	35	17	<0.3	469	1	0.01	439	0.12	40.2	916	0.02	3.46	<0.01
No. Samples	11	10	31	11	10	10	11	11	10	10	10	10	10	10	11	10	11	10	10	11	10	11
Weemol	<0.02	11	**1.1**	<0.01	<2	**398**	<0.02	<0.005	7.4	32	10	<0.3	418	<0.1	0.01	400	0.03	75.3	740	<0.01	2.9	<0.01
No. Samples	2	1	35	2	1	1	2	2	1	1	1	1	1	1	2	1	2	1	1	2	1	2
Yarralin	<0.02	17	**1.1**	<0.01	2	**391**	0.04	0.09	7.7	36	23	<0.3	432	0.6	<0.01	400	0.11	80	775	0.01	3	<0.01
No. Samples	2	2	33	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

Numbers in **bold** exceed the guideline value.

Appendix B

Table 23 Drinking water quality in Barkly region communities (Health parameters)

	ANTIMONY	ARSENIC	BARIUM	BERYLLIUM	BORON	CADMIUM	CHROMIUM	COPPER	FLUORIDE	LEAD	MANGANESE	MERCURY	MOLYBDENUM	NICKEL	NITRATE	RADIOLOGICAL	SELENIUM	SILVER	URANIUM
ADWG	0.003	0.01	2	0.06	4	0.002	0.05	2	1.5	0.01	0.5	0.001	0.05	0.02	50	1	0.01	0.1	0.017
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mSv/yr	mg/L	mg/L	mg/L
Community	Health parameters – 95th percentile or maximum values																		
Ali Curung	<0.0002	0.004	0.1	<0.001	0.9	<0.0002	0.005	0.07	1.3	0.002	<0.005	<0.0001	<0.005	0.01	30	PASS	0.004	<0.01	0.014
No. Samples	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	4	6	6	6
Alpurrurulam	<0.0002	0.002	0.1	<0.001	0.3	<0.0002	<0.005	0.02	**1.7**	<0.001	0.005	<0.0001	<0.005	<0.002	5	0.05	0.002	<0.01	0.012
No. Samples	6	6	6	6	6	6	6	6	8	6	6	6	6	6	8	4	6	6	6
Canteen Creek	<0.0002	<0.0005	0.2	<0.001	0.3	<0.0002	<0.005	0.04	0.54	<0.001	<0.005	<0.0001	<0.005	<0.002	20	0.2	0.001	<0.01	0.0017
No. Samples	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2
Imangara	<0.0002	0.002	0.5	<0.001	0.3	<0.0002	<0.005	<0.01	0.81	<0.001	<0.005	<0.0001	<0.005	<0.002	6	PASS	<0.001	<0.01	0.012
No. Samples	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2
Nturiya	<0.0002	0.001	0.1	<0.001	0.7	<0.0002	<0.005	0.01	1	<0.001	0.02	<0.0001	<0.005	<0.002	50	0.1	0.004	<0.01	0.016
No. Samples	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Tara	<0.0002	0.0005	<0.05	<0.001	0.6	<0.0002	<0.005	0.08	0.94	<0.001	<0.005	<0.0001	<0.005	0.004	20	0.1	0.002	<0.01	0.0049
No. Samples	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Willowra	<0.0002	0.002	0.05	<0.001	0.5	<0.0002	<0.005	0.2	0.9	<0.001	<0.005	<0.0001	<0.005	0.002	40	0.06	0.004	<0.01	**0.024**
No. Samples	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	2	8	8	8
Wilora	<0.0002	0.002	0.05	<0.001	1	<0.0002	<0.005	<0.01	1	<0.001	<0.005	<0.0001	<0.005	<0.002	20	0.09	0.006	<0.01	**0.023**
No. Samples	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	8	5	5	5
Wutunugurra	<0.0002	0.0005	0.5	<0.001	0.1	<0.0002	<0.005	<0.01	0.28	<0.001	<0.005	<0.0001	<0.005	<0.002	5	PASS	<0.001	<0.01	0.0018
No. Samples	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	6	2	2	2

Numbers in **bold** exceed the guideline value.

Appendix B

Table 24 Drinking water quality in Barkley region communities (Aesthetic and other parameters)

	ALUMINIUM	CHLORIDE	FREE CHLORINE (ODOUR THRESHOLD)	COPPER	COLOUR (TRUE)	HARDNESS (AS CACO3)	IRON	MANGANESE	PH	SILICA	SODIUM	SULFATE	TDS	TURBIDITY	ZINC	ALKALINITY (AS CACO3)	BROMINE	CALCIUM	ELECTRICAL CONDUCTIVITY	IODINE (TASTE THRESHOLD)	POTASSIUM	TIN
ADWG Units	0.2 mg/L	250 mg/L	0.6 mg/L	1 mg/L	15 CU	200 mg/L	0.3 mg/L	0.1 mg/L	6.5-8.5 pH unit	80 mg/L	180 mg/L	250 mg/L	600 mg/L	5 NTU	3 mg/L	mg/L	mg/L	mg/L	µS/cm	0.15 mg/L	mg/L	mg/L
Community	Aesthetic parameters – mean values															Other parameters – mean values						
Ali Curung	<0.02	49	**1.03**	0.02	<2	12	<0.02	<0.005	7.9	56	86	4	308	<0.1	0.02	132	0.29	1.9	480	0.1	16.13	<0.01
No. Samples	6	6	21	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Alpurrurulam	<0.02	204	**0.95**	<0.01	<2	**510**	0.07	<0.005	7.6	62	151	71	**943**	0.3	0.03	471	0.48	67.4	1675	0.1	7.51	<0.01
No. Samples	6	8	36	6	8	8	6	6	8	8	8	8	8	8	6	8	6	8	8	6	8	6
Canteen Creek	<0.02	110	**0.85**	0.02	2	195	0.1	<0.005	7.4	45	93	27	437	0.5	0.03	210	0.32	28.8	855	0.09	13.65	<0.01
No. Samples	2	2	36	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Imangara	<0.02	24	**0.76**	<0.01	<2	**295**	<0.02	<0.005	7.8	77	33	<0.3	416	<0.1	0.02	330	0.15	47.8	710	0.06	31.85	<0.01
No. Samples	2	2	32	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Nturiya	<0.02	**348**	**0.36**	<0.01	<2	**329**	0.05	0.01	7.8	76	**261**	170	**1198**	0.3	0.06	203	1.46	82.3	2000	**0.21**	24.8	<0.01
No. Samples	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Tara	<0.02	**345**	**1.01**	0.07	3	**337**	0.08	<0.005	7.2	20	**231**	134	**1030**	<0.1	0.21	200	0.64	38.2	1900	**0.24**	28.75	<0.01
No. Samples	2	2	18	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Willowra	<0.02	173	**0.9**	0.04	<2	**262**	<0.02	<0.005	8	79	136	65	**760**	0.2	0.04	244	0.57	54.3	1288	0.13	32.58	<0.01
No. Samples	8	8	24	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Wilora	<0.02	**540**	0.19	<0.01	<2	**646**	<0.02	<0.005	7.9	78	**315**	198	**1698**	0.2	0.03	390	3.73	105.1	2920	**0.24**	60.26	<0.01
No. Samples	5	5	2	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Wutunugurra	<0.02	50	**1.00**	<0.01	<2	185	<0.02	<0.005	7.5	63	41	6	358	0.3	0.06	190	0.14	40.3	570	0.04	9.45	<0.01
No. Samples	2	2	30	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

Numbers in **bold** exceed the guideline value.

Appendix B

Table 25 Drinking water quality in Southern region communities (Health parameters)

	ANTIMONY	ARSENIC	BARIUM	BERYLLIUM	BORON	CADMIUM	CHROMIUM	COPPER	FLUORIDE	LEAD	MANGANESE	MERCURY	MOLYBDENUM	NICKEL	NITRATE	RADIOLOGICAL	SELENIUM	SILVER	URANIUM
ADWG	0.003	0.01	2	0.06	4	0.002	0.05	2	1.5	0.01	0.5	0.001	0.05	0.02	50	1	0.01	0.1	0.017
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mSv/yr	mg/L	mg/L	mg/L
Community	Health parameters – 95th percentile or maximum values																		
Amoonguna	<0.0002	<0.0005	0.1	<0.001	0.1	<0.0002	<0.005	0.05	0.52	0.003	0.1	<0.0001	<0.005	<0.002	8	PASS	0.001	<0.01	0.0076
No. Samples	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Ampilatwatja	<0.0002	<0.0005	<0.05	<0.001	0.4	<0.0002	<0.005	<0.01	1.2	<0.001	<0.005	<0.0001	<0.005	<0.002	30	0.02	0.002	<0.01	0.0086
No. Samples	2	2	2	2	2	2	2	2	3	2	2	2	2	2	3	2	2	2	2
Areyonga	<0.0002	<0.0005	0.1	<0.001	0.2	<0.0002	<0.005	<0.01	0.45	<0.001	<0.005	<0.0001	<0.005	0.004	7	0.1	0.001	<0.01	0.010
No. Samples	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Atitjere	<0.0002	<0.0005	0.05	<0.001	0.2	<0.0002	<0.005	<0.01	0.6	<0.001	<0.005	<0.0001	<0.005	<0.002	30	PASS	0.003	<0.01	0.0074
No. Samples	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	6	2	2	2
Engawala	<0.0002	<0.0005	0.2	<0.001	0.2	<0.0002	<0.005	<0.01	0.66	<0.001	<0.005	<0.0001	<0.005	<0.002	30	PASS	0.002	<0.01	0.0033
No. Samples	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	12	2	2	2
Finke*	<0.0002	0.0005	0.2	<0.001	0.08	<0.0002	<0.005	0.9	0.19	<0.001	<0.005	<0.0001	<0.005	<0.002	9	PASS	<0.001	<0.01	0.0032
No. Samples	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Haasts Bluff	<0.0002	0.0005	<0.05	<0.001	0.4	<0.0002	<0.005	0.02	0.54	0.002	0.02	<0.0001	<0.005	0.006	8	0.03	0.002	<0.01	0.011
No. Samples	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2
Hermannsburg	<0.0002	<0.0005	<0.05	<0.001	0.2	<0.0002	<0.005	<0.01	0.42	<0.001	0.005	<0.0001	<0.005	<0.002	5	PASS	<0.001	<0.01	0.0045
No. Samples	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	6	2	2	2
Imanpa	<0.0002	0.001	<0.05	<0.001	1	<0.0002	0.005	0.01	0.89	<0.001	0.07	0.0002	<0.005	0.004	30	0.2	0.004	<0.01	0.013
No. Samples	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	2	8	8	8
Kaltukatjara	<0.0002	<0.0005	<0.05	<0.001	0.2	<0.0002	<0.005	0.03	0.46	<0.001	0.005	<0.0001	<0.005	<0.002	0.2	PASS	<0.001	<0.01	<0.00001
No. Samples	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	2	2	2
Kintore	<0.0002	<0.0005	<0.05	<0.001	0.4	<0.0002	<0.005	0.01	0.57	<0.001	<0.005	<0.0001	<0.005	<0.002	30	PASS	<0.001	<0.01	0.00018
No. Samples	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	6	8	8	8
Laramba	<0.0002	0.0005	0.3	<0.001	0.4	<0.0002	<0.005	0.01	1.2	<0.001	<0.005	<0.0001	<0.005	<0.002	40	0.04	0.003	<0.01	**0.046**
No. Samples	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	4	7	7	7
Mt Liebig	<0.0002	<0.0005	0.05	<0.001	0.3	<0.0002	<0.005	0.01	1.4	<0.001	<0.005	<0.0001	<0.005	<0.002	20	PASS	0.002	<0.01	0.0053
No. Samples	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	2	2	2
Nyirripi	<0.0002	0.002	0.1	<0.001	0.5	<0.0002	<0.005	<0.01	**1.8**	<0.001	<0.005	<0.0001	<0.005	<0.002	30	PASS	0.002	<0.01	0.0097
No. Samples	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Papunya	<0.0002	0.0005	0.1	<0.001	0.4	<0.0002	<0.005	0.02	1.1	<0.001	<0.005	<0.0001	<0.005	<0.002	20	PASS	0.005	<0.01	0.0094
No. Samples	2	2	2	2	2	2	2	2	3	2	2	2	2	2	3	6	2	2	2
Pmara Jutunta	<0.0002	0.001	0.1	<0.001	0.7	<0.0002	<0.005	0.02	0.86	<0.001	<0.005	<0.0001	<0.005	<0.002	50	PASS	0.004	<0.01	0.016
No. Samples	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Santa Teresa	<0.0002	<0.0005	0.5	<0.001	0.06	<0.0002	<0.005	0.01	0.23	<0.001	<0.005	<0.0001	<0.005	<0.002	10	0.1	0.003	<0.01	0.0047
No. Samples	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2
Titjikala	<0.0002	0.002	0.3	<0.001	0.1	<0.0002	<0.005	0.01	0.6	<0.001	<0.005	<0.0001	<0.005	<0.002	20	PASS	0.001	<0.01	0.0038
No. Samples	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	2	2	2
Wallace Rockhole	<0.0002	0.0005	<0.05	<0.001	0.4	<0.0002	0.04	0.02	0.95	<0.001	<0.005	<0.0001	<0.005	0.004	20	0.2	0.004	<0.01	0.0061
No. Samples	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Yuelamu	<0.0002	<0.0005	<0.05	<0.001	1	0.0002	<0.005	0.3	**1.6**	0.002	0.09	<0.0001	<0.005	<0.002	10	0.5	<0.001	<0.01	0.0099
No. Samples	9	9	9	9	9	9	9	9	10	9	9	9	9	9	9	2	9	9	9
Yuendumu	<0.0002	<0.0005	<0.05	<0.001	0.3	<0.0002	<0.005	0.02	0.45	<0.001	<0.005	<0.0001	<0.005	<0.002	7	0.1	0.001	<0.01	0.011
No. Samples	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	5	2	2	2

Numbers in **bold** exceed the guideline value.

Appendix B

Table 26 Drinking water quality in Southern region communities (Aesthetic and other parameters)

	ALUMINIUM	CHLORIDE	FREE CHLORINE (ODOUR THRESHOLD)	COPPER	COLOUR (TRUE)	HARDNESS (AS CACO3)	IRON	MANGANESE	PH	SILICA	SODIUM	SULFATE	TDS	TURBIDITY	ZINC	ALKALINITY (AS CACO3)	BROMINE	CALCIUM	ELECTRICAL CONDUCTIVITY	IODINE (TASTE THRESHOLD)	POTASSIUM	TIN
ADWG Units	0.2 mg/L	250 mg/L	0.6 mg/L	1 mg/L	15 CU	200 mg/L	0.3 mg/L	0.1 mg/L	6.5-8.5 pH unit	80 mg/L	180 mg/L	250 mg/L	600 mg/L	5 NTU	3 mg/L	mg/L	mg/L	mg/L	µS/cm	0.15 mg/L	mg/L	mg/L
Community	Aesthetic parameters – mean values															Other parameters – mean values						
Amoonguna	<0.02	71	**0.9**	0.04	<2	**215**	0.16	0.05	7.5	17	82	47	409	3.8	0.02	230	0.39	50	793	0.04	5.87	<0.01
No. Samples	3	3	51	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Ampilatwatja	<0.02	180	**1**	<0.01	<2	**482**	<0.02	<0.005	7.9	36	129	190	**988**	0.3	0.01	300	0.44	101	1600	0.08	24.2	<0.01
No. Samples	2	3	9	2	3	3	2	2	3	3	3	3	3	3	2	3	3	3	3	3	3	2
Areyonga	<0.02	120	**1.1**	<0.01	<2	**511**	<0.02	<0.005	7.7	18	66	83	**698**	<0.1	0.01	365	0.27	98	1300	0.05	9.1	<0.01
No. Samples	2	2	33	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Atitjere	<0.02	125	**1.2**	<0.01	<2	**311**	0.03	<0.005	8.2	34	118	133	**666**	0.3	<0.01	230	0.33	51	1200	0.06	9	<0.01
No. Samples	2	2	15	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Engawala	<0.02	94	**1.1**	<0.01	<2	**384**	<0.02	<0.005	7.9	64	70	32	592	0.4	0.03	340	0.5	78	900	0.06	6.9	<0.01
No. Samples	2	2	33	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Finke*	<0.02	170	**0.7**	0.47	<2	**217**	0.1	<0.005	7.5	16	93	57	500	0.4	0.02	120	0.13	63	945	0.02	7	<0.01
No. Samples	2	2	27	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Haasts Bluff	<0.02	**390**	0.6	0.01	3	**608**	0.75	0.01	7.9	44	178	230	**1195**	5.2	0.05	230	1.61	111	2200	**0.18**	29.6	<0.01
No. Samples	2	2	18	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Hermannsburg	<0.02	110	**0.8**	<0.01	2	**336**	0.04	<0.005	8	15	65	47	527	0.7	0.01	245	0.23	69	935	0.04	7.5	<0.01
No. Samples	2	2	30	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Imanpa	<0.02	**420**	**0.9**	<0.01	2	**523**	0.1	0.01	8.2	26	**256**	248	**1391**	2.1	0.02	211	1.26	103	2375	**0.22**	32.34	<0.01
No. Samples	8	8	36	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Kaltukatjara	<0.02	90	**0.8**	0.03	<2	**302**	0.07	<0.005	7.8	12	59	52	477	0.5	0.08	240	0.36	60	895	0.08	12.2	<0.01
No. Samples	2	2	32	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Kintore	<0.02	44	**0.8**	<0.01	<2	92	<0.02	<0.005	7.8	**83**	77	<0.3	349	0.1	<0.01	173	0.23	14	530	0.04	3	<0.01
No. Samples	8	8	17	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Laramba	<0.02	120	**0.7**	<0.01	<2	**370**	<0.02	<0.005	7.7	**93**	60	27	**660**	0.1	0.01	290	0.29	76	1100	**0.16**	44.53	<0.01
No. Samples	7	7	9	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Mt Liebig	<0.02	99	**1**	0.01	<2	**276**	<0.02	<0.005	7.7	49	97	70	569	<0.1	0.01	240	0.32	63	1000	0.11	13.7	<0.01
No. Samples	2	2	36	2	2	2	2	2	2	2	2	2	2	2	2	5	2	5	5	5	5	5
Nyirripi	<0.02	112	**1.1**	<0.01	<2	**263**	<0.02	<0.005	8.1	83	90	24	**605**	0.1	<0.01	267	0.2	53	987	0.09	28.25	<0.01
No. Samples	6	6	18	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Papunya	<0.02	167	**0.9**	0.01	<2	**248**	<0.02	<0.005	8.3	59	**245**	53	**859**	0.2	0.01	443	0.51	53	1533	**0.18**	11.37	<0.01
No. Samples	2	3	30	2	3	3	2	2	3	3	3	3	3	3	2	3	2	3	3	2	3	2
Pmara Jutunta	<0.02	69	**1**	<0.01	<2	**218**	<0.02	<0.005	7.9	**88**	66	27	531	<0.1	0.04	213	0.65	50	808	0.13	18.38	<0.01
No. Samples	4	4	33	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Santa Teresa	<0.02	11	**0.9**	<0.01	<2	**298**	<0.02	<0.005	7.8	18	8	4	305	<0.1	<0.01	265	0.05	79	570	0.01	4.6	<0.01
No. Samples	2	2	24	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Titjikala	0.04	33	**0.7**	<0.01	<2	**244**	0.03	<0.005	7.6	30	31	10	348	3.7	0.03	220	0.11	72	600	0.02	4.25	<0.01
No. Samples	2	2	36	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Wallace Rockhole	<0.02	155	**0.8**	0.01	4	**316**	0.06	<0.005	7.6	11	104	62	594	0.3	0.05	220	0.27	78	1100	0.07	9.6	<0.01
No. Samples	2	2	36	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Yuelamu	<0.02	52	0.6	0.06	<2	77	<0.02	0.03	7.8	76	52	5	285	0.4	0.35	102	0.31	28	403	0.08	0.53	<0.01
No. Samples	9	10	26	9	10	10	9	9	10	10	10	10	10	10	9	10	10	10	10	10	10	10
Yuendumu	0.03	**315**	**1**	0.01	<2	**618**	0.14	<0.005	7.7	15	142	135	**998**	<0.1	0.12	330	0.59	132	1900	**0.16**	22.95	<0.01
No. Samples	2	2	7	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

Numbers in **bold** exceed the guideline value.

Finke data June 2017


PowerWater