Annual

Drinking Water Quality Report

2017

2017 Water Quality Report

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From the Chief Executive

The Power and Water Corporation is committed to effectively managing its drinking water supplies so that good drinking water is provided to all our customers.

The Drinking Water Quality Report 2016-17 is a record of Power and Water's service delivery across the Northern Territory, under the framework of the Australian Drinking Water Guidelines.

Power and Water continues to strive for a sharper customer focus by working better together to serve our customers and the Territory. This report is the first combined water quality performance report for customers in urban, rural and remote centres.

To best serve our customers and for the public health of the Territory, all drinking water services are delivered under the framework of the Australian Drinking Water Guidelines, the standard for Australia. The preventative, risk management approach, of the guidelines covers all aspects of delivering drinking water – from the catchment to the consumer.

Power and Water's commitment to drinking water quality is put into action with the skills, effort and dedication of mangers, employees and contractors, working tirelessly every day and in all conditions. The responsibility for the drinking water quality commitment is carried across the organisation, by all those involved with the service.

The Department of Health regulates the important public health outcomes which 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.

Michael Thomson
Chief Executive

Drinking Water Quality Report 2016–17

This Drinking Water Quality Report provides a record of the water quality management activities and drinking water quality performance at urban centres and remote communities from 1 July 2016 to 30 June 2017. The report conveys drinking water quality information to the wider Northern Territory public, the Department of Health (DoH) and other interested stakeholders.

In this report, drinking water quality management activities and performance are described in two sections.

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

Section 2 provides information about the drinking water quality supplied to consumers, with the water quality statistics included in the Appendices. This section is broken into two parts:

A — Part A - Major and minor urban centres

B — Part B - Remote communities

Operating Context

Power and Water is responsible for delivering safe drinking water services to its customers throughout the Northern Territory (NT). This responsibility is shared across an organisational structure containing a centralised business services unit and two 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.

The organisational structure manages the differences in legislative and funding obligations of the two operational units, while working together on a consistent approach to ensuring the provision of safe drinking water.

The two operational business units have produced a combined annual Drinking Water Quality Report for 2016-17. Previously, each business unit produced its own report.

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. 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 guidelines are the adopted standards and provide a common benchmark for assessing the acceptability of drinking water supplied to consumers across Australia. The guidelines apply to any water intended for drinking irrespective of the source, or where it is consumed, with the exception of bottled and packaged water, which is covered under the national Food Standards Code.

The ADWG describes a preventative, risk management approach that encompasses all steps in water production - from catchment to consumer.

Version 3 of the ADWG was released in October 2011 and contains the Framework for Management of Drinking Water Quality, which 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 3.3, updated in November 2016.

1

Commitment to drinking water quality management

Power and Water is committed to being a trusted provider of safe, good quality drinking water. This commitment is the foundation of policies which drive the organisation's actions to support effective management of drinking water quality.

The Chief Executive committed to a continual improvement process in May 2016, when the Drinking Water Quality Management System was reviewed. An improvement project was initiated in August 2016. The project identifies, prioritises and addresses the areas in the current management system requiring improvement. The project ensures that the requirements of the Drinking Water Policy are developed, maintained and continuously improved.

Power and Water has formalised the commitment to drinking water quality in publicly available documents:

- *Drinking Water Quality Policy* (https://powerwater.com.au/__data/assets/pdf_file/0009/41994/Drinking_Water_Quality_Policy_Statement_-_September_2016.pdf)
- *Power and Water's Customer Contract (major and minor urban centres only)* (https://powerwater.com.au/customers/customer_contract)

Power and Water engages with various Northern Territory Government (NTG) agencies which regulate drinking water quality. Public health accountabilities and responsibilities have been formalised in the *Memorandum of Understanding between the Department of Health and the Power and Water Corporation for Drinking Water* (https://powerwater.com.au/__data/assets/pdf_file/0005/35807/MMoU_PWC_Health.pdf)

Power and Water's Drinking Water Quality Policy

The Drinking Water Quality Policy was reviewed and re-signed by the CE in September 2016. Power and Water's water quality team reviewed the policy then engaged with internal staff and other Government stakeholders shortly after. The policy sets the basis for drinking water quality management and is supported by all managers, employees and contractors involved with the supply of drinking water at Power and Water.

Building effective partnerships

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 collaborates with a wide range of stakeholders to coordinate planning and management activities, which are critical to the protection of public health and to the provision of safe drinking water to all customers. This is primarily achieved by building effective partnerships with multiple agencies and organisations.

Northern Territory Government departments

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

Department of Health (DoH)

DoH has important responsibilities in protecting public health under the *Public and Environmental Health Act 2011* (NT) and other relevant legislation. The Memorandum of Understanding (MoU) between Power and Water and DoH, documents the accountabilities and responsibilities of the two organisations in relation to drinking water. The MoU defines the role of DoH as the regulatory agency for drinking water quality in the Northern Territory.

A working group compromising officers from DoH and Power and Water was formed in this reporting period and is progressing the redrafting of the MoU.

Department of Environment and Natural Resources (DENR)

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

Department of Infrastructure, Planning and Logistics (DIPL)

DIPL protects water quality through appropriate land use planning.

Department of Primary Industry and Resources (DPIR)

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

Northern Territory response to Per- and poly-Fluorinated Alkyl Substances (PFAS)

Power and Water has been working to understand the impact on public drinking water supplies from the historical use of firefighting foams. In 2016, PFAS were identified as an emerging class of drinking water contaminants and investigations started in all Australian jurisdictions. The Australian Department of Health changed PFAS guidance in April 2017 following research on the topic. The PFAS situation has highlighted how we all need to work together to ensure water resources remain safe and reliable.

The Northern Territory Per- and poly-Fluorinated Alkyl Substances Interagency Working Group was formed. This group coordinates the response to PFAS health guidance changes across the Northern Territory, which requires Power and Water to understand the impact on public water supplies.

Power and Water, at the request of DoH, 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 NT and Federal Departments of Health. PFAS results are not reported in this annual report.

The Department of Defence has advised of the presence of PFAS in the vicinity of some of its bases around Australia, including RAAF Base Tindal, Katherine. 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/21510

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

POWER AND WATER'S VALUES

We work better by working together.

–

We stand up and do what's right.

2

Assessment of the drinking water supply system

An assessment of the drinking water supply and any hazards is fundamental to our risk management approach. It aligns with the philosophy of the ADWG and the principles of good corporate governance.

In this reporting period Power and Water developed and delivered a program of disinfection reliability assessments across all water supplies, which began in October 2016. The systematic and evidence based method was developed to assess the existing disinfection processes. The assessment produced a consolidated report and an improvement plan that prioritised work. A brief description of how the assessments were carried out, along with the key risks identified, is provided in Section 1:11 Evaluation and Audit.

The water quality knowledge from assessments is being compiled into Water Safety Plans (WSPs) for all 92 drinking water systems. The knowledge gained in the disinfection reliability assessments was also used to start planning work for a staged rollout of a safety assessment approach, called Health Based Targets.

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.

Regions and Remote Operations manage the water supply systems in each of the 72 remote communities through the Power and Water subsidiary, Indigenous Essential Services (IES). IES provides electricity, water and wastewater services to remote communities and outstations in the Northern Territory under an agreement with the Department of Housing and Community Development. Figure 2 illustrates services operated at remote communities throughout the Northern Territory under IES. These systems are operated by Essential Services Officers (ESOs). Although some of these systems are considerably smaller, the remoteness presents challenges which are managed through preventative measures.

Garawa drinking water quality is included in this report as Power and Water continues to assist the Mabunji Aboriginal Resource Centre and the Department of Housing and Community Development. 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.

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 but 95 per cent of 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
Borroloola[1]	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

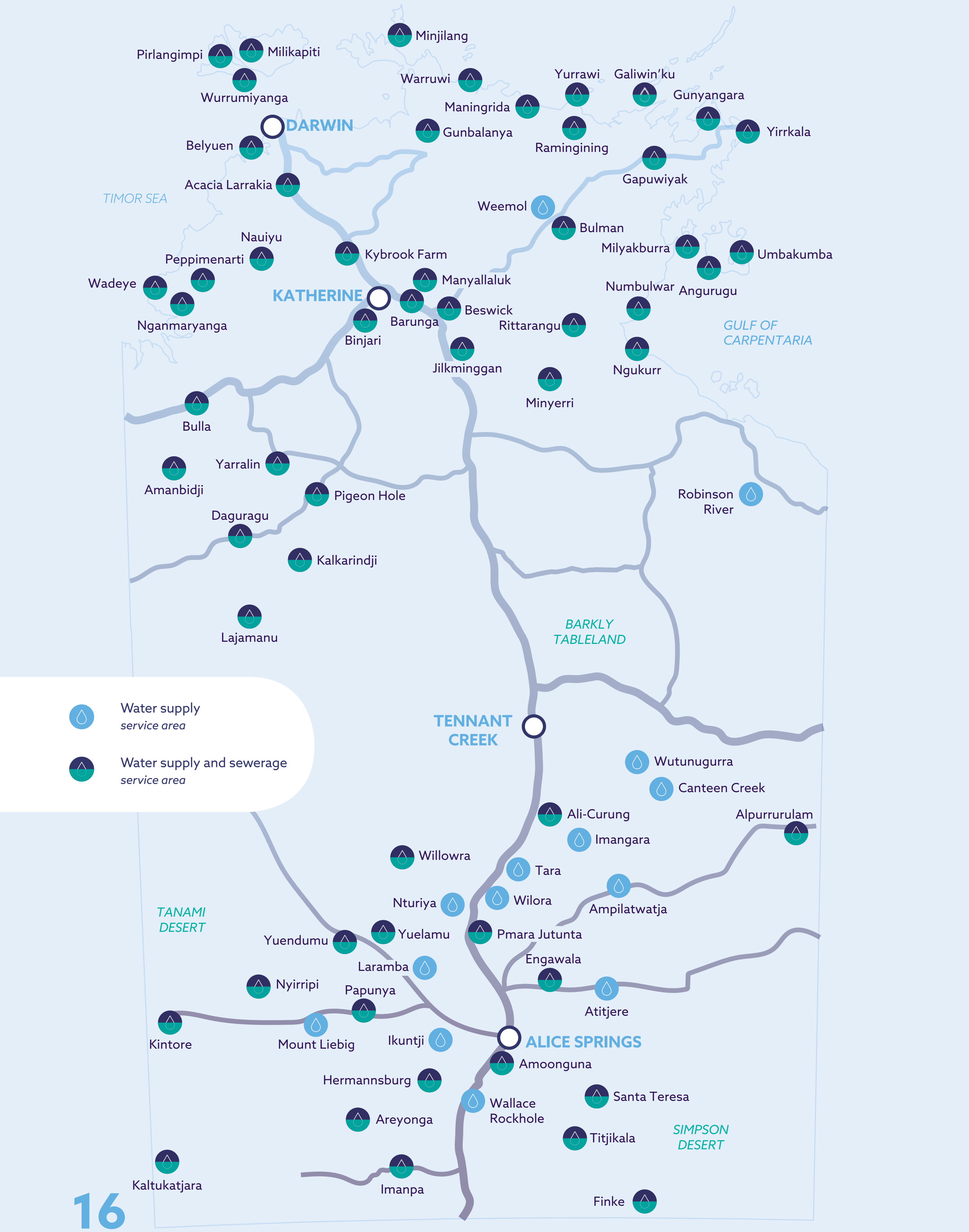
[1] The water source for the Borroloola town camps Garawa 1 and 2 is groundwater and is separate from the Borroloola source.

Table 2 Summary of drinking water sources in remote communities

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

There are unique challenges involved in ensuring the delivery of good quality drinking water across the Northern Territory. Power and Water adopts a systematic, preventative and multiple barrier approach to control the potential risks to drinking water quality.

Barriers act to control or block microbiological pathogens and chemical contaminants that may enter the 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), the installation of a filtration system, disinfection of the water, and maintenance and cleaning programs for the supply system.

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 Organization.

The multiple barrier approach is universally recognised as the foundation for ensuring safe drinking water. Specific water treatment methods can prevent disease from being transmitted to the community. However, treating water after it leaves reservoirs and storages is not the only way to maintain water quality.

Power and Water has adopted a multiple barrier approach to protect drinking water supplies. 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.

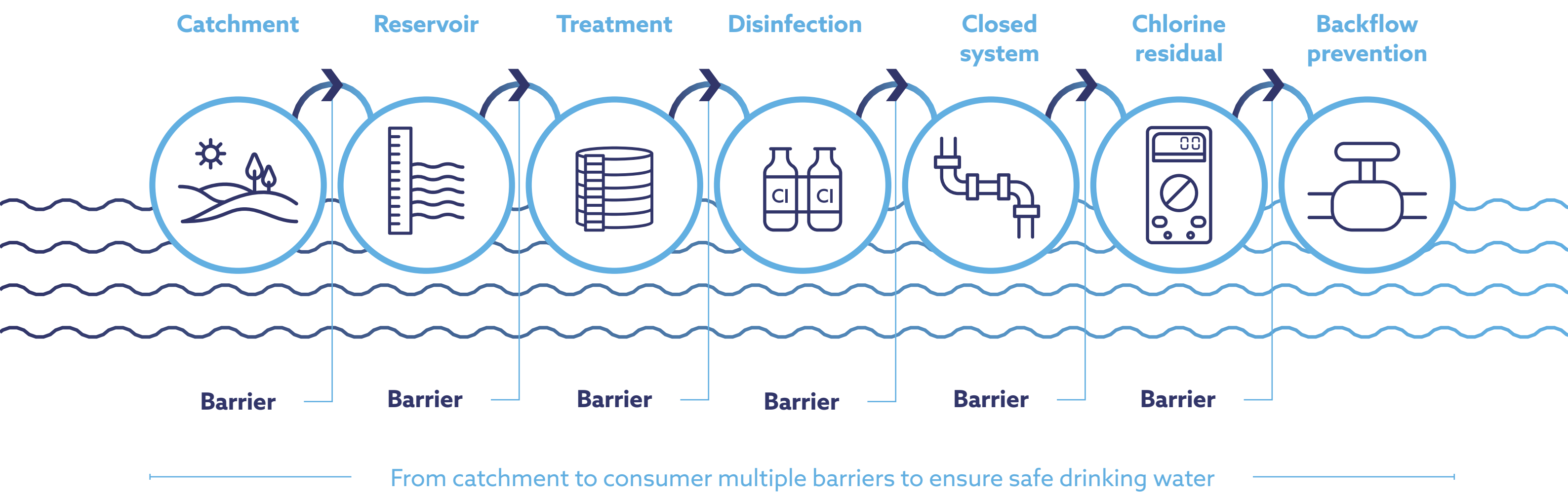
The catchment to consumer framework applies across the entire drinking water supply system – from the water source to the consumer's tap. It enables a holistic assessment of water quality risks and solutions to ensure the reliable delivery of safe drinking water to consumers.

The multiple barriers in place across major and minor urban centre water supply systems in the Northern Territory are shown in Table 3.

Table 3 Water quality barriers in major and minor urban centres

Centre	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	•	•	•	•	•	•	•	•	•	•

Figure 3 Typical multiple barrier system



Protecting the source

Protection of drinking water sources, including borefields, water supply catchments and reservoirs, is critical for Power and Water. They are the primary asset of any water supply, and implementing effective measures to protect them can result in a lower cost safe drinking water supply. It also aligns with Power and Water's Drinking Water Quality Policy and is a priority recommendation of the Australian Drinking Water Quality Guidelines.

Power and Water's *Catchment and Water Source Protection Strategy* is an integrated, comprehensive framework for protecting the Northern Territory's water assets. This strategy outlines the 12 key principles that guide management and clearly articulates the actions that will be taken to uphold these principles.

Power and Water, in partnership with government agencies and relevant stakeholders, incorporates these principles into proactive and effective plans and programs for the protection and sustainable management of our drinking water sources. Individual plans set specific objectives for each of the water sources and the management actions required for meeting these objectives.

During 2016-17, IES has progressed improvements outlined by the water safety assessments, performed in the previous reporting period, to reduce water source risks in a number of communities. Back up production bores were drilled at Ali Curung, Laramba, Willowra and Yuelamu. The detailed design for equipping new bores and borefields was completed for Barunga, Ngukurr, Robinson River and Wadeye. A drilling program to improve water security for Minyerri commenced, and a program at Pirlangimpi is planned.

During this reporting period, an event-based sampling of raw water after rainfall at Darwin River Reservoir was undertaken to better understand the effects of monsoonal events on the raw water quality.

Water supply treatment

Water treatment processes are used to improve the quality of water supplied to a number of communities. This involves the raw water being treated before being disinfected and distributed to the community. Three treatment methods are used: filtration, aeration and disinfection.

Microbiological water quality is of highest priority at Power and Water. It continues to work at maintaining a number of effective barriers against disease-causing organisms. 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 in major and minor urban centres and remote communities in the Northern and Katherine regions. A set minimum free chlorine residual of 0.3mg/L has historically been maintained in the Barkly and Southern region communities since comprehensive chlorination was introduced into all remote communities in 2008. This has primarily been due to the low risk of contamination of groundwater sources in these communities. Future plans will see the transition to 0.5 mg/L minimum free chlorine residual in all remote communities.

The effectiveness of this control is assessed by monitoring, recording and acting on incidents where the level falls below 0.5 mg/L.

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 has effectively reduced levels of naturally occurring nitrate, fluoride and uranium, as well as salinity and hardness.

Enhancing the water supply

A number of improvements to the water treatment systems have occurred during this reporting period:

- Larrimah received a new chlorination system.
- Mataranka received upgrades to its existing chlorination system.
- Gunn Point received a new chlorination system.
- Ampilatwatja upgraded from a UV disinfection system to a sodium hypochlorite disinfection system. This project included SCADA connection.
- Milingimbi had dual dosing (chlorination) pumps installed.
- Robinson River received an upgraded chlorine disinfection system as part of a major water storage upgrade.
- Bulla had a new UV disinfection system and chlorine disinfection upgrade, including SCADA connection.
- Barunga had an online chlorine analyser and recirculation system installed to improve the control of chlorine residual within the distribution system.

The Territory's first remote community dual water reticulation system was completed at Yuelamu in the Central Desert Region. This followed the main community water supply dam being rendered unsafe by a toxic blue green algae bloom in November 2015. The community drinking water supply source is now supplied from two bores, which are treated through the onsite AWT Plant to produce water which is compliant with the ADWG.

Drinking water from the treatment plant is now available in every building at a dedicated tap over the kitchen sink. A separate non-potable supply is also available at all other taps. Longer term water security options for this community are under consideration.

4

Operational procedures and process control

Power and Water maintains operational procedures and monitors process controls to ensure the reliable supply of quality drinking water across the Northern Territory.

To consistently achieve a reliable water supply, with good quality water, it is essential to have 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.

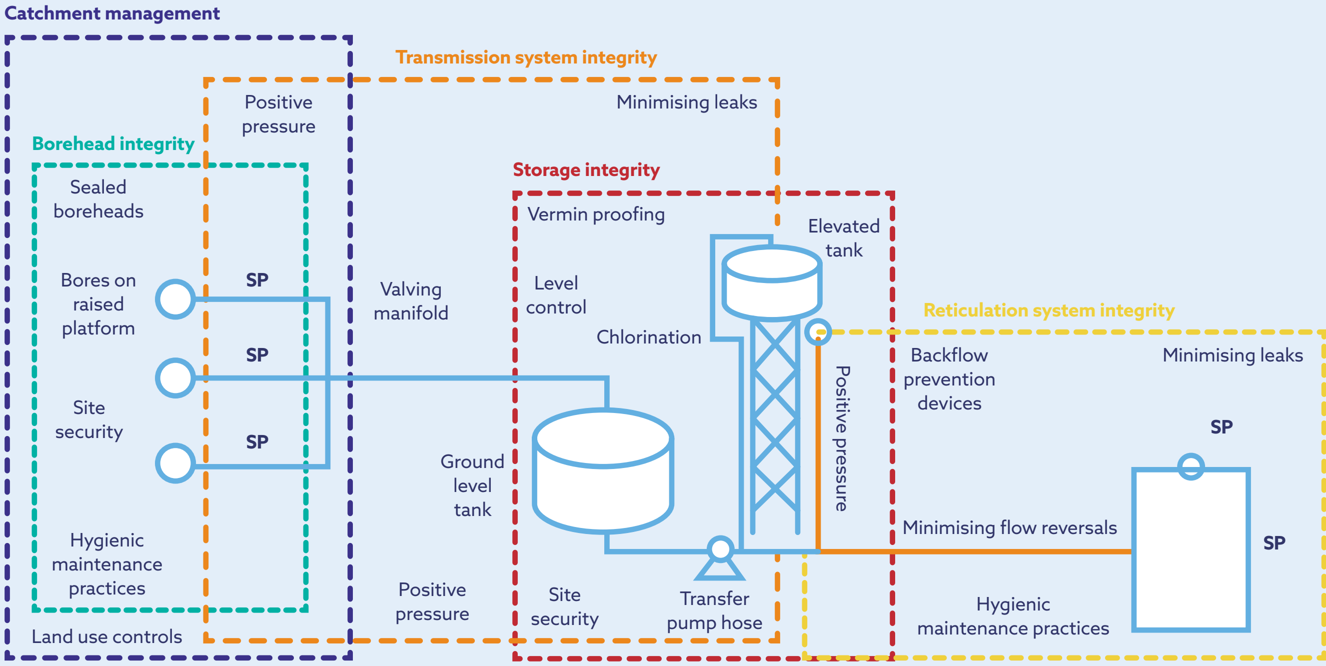
Typically, community water supply systems consist of a number of production bores that pump raw water from the underground aquifer along a rising main to a ground level water storage tank. From the ground level water storage tank, raw water is treated with chlorine and pumped to an elevated tank.

Drinking water is distributed to customers via the reticulation network and the elevated tank maintains adequate pressure in that network.

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

Power and Water uses industrial control systems (ICS) such as the Supervisory Control and Data Acquisition (SCADA) system for process control. This computer controlled supervisory system is used to monitor and control industrial processes that exist in the physical world. SCADA systems are different from other ICS systems as they are large scale processes, which can include multiple sites and cover large distances.

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 is introducing 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

To maintain process control, applicable procedures are managed by Power and Water for the reporting period. Appropriately established procedures and water quality information are made readily available to all employees via Power and Water's intranet site, Aquanet.

During 2016-17, a complete internal audit was undertaken on all processes and procedures, with a number of policies, procedures and plans updated. A procedure was developed for the protocols and processes to be followed regarding special needs customers, in the event of an incident or emergency.

Corrective actions

In this reporting period, Power and Water strengthened corrective and preventative procedures. In particular, corrective actions linked to critical operational monitoring were formalised and implemented.

Process control improvements occurred following the completion of disinfection reliability assessments for each water supply system. Chlorination systems were upgraded, improved or replaced, as they are the critical process for disinfection.

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.

The chemical supply contract was reviewed with a new contract issued to improve the quality of chlorine used at all sites in March 2017.

5

Verification of drinking water quality

Verification of drinking water quality intends to provide an assessment of the overall performance of the water supply and communicates the quality of drinking water being supplied to consumers. Power and Water regularly tests drinking water to confirm it is in line with the ADWG and is safe to drink.

Power and Water verifies its drinking water quality through monitoring of the microbial, physical, chemical, and radiological characteristics of water and the assessment of consumer satisfaction. The monitoring program is developed in consultation with the DoH and approved by the Chief Health Officer. In accordance with the principal commitments in the MoU, the monitoring programs are reviewed annually, with close consultation between each party.

Water quality monitoring

Power and Water managed the drinking water quality monitoring programs for all water supplies in this reporting period. Monitoring includes regular collection of samples to test for microbiological contamination, physical and chemical parameters, and daily monitoring of chlorine residual to ensure effective disinfection.

The extensive drinking water quality monitoring programs have specific target objectives. The drinking water quality monitoring program for major and minor urban centres saw the collection of 11,360 operational and verification samples during the reporting period. In total, 11,158 samples, which equate to 98 per cent of scheduled samples, were collected over this period.

The monitoring data collected was used both operationally and for verification purposes.

Remote community water samples are collected by ESOs at specific locations in the water supply system and sent to laboratories for analysis. To ensure water samples reach the laboratory in time for testing, Power and Water charters small planes to collect samples from each community and deliver them to National Association of Testing Authorities (NATA) accredited testing laboratories in Darwin and Alice Springs.

Each year, 188 charter flights across the Territory collect more than 5,300 water samples. More than 44,300 analyses are carried out to determine microbiological, physiochemical, trace metal and radiological characteristics of the water to confirm that it is safe to drink.

Operational monitoring

Operational monitoring provides information for long term data evaluations, detailed studies and investigations that help to increase the understanding of the drinking water supplies. The data is also used, if necessary, as a trigger for immediate short-term corrective action. Chlorine residual monitoring is an important component of operational monitoring as it provides an indication of the disinfection performance of the water supply system.

In the Water Services business unit, recording of routine daily inspections of treatment plants and associated infrastructure is being migrated to an electronic based system using tablets. This reduces errors associated with the double handling of the data via the paper based system previously used.

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.

Section 2 of this report provides a detailed assessment of the verification data collected for this reporting period.

Water quality indicators

It is neither necessary nor feasible for all potential contaminants to be monitored in a drinking water quality monitoring program. There are two types of health parameters: microbiological indicators that pose an immediate risk to public health; and physical and chemical water quality characteristics that may present a risk if the consumer is exposed to concentrations above ADWG levels over a lifetime.

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

Water borne disease-causing organisms, or pathogens, can pose a serious risk to human health. The risk from pathogens in water supplies can vary significantly in a short period of time, therefore frequent microbiological monitoring is required to assess their presence.

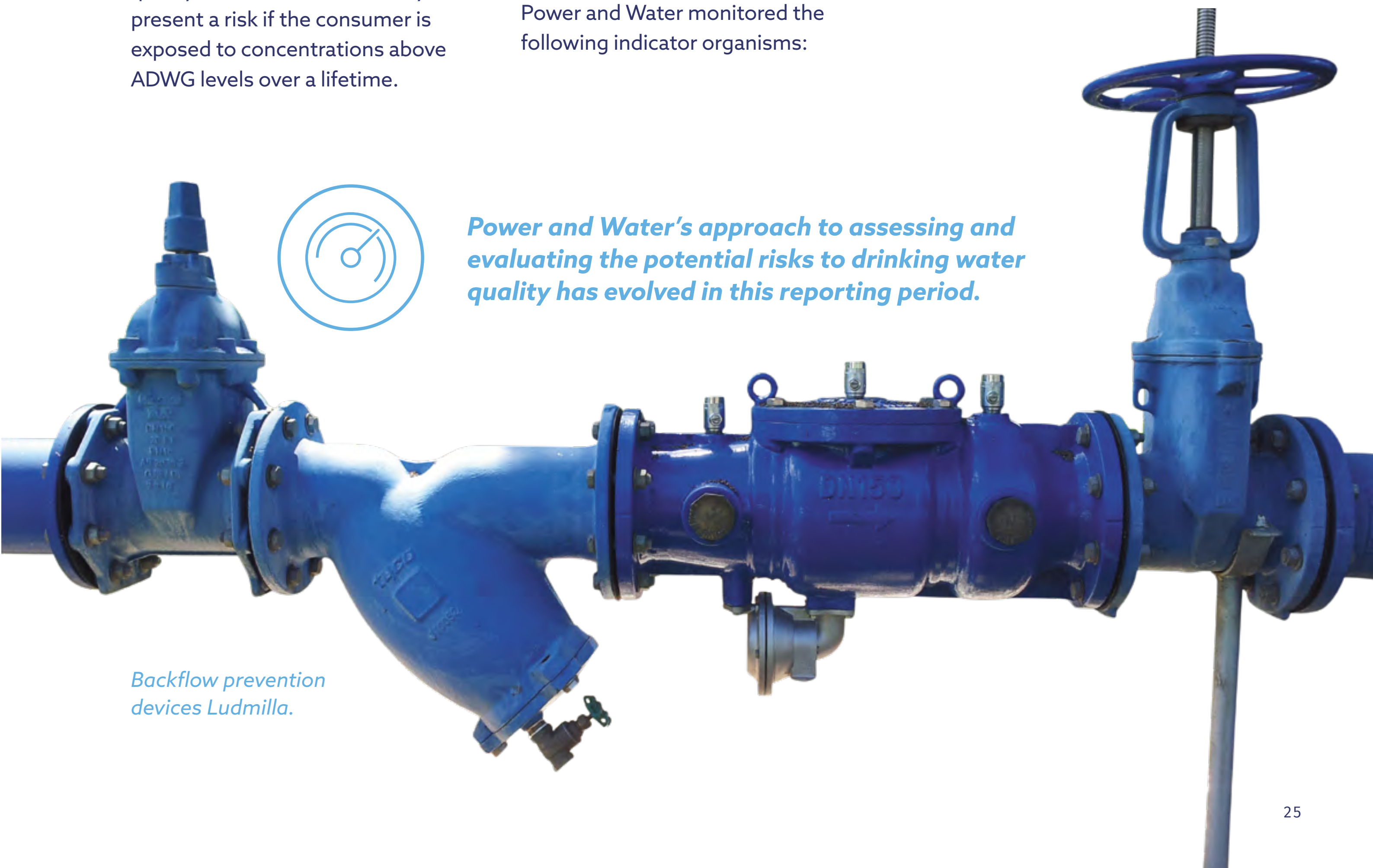
The primary source of pathogens is faecal material, either directly from animals, or from sewage. The analytical procedures used to detect pathogens are complex, protracted and require a specific test for each pathogen. The time taken for these analyses makes it impractical to directly test for all pathogens; therefore indicator organisms are used to determine if contamination with faecal material 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 the effectiveness of a water treatment system, 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's approach to assessing and evaluating the potential risks to drinking water quality has evolved in this reporting period.



Backflow prevention devices Ludmilla.

Power and Water also continued to monitor for the presence of *N. fowleri*, a free-living amoeboflagellate found in soil and aquatic environments, across the major urban centres, one minor urban centre, and as needed for the remaining centres and communities.

This pathogen causes a rapid and usually fatal infection, primary amoebic meningoencephalitis, acquired when contaminated water is forced into the nasal passages. *N. fowleri* is not associated with faecal contamination.

The ADWG recommends an *N. fowleri* action level of two organisms per litre in the treated water system and controlling *N. fowleri* by maintaining a minimum free chlorine level of 0.5 mg/L. Power and Water aims to maintain this level of chlorination in all distribution systems.

Power and Water monitors for the presence of the pathogen *Burkholderia pseudomallei*, the agent responsible for the disease melioidosis, at identified risk centres' reticulated water supply. The monitoring program includes *B. pseudomallei* as an investigative and research activity. Power and Water works closely with the Menzies School of Health Research to identify water supplies likely to be at risk of colonisation by *B. pseudomallei*.

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

Chemical parameters (Health)

The safe levels of chemicals in drinking water are specified in the ADWG and are based on assumed water consumption and potential exposure to chemicals from other sources. Power and Water monitored numerous chemical parameters to ensure that water supplied to customers is safe to drink.

The potential risk to human health increases as the levels of these chemicals increase. Monitoring conducted by Power and Water ensures that any risk to human health is identified and quickly minimised.

The results for health related chemical parameters are presented in tables in the Appendices.

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 by the consumer 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.

The 2011 ADWG outlines the corrective action recommended when guideline limits are exceeded.

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

<0.5 mSv

if the total annual dose is less than 0.5 mSv, Power and Water will continue monitoring in accordance with the water quality monitoring program

between 0.5 & 1 mSv

if the total annual dose lies between 0.5 and 1 mSv, results are reported to the DoH. Collectively Power and Water and DoH determine the frequency of ongoing sampling (primary response level)

>1 mSv

if the total annual dose exceeds 1 mSv, intervention is required. In this instance, Power and Water and DoH would assess the results and examine options to reduce the levels of exposure (secondary response level).

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.

During this reporting period, baseline monitoring for PFAS associated with the historical usage of firefighting foams, was included in Power and Water's annual drinking water quality monitoring program. All urban centres in the Northern Territory have been monitored for the presence of PFAS since October 2016 at the request of DoH.

Other organic chemicals of interest include:

Trihalomethanes

Chlorine introduced into a water supply as a disinfectant can also react with naturally occurring organic matter, such as decayed vegetation, to produce by-products of disinfection such as trihalomethanes (THMs). The concentration of THMs is typically proportional to the amount of organic material in the water.

Surface water supplies have higher levels of naturally occurring organic matter than ground water supplies and hence higher THM levels after disinfection. All major and minor urban centres were monitored for THMs. Results can be found in tables in the Appendices.

Pesticides

Pesticides (insecticides and herbicides) are sometimes used in our catchments to control insects and weeds. 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.

Disinfection performance

Chlorine is used to destroy disease causing organisms in water. Only chlorine based disinfectants leave a beneficial residual level in treated water, protecting it during distribution and storage when its concentration is maintained at an effective level. This requires frequent measurement of the concentration and correction when the concentration is found to be inadequate.

Free chlorine, total chlorine and chlorine decay

Free chlorine is a measure of unreacted chlorine in the water supply that is available for disinfection. A free chlorine residual is maintained in water supplies to ensure adequate disinfection. The free chlorine - total chlorine ratio (FC/TC) can be used to measure the chlorine demand of the water and chlorine decay, and is a useful indication of the cleanliness of a distribution system. In a well-operated and maintained system, the free chlorine to total chlorine ratio is 0.90 or greater. The critical limit is 0.8 Water Industry Operators Association of Australia (WIOA).

Customer satisfaction

Monitoring of consumer comments and complaints provides valuable information on potential problems, which may not have been identified by performance 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 2016 and 2017.

Power and Water conducts customer satisfaction surveys and encourages customers to submit feedback. These processes simplify the evaluation and collation of data in preparation for submission to the National Performance Report (NPR).

6

Management of incidents and emergencies

To this end, Power and Water adheres to a number of protocols that enable an effective response and the rapid dissemination of information.

In 2016, Power and Water updated the emergency management policy framework and plans. These documents outline Power and Water's approach and the processes for managing emergency events across the Northern Territory. The emergency management procedures specific to drinking water complement these updated documents.

The protection of public health and best service to our customers relies on Power and Water's ability to respond appropriately and systematically to incidents that compromise water quality.

Power and Water's role and responsibility in the event of a water quality emergency are defined by agreement with various government agencies. The MoU defines the role of Power and Water as the service provider and DoH as the regulator. The MoU outlines the joint response required, depending on the nature of the event and the potential risk to public health.

Reporting to DoH is set according to the *Protocol for the Notification by Power and Water Corporation of Drinking Water Quality and Supply Reportable Incidents and Events to the Department of Health*. It sets out actions that must be followed to ensure water quality information is promptly reported to DoH.

The information reported includes analytical results where the measured value of a parameter exceeds an aesthetic or health ADWG guideline or set trigger value. Additional information includes known details of the circumstances of the drinking water quality incident or event, and actions being taken to rectify the situation.

An agreement between Power and Water and the Department of Primary Industry and Resources (DPIR) microbiological laboratories details the *Protocol for the Notification by Laboratory Service Providers of E. coli and Coliform Detections in Potable Waters.*

This protocol sets out the procedures whereby laboratory service providers notify Power and Water and the DoH when *E. coli* and coliforms are detected in raw (untreated) water and drinking water. The protocol outlines trigger levels, organisational accountabilities and notification methods.

Incidents and emergencies which 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

The knowledge, skills, motivation and commitment of employees and contractors ultimately determine Power and Water's ability to operate a water supply system successfully. Power and Water is focused on building a professional, capable, accountable and diverse workforce.

Power and Water's training techniques 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.

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. Trade technical workers continue to work towards the completion of Certificates III and IV in Water Operations.

Training, seminars and workshops

Internal Trainer Network

Power and Water's Internal Trainer Network recognises the skills and knowledge of the corporation's employees through the delivery of non-accredited training specific to the organisation. This framework reduces the cost of training delivery, empowers employees to own processes and procedures and recognises their skills. Employees have a better understanding of the safety management system, materials, equipment and operating environment, while trainers develop improved presentation skills.

Essential Services Operator (ESO) Training and Competency Framework

Power and Water is committed to continuous improvement. The ESO Competency Framework and its supporting ESO Competency Assurance Program complements the collaborative approach to ensuring residents in remote NT have the safest and most reliable essential services possible.

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

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

The framework defines key competency components including:

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

Without any one of these components, ESO competency could be compromised, increasing the risk for the ESO, the contractor, 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 2016 event included keynote presentations of 'Innovative groundwater science to inform development in Northern Australia' and 'Water Sensitive Darwin'.

8

Community involvement and awareness

The Northern Territory has a unique, vibrant and diverse community. Connecting with this community is vitally important to delivering quality drinking water. Communication and engagement on issues affecting drinking water quality continues to be a key priority for Power and Water.

Goanna Park Adventure Camp

In late 2016 Power and Water responded to the community interest in PFAS by providing online information about our customer's drinking water as it became available. The results from PFAS testing were first published on the website on 25 November 2016 and were updated as results came back from interstate laboratories. This is described in Section 1 Power and Water's PFAS response.

Engaging with our community

Communication

In 2016 Power and Water launched a Facebook page to deliver a range of informative, educational and engaging content. Customer service officers are now able to respond to enquiries via Facebook and telephone. Customers are also kept informed of current and predicted water quality issues through placement of newspaper advertisements and on the website.

Education and awareness

Power and Water maintains a comprehensive website and publishes pamphlets and fact sheets to promote better understanding of the Northern Territory's various water quality issues.

Water quality specialists are also available to visit schools and conduct interactive presentations on water science and other water related subjects.

Making a contribution

Power and Water is committed to making a meaningful contribution to the Northern Territory community. It 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 including the Tropical Garden Spectacular and Sustainable Living Festival in Darwin
- supporting cultural and local community events such as the *desertSMART EcoFair* and the Desert Harmony Festival.

Continuous improvement

Power and Water works towards improving relationships with its customers by considering actions to improve phone and online customer service, build its presence on social media platforms, and apply the results of customer surveys to build a greater understanding of the needs and expectations of consumers.

The processes to be followed for special needs customers in an incident or emergency were reviewed and improved in 2017 to ensure water is available when required by identified special needs customers.

Water smart programs

Living Water Smart, which commenced in 2013, is a five year program focused on reducing water consumption across the Darwin region by 10 GL. The program has a number of benefits, including a reduction in expenditure on major infrastructure, savings for customers and the long term benefits achieved through sustainable living.

Regions and Remote Operations undertook water efficiency engagement projects at the communities of Ali Curung, Imanpa, Yuendumu, Amanbidji, Minyerri, Ngukurr, Milingimbi and Warruwi during the 2016-17 reporting period. These programs involved engaging the local community residents and stakeholders face-to-face about the need for water efficiency in their communities and challenged and empowered them to change how they use water.

Regions and Remote additionally carried out ongoing monitoring of customer water leaks using smart water meters in eight communities Ali Curung, Galiwinku, Gunbalanya, Milingimbi, Santa Teresa, Yuelamu, and Yuendumu and in turn, reported leaks and approximate cost of water loss to customers and key stakeholders. This process encouraged repair and feedback from the customer, improved relationships and service quality to customers, reduced customer water bills and reduced the overall volume of water loss in the community.

Anula and Jingili Primary School engagement

LIVING
WATER
SMART
Darwin Region

9

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 Research Australia Limited (*WaterRA*), a not for profit organisation which 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

The purpose of this project is to develop guidelines for ongoing operational monitoring of catchment hygienic condition, as well as providing guidance on process controls for catchment management. The guidance will help utilities with explicit direction, to promote consistency, good practice and to support benchmarking against industry agreed best practice.

We lead by example by stepping up to meet the challenge. We share our knowledge and listen when others share theirs.

Australian Research Council Linkage Project

Project # LP130101107: Innovative hybrid membrane-based pre-treatment strategies for remote community groundwater supplies

The purpose of this project is to examine treatment options in remote communities for the removal of naturally occurring inorganic contaminates in groundwater such as nitrates and fluoride. While there are many advanced water treatment options with demonstrated efficacy for removal of such contaminants, the appropriateness in remote and isolated communities with limited access to resources is not understood well. The four primary areas of investigation include:

- investigation of membrane filtration options for groundwater in the Northern Territory
- investigation of fouling of membranes by manganese and iron
- investigation of fouling of small scale nanofiltration membrane units
- comparison of advanced water treatment options for removal of fluoride.

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 of Biofilms, Human Pathogens and Iron in Remote Water Supplies in the Top End

This project involved investigation of a number of remote communities with demonstrated high or low iron in the source water. The purpose of the study is to characterise the microbial composition of biofilms present in water supply infrastructure and identify the presence of iron bacteria. The presence of opportunistic pathogens such as *Burkholderia pseudomallei* and *Pseudomonas aeruginosa* were also assessed. Abiotic factors and bore and site characteristics were associated with the microbial composition of the biofilms found to be present at each community.

10

Documentation and reporting

Documentation provides a basis for effective communication within the organisation as well as with the community and various stakeholders. The ADWG recommends that a system of regular reporting, both internal and external, is important to ensure that relevant stakeholders receive the information needed to make informed decisions about the management or regulation of drinking water quality.

Water Safety Plans for all 92 drinking water systems

As Power and Water is a government owned corporation, it is required to ensure business information is managed appropriately and is consistent with whole of government requirements. Centralised functional support within Power and Water provides this service for the operational business units. The tools and information are made readily available to all employees on Power and Water's intranet.

Specific operational water quality documentation, information, applications and tools are managed by the operational business units:

- water quality knowledge from assessments is being compiled into Water Safety Plans (WSPs) for all 92 drinking water systems
- data generated from the drinking water quality monitoring is maintained and accessed using a purpose- specific Oracle database
- operational data from the online monitoring system, SCADA, is made reportable through a data historian application. This process information system (PI System) records, displays and reports the real time status of water supply infrastructure and water quality.

Water safety plans

Water Safety Plans (WSPs) are used by Power and Water to document the risk understanding and controls at each water supply.

Power and Water's ongoing water quality processes of monitoring, evaluating, responding and assessing are used to describe a WSP for each water supply. The WSP needs to be reviewed and revised so that it remains up to date, and takes account of experiences and changes to the water supply catchment and infrastructure. The reliability assessment findings are an example of improvements to risk understanding in this reporting period, see Section 11.

During the 2016-17 reporting period, Regions and Remote completed updates for the seven highest risk communities (Barunga, Bulla, Gunbalanya, Ngukurr, Pirlangimpi, Robinson River and Yuelamu) along with all Southern and Barkly region communities. Changes to WSPs for the remaining communities in the Northern and Katherine regions have been drafted during this reporting period. Draft WSPs were also developed for each of the major urban centres.

Reporting to stakeholders and regulators

Power and Water produces an annual report which is tabled in the Northern Territory Legislative Assembly as a reporting mechanism for Power and Water's Shareholding Minister and Northern Territory Parliament. 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 to 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 data

Department of Environment and Natural Resources

- compliance with extraction licences

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 Northern Territory drinking water supplied to customers, regulatory bodies and stakeholders. It also reports on its progress and achievements through other channels.

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

The ADWG recommends that a long term evaluation should look at the overall system performance and identify any worrying trends within the data or problems within the water supply.

The overall water supply performance refers to all components of the water supply such as source, storage, disinfection, reticulation and other elements. The review should include operational data like field results and any online data such as chlorine residuals, chlorine dose, pH, flows or tank levels.

Throughout this reporting period, Power and Water has focused on the evaluation of disinfection performance. Disinfection reliability assessments were undertaken across all major and minor centres and remote communities, with the results rolled out to operational staff. A number of other evaluations and audits were carried out during the 2016-17 reporting period. An audit of sampling locations in 12 remote communities was undertaken to ensure samples are being taken in the correct locations, and a quality assurance process for the incoming laboratory results was refined.

Disinfection reliability assessments

The reliability assessments carried out for all 92 drinking water systems were completed through the use of a system analysis tool developed to facilitate the efficient and standardised collection of information from the large number of sites. The analysis tool collected system data via a questionnaire with drop-down lists covering key infrastructure information.

A reliability assessment matrix was developed to assess disinfection system risks. Eighteen hazard scenarios were developed covering likely disinfection system failure mechanisms and a risk level assigned to each hazard scenario.

The completion of the analysis tool was carried out in different ways by Water Services and Regions and Remote, due to the difference in the number of sites and distances required to get to each site. Water Services used site visits and discussions with operators and other relevant staff. Regions and Remote used interviews with Service Coordinators and other operations staff, with a limited number of site visits conducted to confirm the validity of responses.

The risk areas identified in the assessment were:

- operator training and competence
- potential for bypass of disinfection systems during normal operation or maintenance
- equipment failures leading to undetected unplanned disinfection outages
- chemical inventory management.

A number of remedial actions have been completed during this reporting period in response to the assessment results. These include:

- investigation into the use of online chlorine analysers for remote sites underway
- filter refurbishment at Pirlangimpi
- installation of larger chlorine batch tanks at Pirlangimpi and a number of Southern region communities
- introduction of chlorine dosing pumps with enhanced telemetry for all Northern region communities
- installation of locks and signage on all disinfection bypass valve work commenced
- trial of dual pump standard chlorine disinfection system at Millingimbi and Jilkminggan underway
- relocation of the chlorine dosing point at Bulman
- chemical storage security upgrade at Lajamanu and Rittarangu
- inclusion of risk based Water Quality components in ESO Capability Framework enabling various competency levels depending on the particular water quality risks in a community
- Darwin River hazard and operability analysis (HAZOP) procured and initial site visit completed
- Darwin River Sanitary Survey initial site visit and aerial inspection completed
- Donkey Camp chlorine monitoring system upgrade, flow meters added to all analysers.

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.

Throughout this reporting period, Power and Water worked to improve the awareness of drinking water quality risks. This involved a commitment to evaluate business unit performance for improved water quality understanding.

Drinking Water Quality Management System review

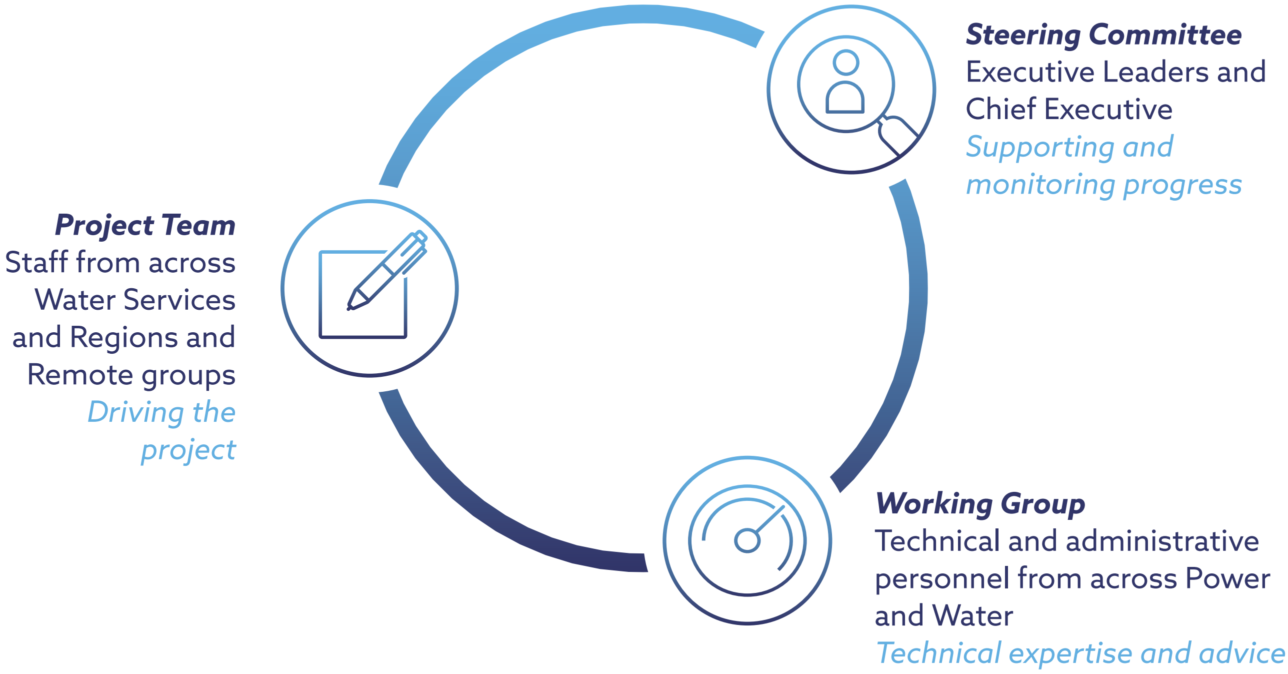
As part of its commitment to continual improvement, Power and Water has implemented a Drinking Water Quality Management System (DWQMS) Improvement Project, at an estimated cost of $2.3 million over the reporting period. This has been initiated by an external audit requested by the Power and Water Board and was conducted in May 2016. It assessed Power and Water's performance in delivering drinking water across the Territory against the Australian Drinking Water Guidelines.

The audit report made several recommendations on how improvements could be made to Power and Water's DWQMS to better align it with the ADWG.

Power and Water formed the DWQMS Improvement Project in late 2016 to implement the recommendations of the report, with the project expected to run until the end of 2018. A number of milestones have already been met and the project is making good progress.

The most notable achievements of the DWQMS Improvement Project have been improvements relating to governance, risk management and training for Power and Water to meet industry best practice.

The structure of the DWQMS Improvement Project has been set up to align with ADWG outcomes and enable review and continual improvement.



Other key outcomes of the project during this reporting period were:

- characterisation and understanding of the existing disinfection barrier risk profile across Power and Water's 92 water supply schemes
- improved governance, visibility and engagement of the Board and Executive in drinking water quality management
- established foundation elements of a drinking water quality management system aligned to the ADWG.

Power and Water continued to demonstrate commitment to the ongoing review and continuous improvement of its services in this reporting period with the following policies, procedures and plans reviewed or developed:

Reviewed:

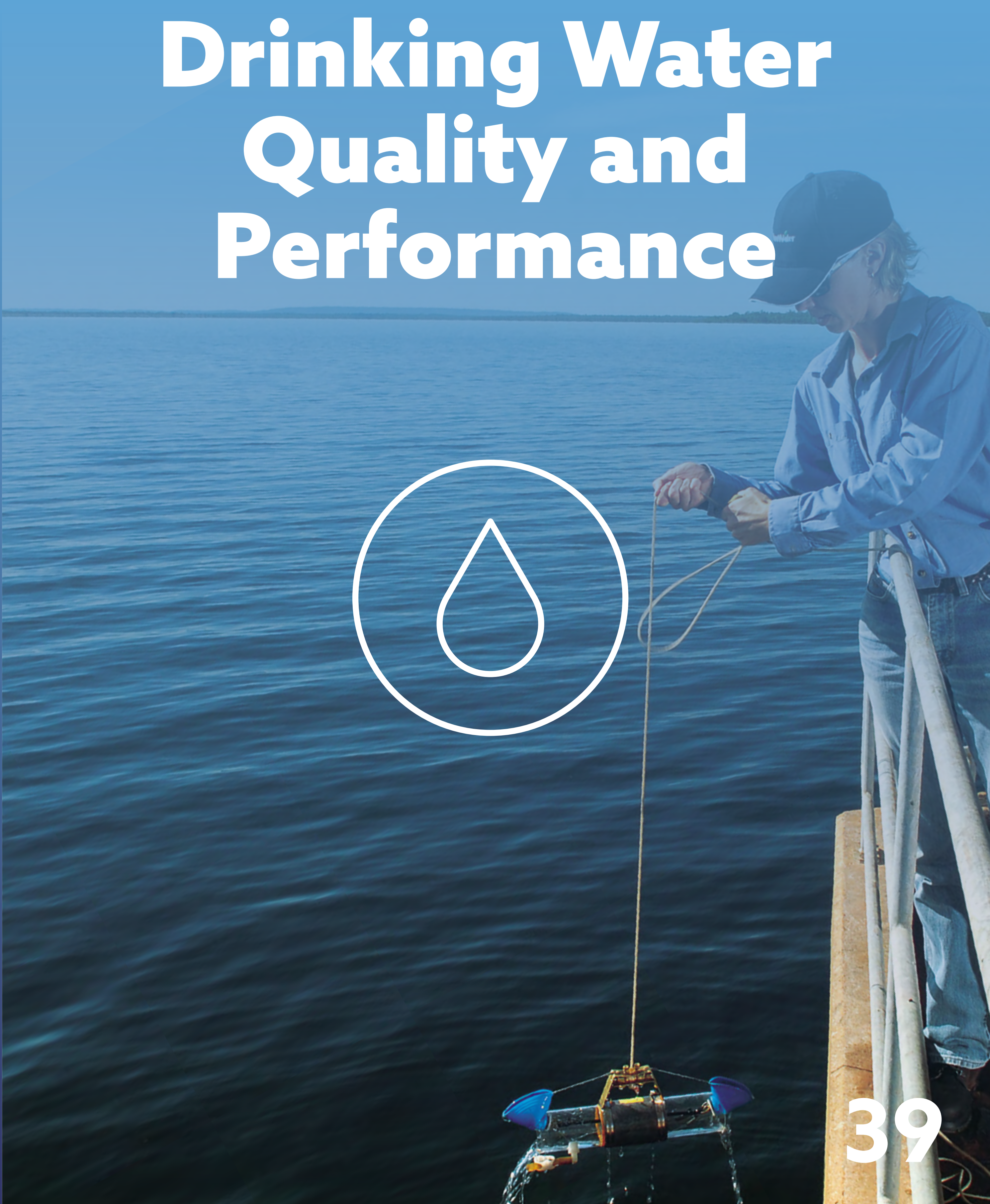
- Drinking Water Quality Policy was reviewed and updated
- MoU was reviewed and is currently being redrafted

Developed:

- risk assessment procedure with a standardised method
- Water Quality Special Needs Customers Procedure
- Water Quality Improvement Plan
- Draft Water Safety Plans for all water supply systems
- Board and Management Visibility and Reporting Drinking Water Quality Performance Procedure
- Management Review Drinking Water Quality Management System Procedure.

Section 2:

Drinking Water Quality and Performance



Part A: Major and minor centres

Figure 5 Percentage of samples taken in major urban centres in which no *E. coli* was detected for monitoring program periods 2012-17

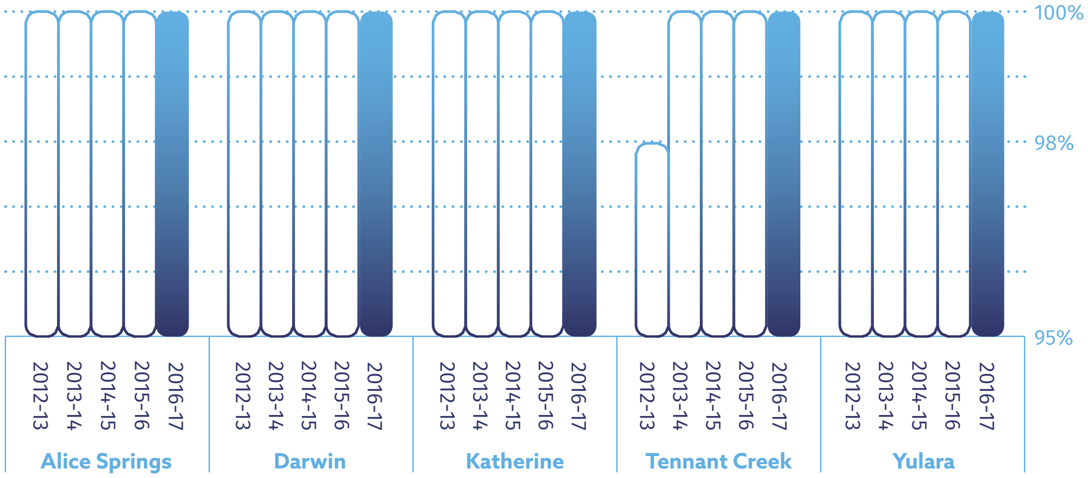
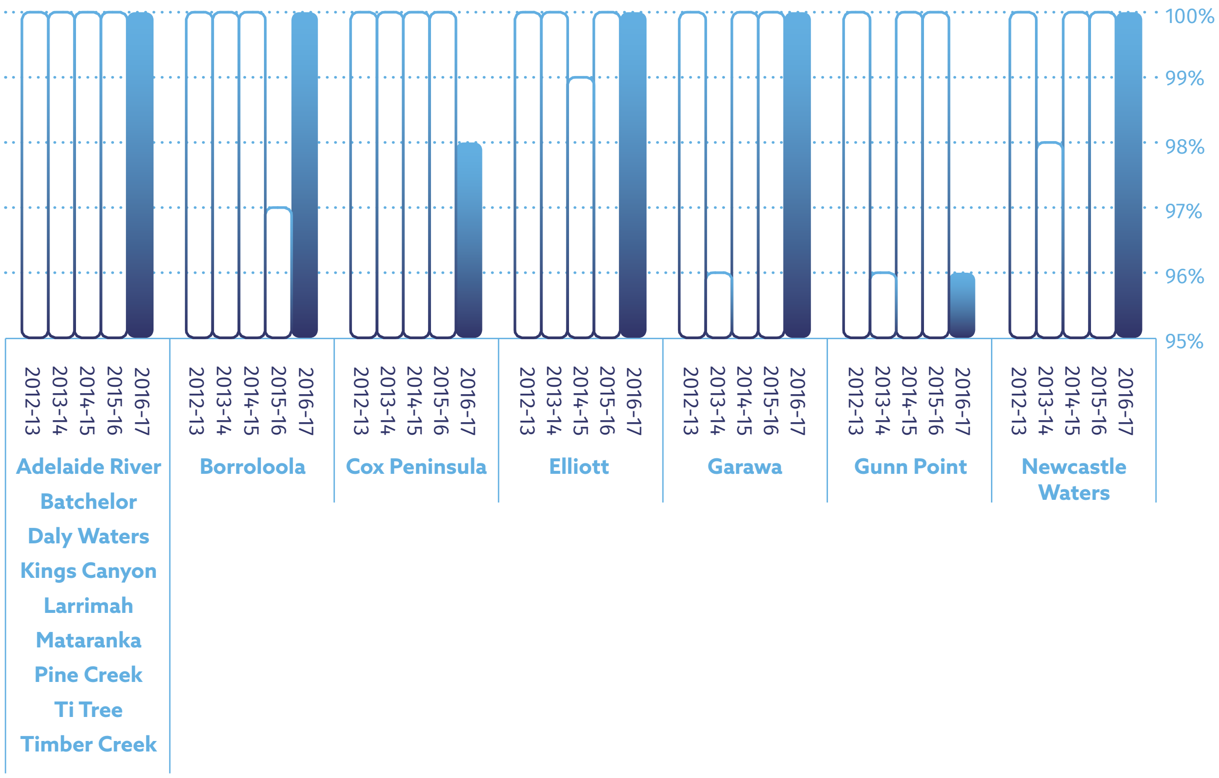


Figure 6 Percentage of samples taken in minor urban centres in which no *E. coli* was detected for monitoring program periods 2012-17



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 preventative 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 11,360 samples to be collected for bacteriological verification assessment from 20 centres across the Northern Territory over the reporting period. A total of 11,158 samples were taken. The sample collection performance for individual urban centres for the recent period 2016-17 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).

During the 2016-17 reporting period, the 100 per cent *E. coli* free target was achieved in all major urban centres in the Northern Territory.

The majority of minor urban centres also achieved the 100 per cent *E. coli* free targets. A summary of the incidents that occurred during the monitoring period can be found in Table 8. A graph showing the percentage of samples taken in major urban centres between 2012 and 2017 in which no *E. coli* were detected can be found in Figure 5. A similar graph for the minor urban centres is found in Figure 6.

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. Water Services 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, Water Services conducted the *N. fowleri* monitoring program, collecting 391 samples from across the Northern Territory. Investigation sampling of tank sediments continued during tank cleaning.

The results from the 2016-17 *N. fowleri* monitoring program can be found in Table 5.

Table 5 Thermophilic Amoeba detections, monitored supplies and investigation 2016-17

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 magna* (/L)
		Positive samples								
Alice Springs Investigative – distribution system	6	0	0	0	0	0	0	0	0	0
Katherine Investigative – distribution system	35	0	0	0	0	0	0	0	0	0
Darwin Verification – distribution system	208	0	8	0	8	0	0	0	0	0
Darwin Operational – raw water (surface and groundwater)	26	0	1	0	0	1	0	0	1	0
Total samples	**275**									

Centre Investigational 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 magna* (/L)
		Positive samples								
Tennant Creek Investigative	60	0	0	0	0	0	0	0	0	0
Yulara Investigative	8	0	0	0	0	0	0	0	0	0
Gunn Point Investigative	48	0	14	0	12	4	0	0	4	0
Total samples	**116**									

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 2016-17 *B. pseudomallei* was detected in untreated water from Katherine and Darwin.

Chemical and physical results

The results of monitoring 42 different chemical and physical 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 2016, 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 ADWG screening level of gross alpha and gross beta activity concentrations. The Annual Radiological Dose (ADR) is calculated only for supplies that had one or more samples failing 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:

5 Years
2011-17 for surface water

2 Years
2014-17 groundwater

Annual assessment

All water supplies passed the annual ADWG limit of 1 mSv/yr in 2016-17. As shown in Table 6, the majority of water supplies complied with the ADWG screening level, with gross alpha and gross beta radioactivity levels below 0.5 Bq/L ("PASS") during reporting periods. Results for the radiological assessment of all supplies for 2016-17 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. For example, 274 samples were collected from the Kings Canyon supply between the years 2014 and 2017. Kings Canyon radiological dose passes the guideline limit during the reporting period 2016 to 2017.

Table 6 Summary of annual radiological assessments

Reporting year		2013-14	2014-15	2015-16	2016-17
Total number of centres sampled[1]		19	20	20	20
Number of centres complying with 2011 ADWG screening level	Major	4	3	3	2
	Minor	10	11	12	12
Number of centres exceeding the annual guideline value (1 mSv/yr)	Major	None	None	None	None
	Minor	None	1	1	None

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

Chemical Health parameters

Trihalomethanes (THM)

During the 2016-17 monitoring period, all water supplies were assessed for THMs. The concentration of THMs for water supplies ranged during the period 2016-17 from <0.004 to 0.084 mg/L, all well below ADWG 2016 health guideline limit of 0.25 mg/L.

Long term THM levels (2011-2017) are shown in Table 13 in the Appendices. THMs in all water supplies remain at levels similar to those measured in previous years and appear to be stable. 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. The highest levels of THMs are in Darwin, Katherine and Pine Creek supplies, all of which use surface water.

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 limited use in some areas. Due to these results, pesticide monitoring during 2016-17 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 Territory groundwater come from a variety of natural sources. Termite mounds, nitrogen fixing bacteria and plants contribute to the soil nitrate levels, which are washed into the groundwater when it rains.

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 typically has nitrate levels on or around 50 mg/L and less than 100 mg/L. 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 lead is released into water from brass fittings. Unlike most drinking water contaminants, lead is rarely found in the source water used for public water supplies. Instead, lead can enter tap water when plumbing materials containing lead corrode.

The ADWG recommends that lead concentrations in drinking water above 0.01 mg/L are a health consideration for the most vulnerable people, such as very young children and pregnant women. Lead was not detected from most of the water samples taken in the Territory; however in Garawa the maximum concentration detected was 0.01 mg/L from a sample site with corroded brass fittings. A new sample site was installed at Garawa.

Customer satisfaction

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.

Types of complaints

Figure 8 shows the proportions of each type of complaint received for the Darwin water supply in 2016-17.

Ninety-five per cent of Darwin's customer complaints related to discoloured water, milky water and floating particles. Milkiness or cloudiness is most commonly due to the re-pressurising of water mains. This causes trapped air to dissolve in the water and minute air bubbles form in the water when the tap is turned on, creating a milky appearance, which clears if the water is left to stand. Other causes of cloudy water are tap aerators and hot water systems.

Customers also complain about odour, taste and high chlorine levels. These often relate to varying chlorine levels due to changing water demand. The chlorine residual in the reticulation network is regularly monitored and adjusted as required. Online water quality monitoring units are installed in most centres to improve monitoring across the entire network.

Free chlorine residuals are 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.

Number of complaints

Table 7 shows the total number of complaints specific to water quality made by customers between 2012 and 2017. In Darwin there was a reduction of approximately 55 per cent in water quality complaints in the 2016-17 reporting period.

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 highest numbers of complaints were received in January 2017. The main water complaint was discoloured water such as clarity and particles. This can be attributed to the weather in late January mixing the Darwin River Reservoir.

As with many water supply reservoirs, Darwin River Reservoir is subject to stratification. 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 by solar radiation faster than the heat can disperse into the lower depths of the reservoir. The generated difference in the surface and bottom water densities limit circulation between these layers and can lead to these layers having significantly different aesthetic qualities.

Atmospheric oxygen is absorbed by water at the interface between air and water. Algal photosynthesis near the surface also supplies oxygen to the water. Oxygen at the bottom of a reservoir is consumed by the decomposition of organic material. As water circulation is restricted due to stratification, oxygen consumed in the lower layers is not replenished from the surface resulting in further oxygen depletion at the bottom of the reservoir. The decomposition of organic material under anaerobic conditions lowers the pH and encourages production of hydrogen sulphide. This process reduces iron and manganese in the sediments to soluble forms.

Once the reservoir has stratified, a large amount of energy is required to disrupt the layered structure and mix the reservoir again. Destratification occurs with a decrease in surface temperature, inflow and wind-induced mixing processes. These cause the layers to mix and bring low quality anoxic water from the bottom of the reservoir to the surface, where it is drawn into the supply. Soluble iron and manganese entering the distribution system can be oxidised and will precipitate out of solution, creating discoloured water. This pattern corresponds with the comparatively high number of complaints received in the wet season shown in Figure 7.

Power and Water strives to minimise the impact of these seasonal variations. In major centres where customers frequently report discoloured water, mains are flushed before the anticipated increased demands associated with seasonal changes. If a customer reports discoloured water, the mains supplying the customer's residence is also 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 routine flushing is required.

Figure 7 Monthly drinking water quality complaints received for Darwin 2016-17

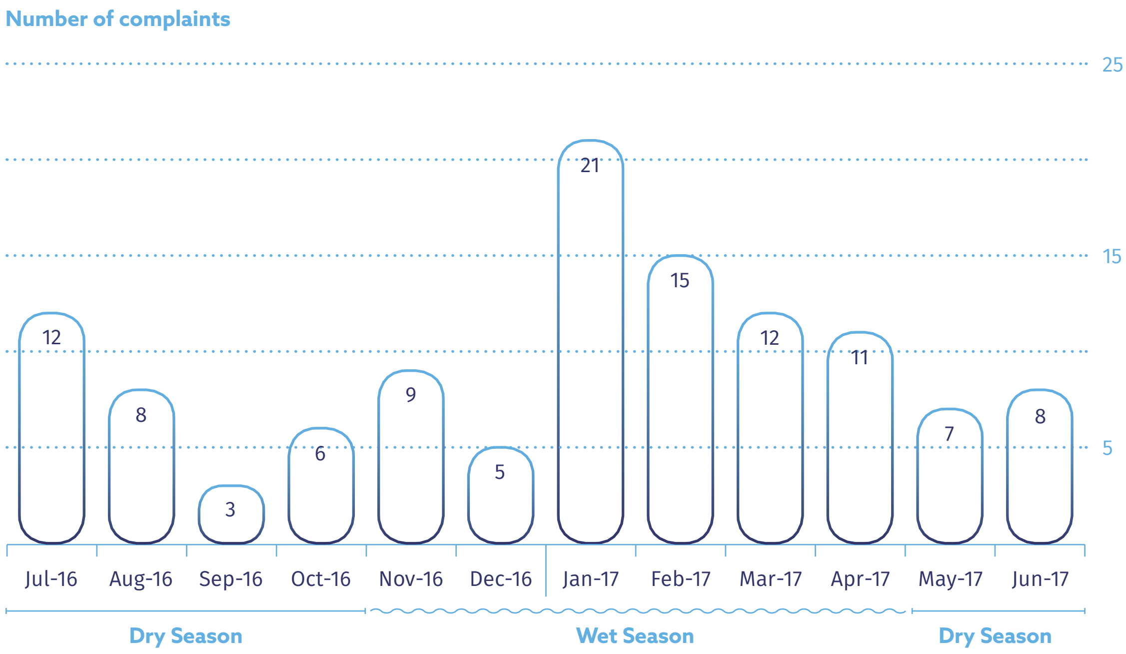


Figure 8 Customer complaints for Darwin 2016-17 by complaint type

95% Clarity/ Dirtiness/ Particles

5% Taste/ Odour/ Smell

0% Alleged illness

0% Other

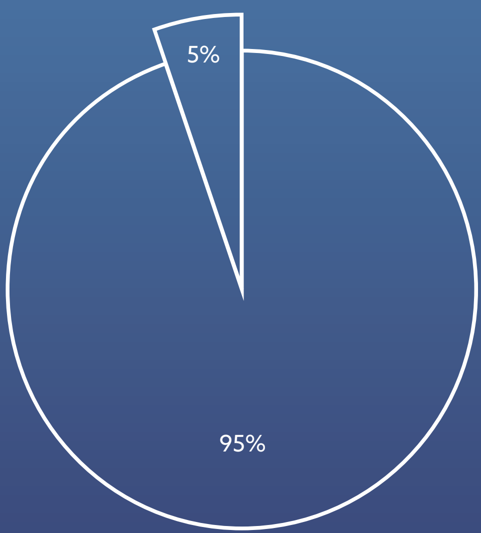


Table 7 Water quality complaints

Region	Properties (2016-17)	2012-13	2013-14	2014-15	2015-16	2016-17
Adelaide River	95[A]	2	1	6	60	0
Alice Springs	12468	6	5	4	4	0
Darwin	59155	144	155	208	212	117
Katherine	2172	0	4	2	4	0
Tennant Creek	1302	0	0	0	0	0
Total	**75192**	**152**	**165**	**220**	**220**	**117**
Complaints per 1000 properties (for the water supply system specified)		2.02	2.19	2.93	2.93	1.56

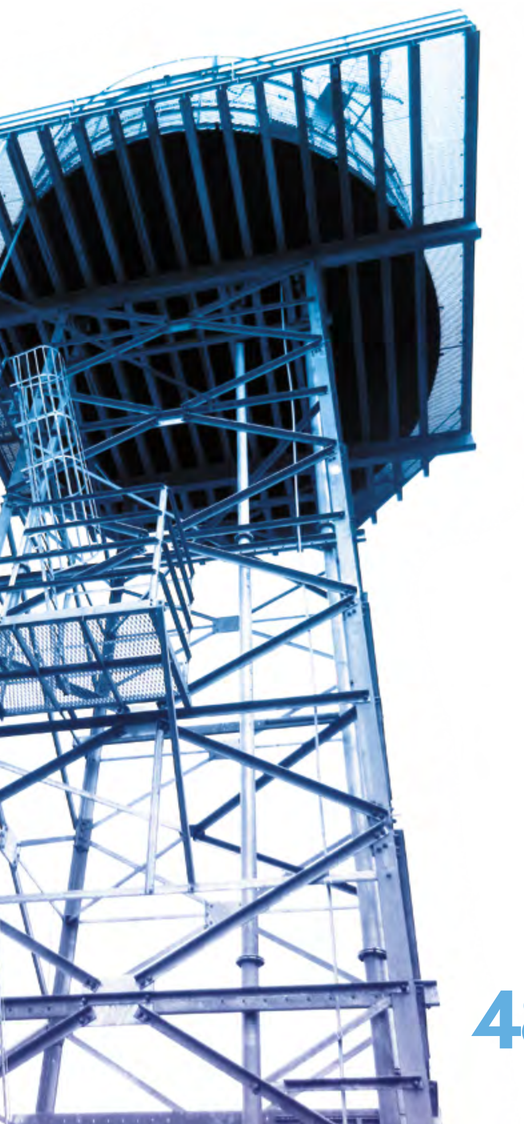
[A] *Properties based on number of meters*

Recorded emergencies/ incidents

During the 2016-17 reporting period the following incidents occurred:

- a self-service water fill point taken offline at Cox Peninsula
- *E. coli* detection at Gunn Point.

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 DoH was notified to help determine the most effective corrective actions. Investigations were conducted to determine the likely causes and identified preventative corrective actions.

The initial action taken for the Cox Peninsula *E. coli* detection in March 2017 was to take the self-service filling station offline overnight.

It was established that the sample was incorrectly labelled and that the result was not from a verification drinking water sample. The sampling mix-up was confirmed through extra samples.

The Gunn Point *E. coli* detection in September was at the Tank Outlet. This tank supplies a single customer, who was contacted and informed. Staff from PWC attended on the same day to take corrective actions and repair the chlorination equipment. Samples were collected after the corrective actions and showed that the water was free of *E. coli*.

Table 8 *E. coli* incidents during the drinking water quality monitoring program period 2016-17

Year	Supply	Samples with *E. coli* Detections	Collection Date	Number of *E. coli* Detected in Sample (MPN/100 mL)
2016-17	Cox Peninsula	1 (sample incorrectly labelled)	8 March 2017	19 (not a drinking water result)
	Gunn Point	1	20 September 2016	1

Part B: Remote communities

The analysis of water quality data for the 2016-17 reporting period has changed from previous years to comply with ADWG recommendations for analysis of water quality results. In previous years, a rolling average of the previous five years of data was used to compile the tables in Appendix B.

For the 2016-17 reporting period, the ADWG recommendations described have been adopted in compiling the tables in Appendix B.

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) for the reporting period
- for aesthetic parameters, the average value for data in the reporting period should be reported
- for radiological analysis, three years of data should be used for ground water sources, and six years of data for surface water sources. The reported value should be the maximum result for the reporting period.

Microbiological parameters

Bacteria

E. coli is a member of the bacterial coliform group and is excreted from the intestines of warm-blooded animals, including humans. It is used as a specific indicator of recent faecal contamination or inadequate treatment.

E. coli should not be present in any sample and ADWG recommends 100 per cent compliance. If *E. coli* is detected in a drinking water supply, immediate action is taken in accordance with established protocols.

Power and Water has a MoU with DoH for managing drinking water quality in its area of control. The MoU outlines actions that need to be taken when water tests identify issues, including when *E. coli* is detected in the distribution system. In some instances, DoH will take an extra step and issue a Precautionary Advice for Drinking Water to advise a community that drinking water should be boiled before consumption.

Details of *E. coli* detections in drinking water supply for the 2016-17 reporting period are found under 'Recorded emergencies/incidents'.

Compliance Performance

Power and Water's Drinking Water Quality Monitoring Program requires that water samples are collected and analysed for the presence of *E. coli* at a minimum frequency determined by the size of the community. For the 2016-17 reporting period, 95% of scheduled samples were collected across all communities. Further information is detailed in Appendix B Tables 15 to 18.

Chemical and physical parameters

The results of monitoring 38 different chemical and physical water quality parameters are presented in this report as statistical values. The ADWG specifies that health related parameters are to be 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 ADWG, 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 measure of gross alpha and gross beta activity concentrations.

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, the majority of water supplies complied with the ADWG screening level, with gross alpha and gross beta radioactivity levels below 0.5 Bq/L during reporting periods. All water supplies passed an annual guideline limit of 1 mSv/yr in 2016-17.

Table 9 Summary of annual radiological assessments

Year	2016-17
Total number of centres sampled	71
Number of centres complying with ADWG Screening level	45
Number of centres exceeding the annual guideline value (1 mSv/yr)	None

The 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 2016-17 are shown in Table 19, 21, 23 and 25 in the Appendices.

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 concentration in drinking water is recommended by the ADWG to not exceed 0.003 mg/L. Antimony has occasionally been detected in natural source waters. Occurrences are more common in areas near lead or copper smelting operations. Studies overseas have generally found low concentrations in drinking water, typically less than 0.005 mg/L, but higher concentrations have been reported occasionally.

Beswick's water supply has elevated levels of antimony. Samples are collected on a quarterly basis to monitor the levels of antimony present in the water at Beswick. For this reporting period antimony levels ranged between 0.005 mg/L and 0.007 mg/L.

Arsenic concentrations in drinking water are recommended by the ADWG not to exceed 0.01 mg/L. Arsenic can occur naturally in ground and surface water through the dissolution of minerals and ores. These minerals and ores can make a significant contribution to the arsenic concentration in drinking water.

In Australia, arsenic concentrations typically range from less than 0.001 mg/L to 0.03 mg/L. Studies of the consumption of drinking water containing arsenic above 0.3 mg/L over five to 25 years have shown effects on the skin, vascular system and nervous system, with the possibility of being carcinogenic.

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 concentration in drinking water is recommended by ADWG to be less than 2 mg/L. A number of epidemiological studies have been carried out on the effects of barium in drinking water on cardiovascular disease. No adverse effects have been found with barium concentrations up to 7 mg/L. In a study using a small number of volunteers, no adverse effects were observed after eight weeks' exposure to drinking water containing up to 10 mg/L of barium.

Bulla's water supply has elevated levels of barium. Samples are collected on a quarterly basis to monitor the levels of barium present in the water at Bulla. For this reporting period barium levels ranged between 3 mg/L and 10 mg/L.

Chromium concentration in drinking water is recommended by ADWG not to exceed 0.05 mg/L. Chromium is present naturally in the environment.

In major Australian reticulated water supplies, concentrations of total chromium range up to 0.03 mg/L, with typical concentrations usually less than 0.005 mg/L.

Wallace Rockhole's water supply contained chromium concentrations from 0.04 mg/L to 0.06 mg/L during this reporting period.

Fluoride concentration in drinking water is 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 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. At concentrations of 1.5 to 2.0 mg/L, teeth may become mottled due to dental fluorosis. The ADWG for fluoride in drinking water is 1.5 mg/L.

The majority of communities in the Barkly and Southern regions have fluoride levels between 0.5 mg/L and 1.5 mg/L, with two communities, Alpurrurulam and Nyirripi, above the ADWG value. Alpurrurulam had a maximum value of 1.8 mg/L and Nyirripi had a maximum value of 1.9 mg/L for the 2016-17 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 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.

Historically, elevated nitrate levels have been identified in Pmara Jutunta, Kintore, Yuelamu and Ali Curung (as well as Ti Tree Water Services centre). In 2013-14, Power and Water installed advanced water treatment systems at Ali Curung, Yuelamu and Kintore to reduce nitrate levels to below the guideline of 50 mg/L.

Uranium is widely distributed in geological formations. It can be found in groundwater aquifers surrounded by granite rocks and pegmatites as well as in sedimentary rock like sandstone.

Uranium occurs as three naturally occurring isotopes and under appropriate conditions can become soluble and therefore present in a region's groundwater. The transport of uranium in groundwater varies widely according to the aquifer conditions. Uranium may also be present in the environment as a result of mine tailings and the use of phosphate pesticides.

Elevated levels of uranium are present in southern communities of Willowra, Wilora and Laramba. Power and Water is investigating economically viable options to achieve uranium concentrations within ADWG, and projects are being prioritised based upon the IES Safe Water Strategy.

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

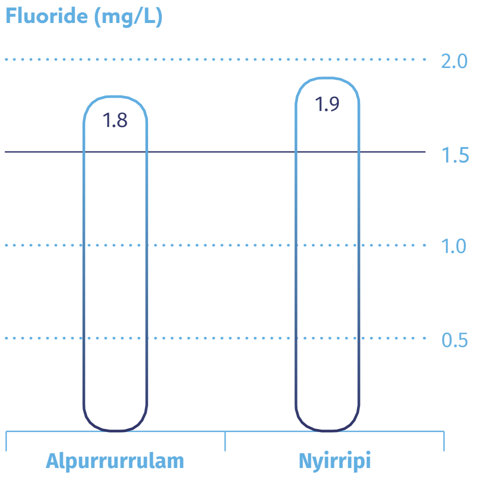
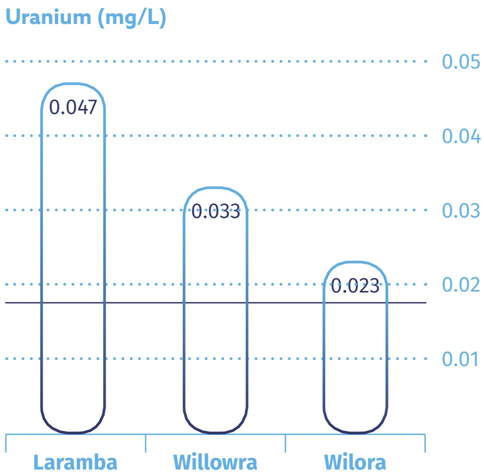


Figure 10 Communities with maximum uranium levels greater than 0.017 mg/L in drinking water



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.

Aluminium concentration in drinking water is recommended by ADWG to not exceed 0.2 mg/L.

Aluminium may be present in water through natural leaching from soil and rock, or from the use of aluminium salts as coagulants in water treatment.

Where alum is used as a coagulant in water treatment, post-flocculation effects can occur if the soluble aluminium concentration in the treated water exceeds 0.2 mg/L. Depending on pH, a whitish gelatinous precipitate of aluminium hydroxide can be formed in the distribution system which may result in customer complaints about 'milky coloured' water.

For this reporting period, aluminium levels ranged from 0.01 mg/L to 0.5 mg/L in Acacia Larrakia's water supply and from 0.08 mg/L to 2 mg/L in Warruwi's water supply.

Chloride concentration in drinking water is recommended by ADWG to not exceed 250 mg/L.

The ADWG describe various degrees of hardness as:

<0–60 mg/L $CaC0_3$	Soft but possibly corrosive
60-200 mg/L $CaCO_3$	Good quality
200-500 mg/L $CaCO_3$	Increasing scaling problems
>500 mg/L $CaCO_3$	Severe scaling

Chloride is present in natural waters from the dissolution of salt deposits, and contamination from effluent disposal. In surface water, the concentration of chloride is usually less than 100 mg/L and frequently below 10 mg/L. Groundwater can have higher concentrations, particularly if there is salt water intrusion.

The taste threshold of chloride in water is dependent on the associated cation but is in the range 200–300 mg/L. The chloride content of water can affect corrosion of pipes and fittings. It can also affect the solubility of metal ions.

Typical values depend to a large extent on local conditions, but concentrations of 150 mg/L are not uncommon in some areas.

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

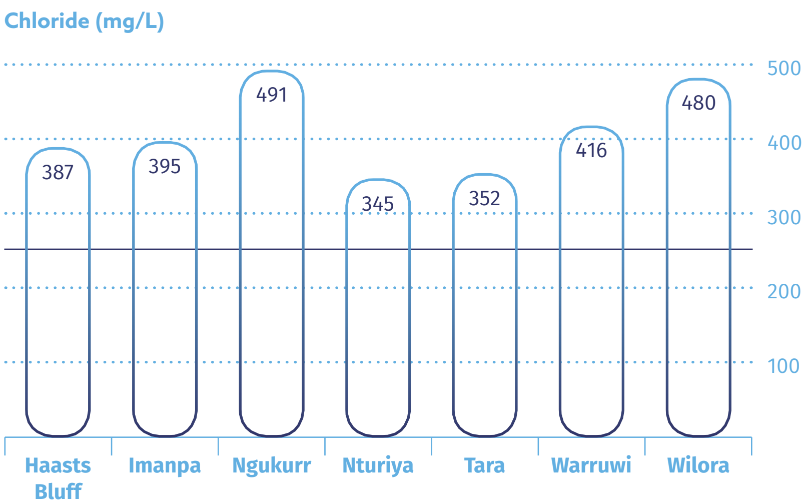
Hardness is primarily the amount of calcium and magnesium ions in water and is expressed as a calcium carbonate ($CaCO_3$) equivalent. High hardness requires more soap to achieve lather and may lead to excessive scaling in hot water pipes and fittings.

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 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.

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



Iodine has a taste threshold of around 1.5 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.

Elevated levels of iodine were recorded in a number of Southern region communities during the reporting period.

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

Hardness (as CaCO3) (mg/L CaCO3)

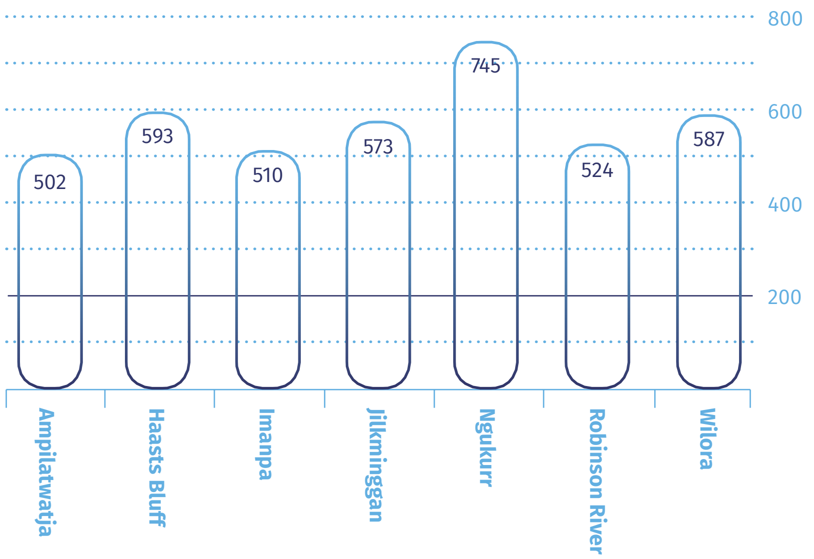
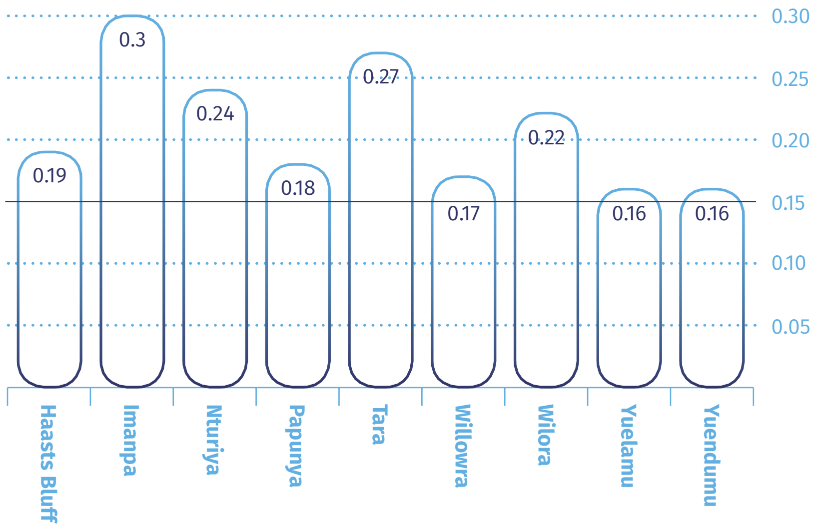


Figure 13 Communities with average iodine levels greater than 0.15 mg/L in drinking water

Iodine (taste threshold) (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. Growths of iron bacteria, which increase the concentration of iron, may cause taste and odour problems and lead to pipe restrictions, blockages and corrosion. The concentration of iron at the tap can also be influenced by factors such as rusting iron pipes.

There are a number of communities regularly monitored for iron levels above 0.3 mg/L (Figure 14).

Economically viable options to reduce high iron levels in other communities (see Figure 14) are being investigated. Some options include infrastructure changes to maximise iron oxidation and fallout, 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.

Manganese concentration in drinking water is considered for both health and aesthetic reasons; the ADWG recommends concentrations not exceed 0.5 mg/L for health considerations and 0.1 mg/L for aesthetic considerations.

At concentrations exceeding 0.1 mg/L, manganese imparts an undesirable taste to water and stains plumbing fixtures and laundry.

Uncontaminated rivers and streams generally have low concentrations of manganese, ranging from 0.001 mg/L to 0.6 mg/L. High concentrations may occur in polluted rivers or under anoxic conditions such as at the bottom of deep reservoirs or lakes, or in groundwater.

Figure 14 Communities with average iron concentration greater than 0.3 mg/L in the distribution system

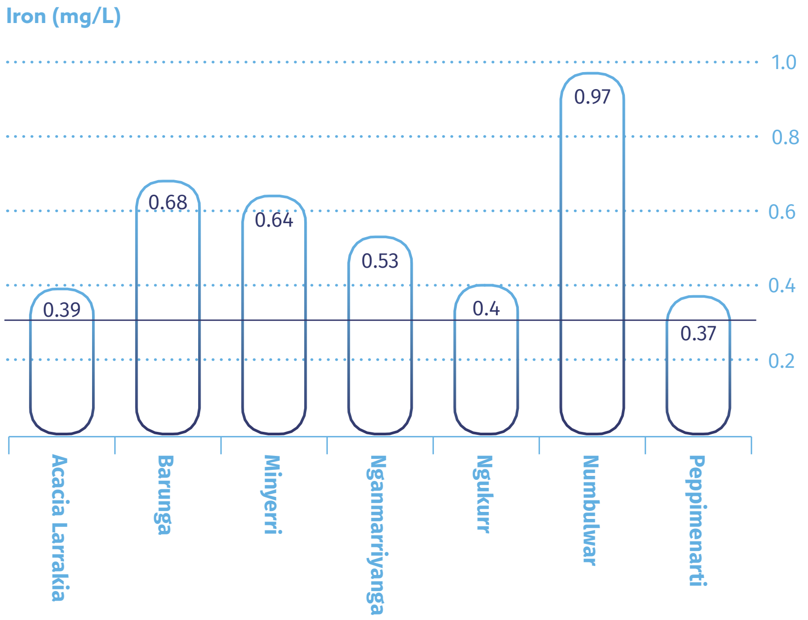
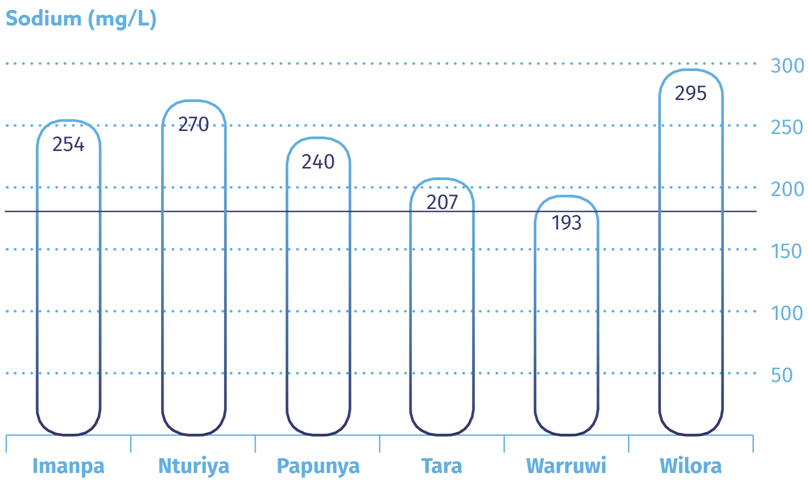


Figure 15 Communities with average sodium concentration greater than 180 mg/L in drinking water



Historically, elevated manganese levels have been identified in Nauiyu, Nganmarriyanga, Numbulwar and Minyerri.

pH is a measure of the hydrogen ion concentration of water. It is measured on a logarithmic scale from 0 to 14. A pH of 7 is neutral, greater than 7 is alkaline and less than 7 is acidic. The ADWG recommend pH levels in drinking water should be between 6.5 and 8.5. 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.

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.

Silica concentration in drinking water is recommended by ADWG to not exceed 80 mg/L. Silica present in water is usually referred to as amorphous silica. Silica forms silicates on surfaces, resulting in silica build-up. In cases where customer complaints occur due to scale build-up, water hardness and silica concentrations should be investigated to determine the cause.

Dissolved silica from various sources can range between 0.6 mg/L in some surface water to 110 mg/L in groundwaters.

Historically, elevated silica levels have been identified in Lajamanu, Laramba and Kintore.

Sodium is an essential element for humans, although there is currently no agreement on the minimum amount required. The sodium ion is widespread in water due to the high solubility of sodium salts and the abundance of mineral deposits.

The ADWG recommends action on levels above 180mg/L, when the taste becomes noticeable.

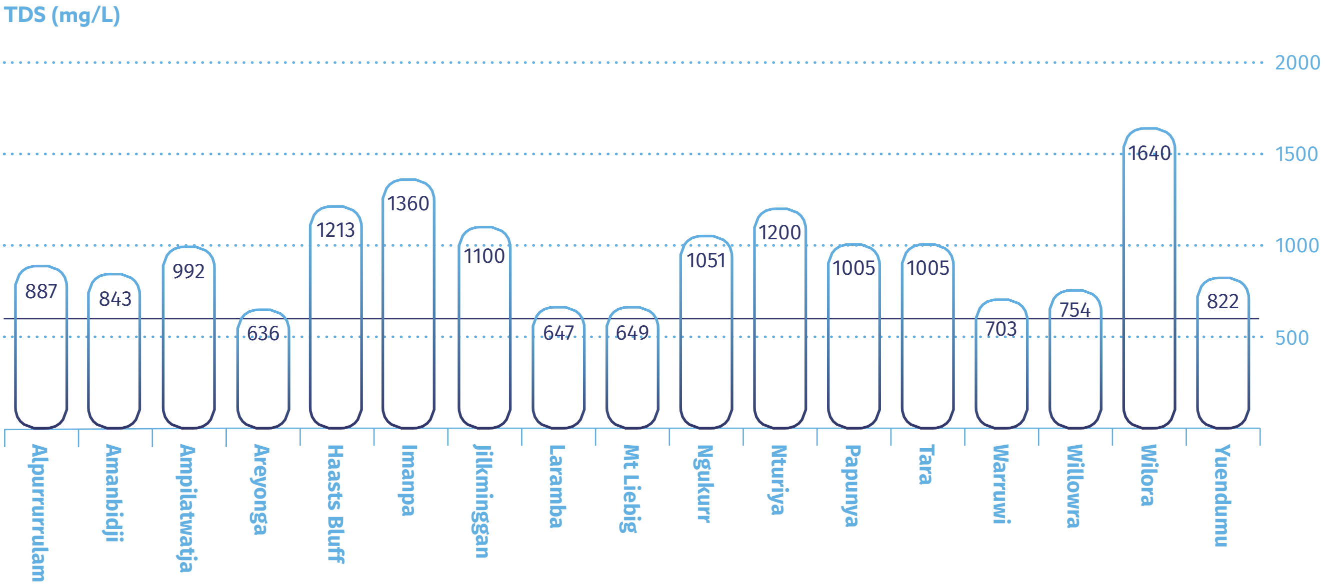
Total dissolved solids (TDS) are small organic and inorganic particles dissolved in water that can affect how the water tastes. TDS comprise sodium, potassium, calcium, magnesium, chloride, sulphate, bicarbonate, carbonate, silica, organic matter, fluoride, iron, manganese, nitrate and phosphate.

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. The ADWG provide advice on the palatability of drinking water according to TDS concentration:

0–600 mg/L	Good
600–900 mg/L	Fair
900–1200 mg/L	Poor
>1200 mg/L	Unacceptable (unpalatable)

Figure 16 Communities with levels of TDS greater than 600 mg/L in drinking water



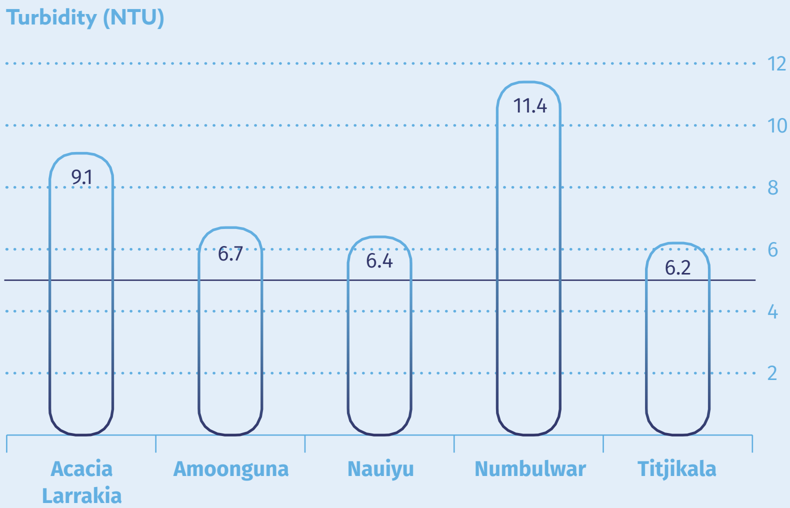
We are owned by the Territory and we serve the people of the Territory.

Turbidity is a measure of the 'cloudiness' of water caused by fine suspended matter such as clay or silt. The degree of cloudiness depends on the amount, size and composition of the suspended matter. High levels of turbidity gives water a 'muddy' or 'milky' appearance that is visible to the eye. At low levels, turbidity can only be measured by an instrument such as a turbidimeter.

Power and Water considers turbidity when managing community disinfection systems and adjusts the disinfection doses to ensure adequate disinfection is achieved. Figure 18 contains data for communities with turbidity greater than 5 NTU. Routine monitoring is also undertaken to check that disinfection systems are effective and safe water is being supplied.

Testing for each of the communities are provided in the tables in Appendix B.

Figure 18 Communities with turbidity above ADWG value of 5 NTU



Recorded emergencies/ incidents

During the 2016-17 reporting period the following communities had *E. coli* detections in the drinking water supply:

- Belyuen - 3 May 2017
- Tara - 14 February 2017
- Canteen Creek - 6 December 2016
- Numbulwar - 2 August 2016

Power and Water responds rapidly to *E. coli* detections, with the primary response being to ensure adequate chlorination of the water supply, followed by an investigation into the cause of the contamination. No Boil Water Alerts were issued by DoH in response to the *E. coli* detections in 2016-17.

In response to a power supply issue at Yarralin, a precautionary boil water alert was issued on 31 January 2017. The alert was lifted on 2 February 2017 once power and chlorination was restored and bacteriological monitoring confirmed that there was no contamination of the water supply.

Table 10 *E. coli* incidents during the drinking water quality monitoring program period 2016-17

Year	Supply	Samples with *E. coli* Detections	Collection Date	Number of *E. coli* Detected in Sample (MPN/100 mL)
2016-17	Belyuen	1	3 May 2017	5
	Tara	1	14 February 2017	1
	Canteen Creek	1	6 December 2016	1
	Numbulwar	3	2 August 2016	1 in each sample

Glossary of acronyms

Acronym	
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
WIMS	Work Information Management System
WIOA	Water Industry Operators Association
WaterRA	Water Research Australia

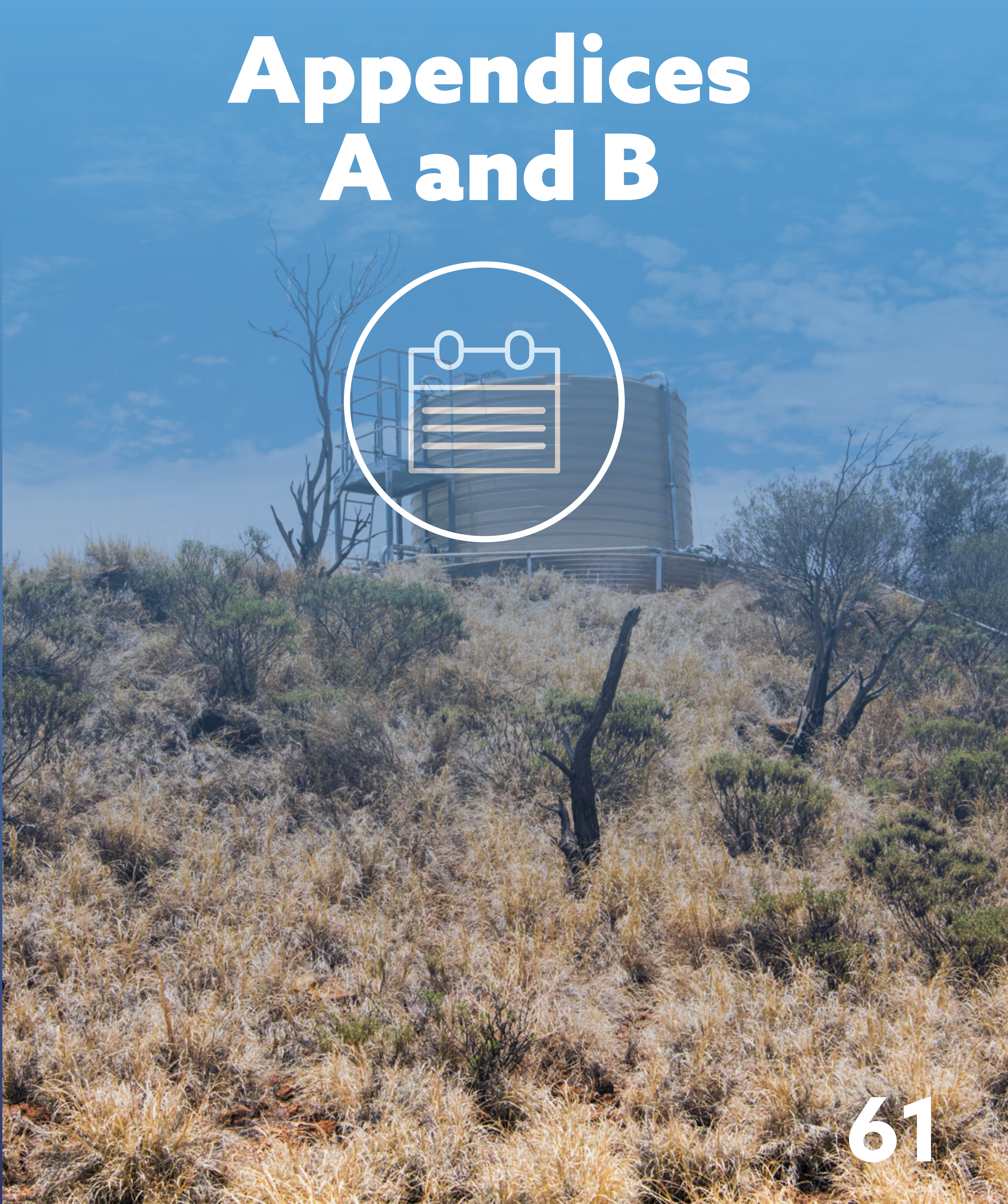
Units of measurement

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

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 2016-17. Exceedances are shown bold blue.
Aesthetic parameters	Assessments are reported as the mean. Data covers the period 2016-17. Exceedances are shown bold blue.
Other parameters	Assessments are reported as the mean. Data covers the period 2016-17. Exceedances are shown bold blue.
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.
*	Due to health implications these values have been reported as maximum values.

Appendices A and B



Appendix A – Drinking water quality: Major and minor centres

Table 11 Bacteriological monitoring in major centres 2016-17

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	176	0	100
	Total Coliforms	<10 in 95% of samples	170	176	0	100
Darwin	*E. coli*	No *E. coli* in 100% samples	585	609	0	100
	Total Coliforms	<10 in 95% of samples	585	609	0	100
Katherine	*E. coli*	No *E. coli* in 100% samples	182	187	0	100
	Total Coliforms	<10 in 95% of samples	182	187	0	100
Tennant Creek	*E. coli*	No *E. coli* in 100% samples	208	208	0	100
	Total Coliforms	<10 in 95% of samples	208	208	0	100
Yulara	*E. coli*	No *E. coli* in 100% samples	104	104	0	100
	Total Coliforms	<10 in 95% of samples	104	104	0	100

Table 12 Bacteriological monitoring in minor centres 2016-17

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	106	0	100%
	Total Coliforms	<10 in 95% of samples	104	106	0	100%
Batchelor	*E. coli*	No *E. coli* in 100% samples	104	107	0	100%
	Total Coliforms	<10 in 95% of samples	104	107	0	100%
Borroloola	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Cox Peninsula	*E. coli*	No *E. coli* in 100% samples	52	52	1	98%
	Total Coliforms	<10 in 95% of samples	52	52	1	98%
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	156	0	100%
	Total Coliforms	<10 in 95% of samples	156	156	0	100%
Garawa[1]	*E. coli*	No *E. coli* in 100% samples	24	24	0	100%
	Total Coliforms	<10 in 95% of samples	24	24	0	100%
Gunn Point	*E. coli*	No *E. coli* in 100% samples	26	27	1	96%
	Total Coliforms	<10 in 95% of samples	26	27	0	100%
Kings Canyon	*E. coli*	No *E. coli* in 100% samples	156	156	0	100%
	Total Coliforms	<10 in 95% of samples	156	156	1	99%
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	52	0	100%
	Total Coliforms	<10 in 95% of samples	48	52	0	100%
Newcastle Waters	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Pine Creek	*E. coli*	No *E. coli* in 100% samples	156	159	0	100%
	Total Coliforms	<10 in 95% of samples	156	159	0	100%
Ti Tree	*E. coli*	No *E. coli* in 100% samples	36	41	0	100%
	Total Coliforms	<10 in 95% of samples	36	41	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.*

Table 13 Health parameters in major and minor centres 2016-17

	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Chlorine (Total)	Chromium	Copper	Fluoride
ADWG	0.003	0.01	2	0.06	4	0.002	5	0.05	2	1.5
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Community	**Health parameters – 95th percentile or maximum values**									
Alice Springs	<0.0002	<0.0005	0.1	<0.001	0.2	<0.0002	1	<0.005	0.1	0.61
No. samples	12	12	12	12	12	12	162	12	12	15
Darwin	<0.0002	<0.0005	<0.05	<0.001	0.01	<0.0002	3	<0.005	0.3	0.79
No. samples	67	67	67	67	67	67	601	67	67	121
Katherine	<0.0002	0.001	<0.05	<0.001	<0.02	<0.0002	2	<0.005	0.1	0.67
No. samples	16	16	16	16	16	16	159	16	16	58
Tennant Creek	<0.0002	0.002	0.1	<0.001	1	<0.0002	1	<0.005	0.02	1.5
No. samples	4	4	4	4	4	4	208	4	4	57
Yulara	<0.0002	<0.0005	<0.05	<0.001	1	<0.0002	1	<0.005	0.1	<0.1
No. samples	6	6	6	6	6	6	104	6	6	5
Adelaide River	<0.0002	0.004	<0.05	<0.001	0.02	<0.0002	1	<0.005	0.1	0.36
No. samples	22	22	22	22	22	22	106	22	22	5
Batchelor	<0.0002	0.001	<0.05	<0.001	0.02	<0.0002	1	<0.005	0.03	0.13
No. samples	6	6	6	6	6	6	107	6	6	6
Cox Peninsula	<0.0002	<0.0005	<0.05	<0.001	0.04	<0.0002	3	<0.005	<0.01	<0.1
No. samples	3	3	3	3	3	3	52	3	3	3
Borroloola	<0.0002	<0.0005	<0.05	<0.001	0.04	<0.0002	1	<0.005	0.02	<0.1
No. samples	5	5	5	5	5	5	36	5	5	5
***Garawa*[1]**	<0.0002	<0.0005	<0.05	<0.001	0.04	<0.0002	1	<0.005	0.2	0.11
No. samples	4	4	4	4	4	4	24	4	4	4
Daly Waters	<0.0002	0.001	0.1	<0.001	0.4	<0.0002	1	0.01	0.2	0.42
No. samples	8	8	8	8	8	8	36	8	8	8
Elliott	<0.0002	<0.0005	0.2	<0.001	0.4	<0.0002	1	<0.005	0.02	0.78
No. samples	6	6	6	6	6	6	155	6	6	6
Gunn Point	0.0004	0.001	0.2	<0.001	<0.02	0.002	**9**	<0.005	0.01	0.46
No. samples	2	2	2	2	2	2	26	2	2	2
Kings Canyon	<0.0002	0.002	<0.05	<0.001	0.4	<0.0002	1	0.01	0.03	0.51
No. samples	6	6	6	6	6	6	155	6	6	5
Larrimah	<0.0002	<0.0005	0.1	<0.001	0.3	<0.0002	2	<0.005	0.1	0.22
No. samples	4	4	4	4	4	4	36	4	4	6
Mataranka	<0.0002	<0.0005	0.1	<0.001	0.1	<0.0002	1	<0.005	0.1	0.27
No. samples	4	4	4	4	4	4	50	4	4	6
Newcastle Waters	<0.0002	0.001	0.3	<0.001	0.3	<0.0002	1	<0.005	0.01	0.86
No. samples	6	6	6	6	6	6	36	6	6	6
Pine Creek	<0.0002	0.01	<0.05	<0.001	<0.02	<0.0002	2	<0.005	0.1	0.58
No. samples	36	36	36	36	36	36	159	36	36	6
Ti Tree	<0.0002	0.002	0.1	<0.001	0.4	<0.0002	1	<0.005	<0.01	0.95
No. samples	7	7	7	7	7	7	41	7	7	28
Timber Creek	<0.0002	0.001	1	<0.001	0.1	<0.0002	1	<0.005	0.04	1.5
No. samples	12	12	12	12	12	12	33	12	12	15

Numbers in bold exceed the guideline value.

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

	Lead	Manganese	Mercury	Molybdenum	Nickel	Nitrate	Radiological	Selenium	Silver	THMs	Uranium
	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
	0.003	0.03	<0.0001	<0.005	0.004	9	0.3	0.002	<0.01	0.0040	0.0091
	12	12	12	12	12	15	32	12	12	28	12
	0.006	0.1	<0.0001	<0.005	<0.002	1	PASS	<0.001	<0.01	0.084	0.000051
	67	67	67	67	67	67	15	67	67	71	67
	0.001	<0.005	<0.0001	<0.005	0.004	1	PASS	<0.001	<0.01	0.065	0.00016
	16	16	16	16	16	4	6	16	16	35	16
	0.001	0.01	<0.0001	<0.005	<0.002	40	0.4	0.003	<0.01	0.024	0.0095
	4	4	4	4	4	4	27	4	4	30	4
	<0.001	<0.005	<0.0001	<0.005	<0.002	20	0.2	<0.001	<0.01	0.0070	<0.00001
	6	6	6	6	6	5	12	6	6	8	6
	0.002	0.1	<0.0001	<0.005	<0.002	0.4	PASS	<0.001	<0.01	0.017	0.000030
	22	22	22	22	22	5	14	22	22	10	22
	<0.001	0.04	<0.0001	<0.005	<0.002	2	PASS	<0.001	<0.01	<0.004	0.00033
	6	6	6	6	6	6	4	6	6	11	6
	<0.001	<0.005	<0.0001	<0.005	<0.002	0.3	PASS	<0.001	<0.01	0.011	0.000030
	3	3	3	3	3	3	7	3	3	6	3
	0.002	0.3	<0.0001	<0.005	0.004	1	0.4	<0.001	<0.01	0.0040	0.00025
	5	5	5	5	5	5	4	5	5	11	5
	0.01	<0.005	<0.0001	<0.005	0.002	0.4	0.3	<0.001	<0.01	<0.004	0.00013
	4	4	4	4	4	4	2	4	4	4	4
	0.006	0.1	<0.0001	<0.005	0.01	10	PASS	0.002	<0.01	0.034	0.0070
	8	8	8	8	8	8	3	8	8	12	8
	<0.001	<0.005	<0.0001	<0.005	<0.002	20	PASS	0.002	<0.01	0.0050	0.0065
	6	6	6	6	6	6	8	6	6	13	6
	0.006	0.01	<0.0001	<0.005	0.01	0.3	PASS	<0.001	<0.01	0.019	0.000060
	2	2	2	2	2	2	2	2	2	6	2
	<0.001	<0.005	0.0004	<0.005	0.01	4	1	0.003	<0.01	0.0080	0.0025
	6	6	6	6	6	5	274	6	6	8	6
	0.002	<0.005	<0.0001	<0.005	<0.002	3	PASS	0.002	<0.01	0.0070	0.0027
	4	4	4	4	4	6	5	4	4	9	4
	0.003	<0.005	<0.0001	<0.005	<0.002	1	PASS	<0.001	<0.01	0.0070	0.00068
	4	4	4	4	4	6	3	4	4	12	4
	<0.001	<0.005	<0.0001	<0.005	<0.002	9	PASS	<0.001	<0.01	<0.004	0.0053
	6	6	6	6	6	6	4	6	6	11	6
	0.002	0.04	<0.0001	<0.005	<0.002	1	PASS	<0.001	<0.01	0.035	0.00021
	36	36	36	36	36	6	20	36	36	21	36
	<0.001	<0.005	0.0001	<0.005	<0.002	**60**	PASS	0.002	<0.01	0.0080	0.0075
	7	7	7	7	7	30	8	7	7	5	7
	0.002	<0.005	<0.0001	<0.005	0.002	1	PASS	<0.001	<0.01	0.0070	0.0022
	12	12	12	12	12	15	4	12	12	5	12

Table 14 Aesthetic and other parameters in major and minor centres 2016-17

	Aluminium	Chloride	Chlorine (Free)	Copper	Colour (true)	Hardness (as CaCO3)	Iron	Manganese	pH	Silica
ADWG	0.2	250	0.6	1	15	200	0.3	0.1	6.5-8.5	80
Units	mg/L	mg/L	mg/L	mg/L	CU	mg/L	mg/L	mg/L	pH unit	mg/L
Community	**Aesthetic parameters – mean values**									
Alice Springs	<0.02	71	**0.9**	0.04	<2	**217**	0.02	0.007	7.8	17
No. samples	12	15	162	12	15	15	15	12	15	15
Darwin	<0.02	7	**1.1**	0.04	3	39	0.09	0.032	7.3	12
No. samples	67	64	601	67	67	67	67	67	67	67
Katherine	<0.02	7	**1.9**	0.01	<2	110	<0.01	<0.005	7.7	15
No. samples	16	4	159	16	4	4	4	16	4	4
Tennant Creek	0.04	144	**0.8**	0.01	<2	**232**	0.07	<0.005	7.8	**84**
No. samples	4	4	208	4	4	4	4	4	4	4
Yulara	<0.02	29	**0.8**	0.07	<2	5	<0.01	<0.005	7.0	4
No. samples	6	4	104	6	5	5	5	6	5	5
Adelaide River	<0.02	22	**1.0**	0.02	2	112	<0.01	0.012	7.6	28
No. samples	22	5	106	22	5	5	5	22	5	5
Batchelor	<0.02	5	**1.0**	0.02	<2	191	0.01	0.009	7.3	27
No. samples	6	6	107	6	6	6	6	6	6	6
Cox Peninsula	0.03	7	**1.3**	<0.01	3	3	0.27	<0.005	6.5	16
No. samples	3	3	52	3	3	3	3	3	3	3
Borroloola	<0.02	10	**1.0**	<0.01	<2	52	<0.01	0.064	6.8	14
No. samples	5	3	36	5	5	5	5	5	5	5
***Garawa*[1]**	<0.02	12	**1.0**	0.12	<2	6	<0.01	<0.005	**5.8**	14
No. samples	4	2	24	4	4	4	4	4	4	4
Daly Waters	0.03	**277**	**0.9**	0.05	<2	**549**	**0.36**	0.018	7.2	33
No. samples	8	8	36	8	8	8	8	8	8	8
Elliott	<0.02	162	**1.0**	0.01	<2	**453**	<0.01	<0.005	7.8	50
No. samples	6	6	155	6	6	6	6	6	6	6
Gunn Point	<0.02	6	**2.3**	<0.01	<2	70	0.10	0.024	7.2	11
No. samples	2	2	27	2	2	2	2	2	2	2
Kings Canyon	<0.02	**261**	**0.9**	0.01	<2	**377**	0.05	<0.005	7.0	19
No. samples	6	5	155	6	5	5	5	6	5	5
Larrimah	<0.02	201	**1.0**	0.03	<2	**523**	0.04	<0.005	7.6	40
No. samples	4	6	36	4	6	6	6	4	6	6
Mataranka	<0.02	26	**1.0**	0.03	<2	**302**	<0.01	<0.005	7.5	27
No. samples	4	6	50	4	6	6	6	4	6	6
Newcastle Waters	<0.02	42	**1.0**	<0.01	<2	**346**	<0.01	<0.005	7.8	59
No. samples	6	6	36	6	6	6	6	6	6	6
Pine Creek	<0.02	11	**1.2**	0.10	<2	102	0.01	0.015	7.0	47
No. samples	36	6	159	36	6	6	6	36	6	6
Ti Tree	<0.02	68	**0.9**	<0.01	<2	**228**	<0.01	<0.005	8.0	**89**
No. samples	7	28	41	7	30	28	28	7	28	28
Timber Creek	<0.02	36	**1.0**	0.02	<2	**455**	0.01	<0.005	7.1	21
No. samples	12	15	36	12	15	15	15	12	15	15

Numbers in bold exceed the guideline value.

Sodium	Sulfate	TDS	Turbidity	Zinc	Alkalinity (as CaCO3)	Bromine	Calcium	Electrical Conductivity	Iodine	Magnesium	Potassium	Tin
180	250	600	5	3								
mg/L	mg/L	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	µS/cm	mg/L	mg/L	mg/L	mg/L
					Other parameters – mean values							
82	37	419	0.2	0.03	233	0.25	48.9	790	0.04	23.1	5.7	<0.01
15	15	15	15	12								
4	<0.3	55	0.9	0.01	31	0.03	8.1	89	<0.01	4.6	0.7	<0.01
67	67	67	67	67								
5	<0.3	123	0.2	<0.01	100	0.02	26.0	235	<0.01	11.0	0.8	<0.01
4	4	4	4	16								
131	36	**711**	2.8	<0.01	273	0.65	36.4	1175	0.14	34.2	31.2	<0.01
4	4	4	4	4								
33	2	95	0.6	0.03	<20	0.16	1.4	162	<0.01	0.3	3.1	<0.01
5	5	5	5	6								
38	<0.3	211	1.2	0.01	154	0.07	17.2	371	<0.01	16.8	1.1	<0.01
5	5	5	5	22								
6	<0.3	206	0.4	<0.01	185	0.02	24.7	361	<0.01	31.6	0.4	<0.01
6	6	6	6	6								
9	0.3	43	1.5	0.01	<20	0.02	0.7	37	<0.01	0.3	0.8	<0.01
3	3	3	3	3								
6	<0.3	87	0.2	<0.01	48	0.03	19.1	137	<0.01	1.0	1.2	<0.01
5	5	5	5	5								
9	<0.3	45	0.1	0.03	<20	0.02	0.4	63	<0.01	1.2	1.1	<0.01
4	4	4	4	4								
199	131	**1150**	3.9	0.01	426	0.96	128.9	1981	0.08	55.3	23.5	<0.01
8	8	8	8	8								
88	27	**748**	0.4	<0.01	380	0.58	104.4	1350	0.05	46.7	21.1	<0.01
6	6	6	6	6								
11	<0.3	102	2.5	3.00	75	0.01	13.6	170	<0.01	9.0	0.7	<0.01
2	2	2	2	2								
122	145	**815**	0.6	0.02	134	1.04	77.5	1466	0.14	44.6	22.3	<0.01
5	5	5	5	6								
136	91	**935**	0.7	0.02	438	0.63	120.5	1632	0.05	54.1	12.2	<0.01
6	6	6	6	4								
19	<0.3	398	0.2	0.01	330	0.12	67.6	711	<0.01	32.2	5.5	<0.01
6	6	6	6	4								
53	4	501	0.5	<0.01	383	0.16	80.5	892	0.04	35.3	29.6	<0.01
6	6	6	6	6								
32	<0.3	190	0.1	0.02	145	0.04	13.3	327	0.01	16.7	1.4	<0.01
6	6	6	6	36								
68	23	512	0.3	<0.01	211	0.36	53.2	801	0.08	23.0	18.2	<0.01
28	28	28	28	7								
23	<0.3	463	0.3	0.01	432	0.15	71.7	896	0.01	67.2	6.5	<0.01
15	15	15	15	12								

Appendix B – Drinking water quality: Remote communities

Table 15 Bacteriological monitoring in Northern region communities 2016-17

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	0	100%
Angurugu	*E. coli*	No *E. coli* in 100% samples	156	**140**	0	100%
	Total Coliforms	<10 in 95% of samples	156	**140**	0	100%
Belyuen	*E. coli*	No *E. coli* in 100% samples	36	36	1	97%
	Total Coliforms	<10 in 95% of samples	36	36	2	94%
Galiwinku	*E. coli*	No *E. coli* in 100% samples	156	**149**	0	100%
	Total Coliforms	<10 in 95% of samples	156	**149**	0	100%
Gapuwiyak	*E. coli*	No *E. coli* in 100% samples	156	**149**	0	100%
	Total Coliforms	<10 in 95% of samples	156	**149**	0	100%
Gunbalanya	*E. coli*	No *E. coli* in 100% samples	156	**146**	0	100%
	Total Coliforms	<10 in 95% of samples	156	**146**	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	240	**222**	0	100%
	Total Coliforms	<10 in 95% of samples	240	**222**	1	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	**150**	0	100%
	Total Coliforms	<10 in 95% of samples	156	**150**	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%

Centre	Parameter (MPN/100mL)	Target Level	Total No. Samples Required	Total No. Samples Collected	Total Exceedances (No.)	Samples Passing Reporting Level (%)
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	**44**	0	100%
	Total Coliforms	<10 in 95% of samples	48	**44**	1	98%
Nguiu	*E. coli*	No *E. coli* in 100% samples	156	**147**	0	100%
	Total Coliforms	<10 in 95% of samples	156	**147**	0	100%
Nganmarriyanga	*E. coli*	No *E. coli* in 100% samples	36	**33**	0	100%
	Total Coliforms	<10 in 95% of samples	36	**33**	0	100%
Numbulwar	*E. coli*	No *E. coli* in 100% samples	156	**153**	3	98%
	Total Coliforms	<10 in 95% of samples	156	**153**	1	99%
Peppimenarti	*E. coli*	No *E. coli* in 100% samples	36	**33**	0	100%
	Total Coliforms	<10 in 95% of samples	36	**33**	0	100%
Pirlangimpi	*E. coli*	No *E. coli* in 100% samples	36	37	0	100%
	Total Coliforms	<10 in 95% of samples	36	37	0	100%
Ramingining	*E. coli*	No *E. coli* in 100% samples	36	48	0	100%
	Total Coliforms	<10 in 95% of samples	36	48	0	100%
Umbakumba	*E. coli*	No *E. coli* in 100% samples	36	39	0	100%
	Total Coliforms	<10 in 95% of samples	36	39	0	100%
Wadeye	*E. coli*	No *E. coli* in 100% samples	260	**249**	0	100%
	Total Coliforms	<10 in 95% of samples	260	**249**	0	100%
Warruwi	*E. coli*	No *E. coli* in 100% samples	36	37	0	100%
	Total Coliforms	<10 in 95% of samples	36	37	0	100%
Yirrkala	*E. coli*	No *E. coli* in 100% samples	48	48	0	100%
	Total Coliforms	<10 in 95% of samples	48	48	1	98%

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

Table 16 Bacteriological monitoring in Katherine region communities 2016-17

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	**24**	0	100%
	Total Coliforms	<10 in 95% of samples	36	**24**	0	100%
Barunga	*E. coli*	No *E. coli* in 100% samples	36	**34**	0	100%
	Total Coliforms	<10 in 95% of samples	36	**34**	0	100%
Beswick	*E. coli*	No *E. coli* in 100% samples	36	**33**	0	100%
	Total Coliforms	<10 in 95% of samples	36	**33**	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	0	100%
Bulman	*E. coli*	No *E. coli* in 100% samples	36	**35**	0	100%
	Total Coliforms	<10 in 95% of samples	36	**35**	0	100%
Daguragu	*E. coli*	No *E. coli* in 100% samples	24	**22**	0	100%
	Total Coliforms	<10 in 95% of samples	24	**22**	0	100%
Jilkminggan	*E. coli*	No *E. coli* in 100% samples	36	**34**	0	100%
	Total Coliforms	<10 in 95% of samples	36	**34**	1	97%
Kalkarindji	*E. coli*	No *E. coli* in 100% samples	36	**32**	1	97%
	Total Coliforms	<10 in 95% of samples	36	**32**	0	100%
Kybrook Farm	*E. coli*	No *E. coli* in 100% samples	36	39	0	100%
	Total Coliforms	<10 in 95% of samples	36	39	1	97%
Lajamanu	*E. coli*	No *E. coli* in 100% samples	36	**33**	0	100%
	Total Coliforms	<10 in 95% of samples	36	**33**	0	100%
Manyallaluk	*E. coli*	No *E. coli* in 100% samples	36	**32**	0	100%
	Total Coliforms	<10 in 95% of samples	36	**32**	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	**144**	0	100%
	Total Coliforms	<10 in 95% of samples	156	**144**	0	100%
Pigeon Hole	*E. coli*	No *E. coli* in 100% samples	36	**33**	0	100%
	Total Coliforms	<10 in 95% of samples	36	**33**	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%

Centre	Parameter (MPN/100mL)	Target Level	Total No. Samples Required	Total No. Samples Collected	Total Exceedances (No.)	Samples Passing Reporting Level (%)
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	**33**	0	100%
	Total Coliforms	<10 in 95% of samples	36	**33**	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%

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

Table 17 Bacteriological monitoring in Barkly region communities 2016-17

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	**35**	0	100%
	Total Coliforms	<10 in 95% of samples	36	**35**	0	100%
Alpurrurulam	*E. coli*	No *E. coli* in 100% samples	36	42	0	100%
	Total Coliforms	<10 in 95% of samples	36	42	0	100%
Canteen Creek	*E. coli*	No *E. coli* in 100% samples	36	39	1	97%
	Total Coliforms	<10 in 95% of samples	36	39	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	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Tara	*E. coli*	No *E. coli* in 100% samples	36	39	1	97%
	Total Coliforms	<10 in 95% of samples	36	39	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	36	36	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*

Table 18 Bacteriological monitoring in Southern region communities 2016-17

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	2	94%
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	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	0	100%
Kintore	*E. coli*	No *E. coli* in 100% samples	36	36	0	100%
	Total Coliforms	<10 in 95% of samples	36	36	1	97%
Laramba	*E. coli*	No *E. coli* in 100% samples	36	**33**	0	100%
	Total Coliforms	<10 in 95% of samples	36	**33**	0	100%
Mt Liebig	*E. coli*	No *E. coli* in 100% samples	36	39	0	100%
	Total Coliforms	<10 in 95% of samples	36	39	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	39	0	100%
	Total Coliforms	<10 in 95% of samples	36	39	1	97%

Centre	Parameter (MPN/100mL)	Target Level	Total No. Samples Required	Total No. Samples Collected	Total Exceedances (No.)	Samples Passing Reporting Level (%)
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	42	48	0	100%
	Total Coliforms	<10 in 95% of samples	42	48	0	100%
Yuendumu	*E. coli*	No *E. coli* in 100% samples	36	**32**	0	100%
	Total Coliforms	<10 in 95% of samples	36	**32**	0	100%

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

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

	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Copper*	Fluoride*
ADWG	0.003	0.01	2	0.06	4	0.002	0.05	2	1.5
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Community	**Health parameters – 95th percentile or maximum values**								
Acacia Larrakia	<0.0002	0.002	<0.05	<0.001	<0.02	<0.0002	<0.005	<0.01	<0.1
No. Samples	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	1.3
No. Samples	2	2	2	2	2	2	2	2	102
Belyuen	<0.0002	0.002	<0.05	<0.001	<0.02	<0.0002	<0.005	<0.01	0.28
No. Samples	2	2	2	2	2	2	2	2	2
Galiwinku	<0.0002	<0.0005	<0.05	<0.001	<0.02	<0.0002	<0.005	0.02	<0.1
No. Samples	2	2	2	2	2	2	2	2	2
Gapuwiyak	<0.0002	<0.0005	<0.05	<0.001	<0.02	<0.0002	<0.005	0.02	<0.1
No. Samples	2	2	2	2	2	2	2	2	2
Gunbalanya	<0.0002	<0.0005	<0.05	<0.001	<0.02	<0.0002	<0.005	0.02	<0.1
No. Samples	3	3	3	3	3	3	3	3	2
Gunyangara	<0.0002	<0.0005	<0.05	<0.001	<0.02	<0.0002	<0.005	0.1	<0.1
No. Samples	2	2	2	2	2	2	2	2	2
Maningrida	<0.0002	<0.0005	<0.05	<0.001	<0.02	<0.0002	<0.005	0.03	1.5
No. Samples	3	3	3	3	3	3	3	3	66
Milikapiti	<0.0002	<0.0005	<0.05	<0.001	0.02	<0.0002	<0.005	0.03	<0.1
No. Samples	2	2	2	2	2	2	2	2	2
Milingimbi	<0.0002	<0.0005	<0.05	<0.001	0.06	<0.0002	<0.005	0.03	<0.1
No. Samples	2	2	2	2	2	2	2	2	4
Milyakburra	<0.0002	<0.0005	<0.05	<0.001	0.06	<0.0002	0.005	0.3	<0.1
No. Samples	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	<0.1
No. Samples	2	2	2	2	2	2	2	2	2
Nauiyu	0.0002	0.004	<0.05	<0.001	0.02	<0.0002	<0.005	0.03	0.38
No. Samples	6	6	6	6	6	6	6	6	6
Nganmarriyanga	<0.0002	0.002	0.3	<0.001	0.04	<0.0002	<0.005	<0.01	0.28
No. Samples	2	2	2	2	2	2	2	2	2
Numbulwar	<0.0002	0.003	0.4	<0.001	0.04	<0.0002	<0.005	<0.01	0.16
No. Samples	10	10	10	10	10	10	10	10	12
Peppimenarti	<0.0002	0.0005	0.05	<0.001	0.04	<0.0002	<0.005	<0.01	0.53
No. Samples	9	9	9	9	9	9	9	9	9
Pirlangimpi	<0.0002	<0.0005	<0.05	<0.001	<0.02	<0.0002	<0.005	<0.01	<0.1
No. Samples	2	2	2	2	2	2	2	2	2
Ramingining	<0.0002	<0.0005	<0.05	<0.001	0.02	<0.0002	<0.005	0.05	<0.1
No. Samples	3	3	3	3	3	3	3	3	3

	Lead	Manganese	Mercury	Molybdenum	Nickel	Nitrate*	Radiological	Selenium	Silver	Uranium
	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
	<0.001	0.05	<0.0001	<0.005	<0.002	1	PASS	<0.001	<0.01	0.00041
	2	2	2	2	2	2	4	2	2	2
	0.004	0.01	0.0002	<0.005	<0.002	0.6	PASS	<0.001	<0.01	0.00005
	2	2	2	2	2	2	7	2	2	2
	<0.001	0.03	<0.0001	<0.005	<0.002	0.2	0.3	<0.001	<0.01	0.0012
	2	2	2	2	2	2	6	2	2	2
	0.001	<0.005	<0.0001	<0.005	<0.002	0.8	PASS	<0.001	<0.01	0.00003
	2	2	2	2	2	2	9	2	2	2
	0.003	<0.005	<0.0001	<0.005	<0.002	3	PASS	<0.001	<0.01	0.00003
	2	2	2	2	2	2	6	2	2	2
	<0.001	0.01	<0.0001	<0.005	<0.002	1	PASS	<0.001	<0.01	0.00003
	3	3	3	3	3	2	16	3	3	3
	<0.001	<0.005	<0.0001	<0.005	<0.002	0.6	Not Tested	<0.001	<0.01	<0.00001
	2	2	2	2	2	2		2	2	2
	0.002	<0.005	<0.0001	<0.005	<0.002	0.1	PASS	<0.001	<0.01	0.00006
	3	3	3	3	3	3	7	3	3	3
	0.001	<0.005	<0.0001	<0.005	<0.002	0.7	PASS	<0.001	<0.01	<0.00001
	2	2	2	2	2	2	5	2	2	2
	0.003	0.01	0.0001	<0.005	0.002	7	PASS	<0.001	<0.01	0.00014
	2	2	2	2	2	4	8	2	2	2
	0.002	<0.005	<0.0001	<0.005	0.006	0.6	PASS	<0.001	<0.01	0.00003
	1	2	2	2	2	2	4	2	2	2
	0.001	<0.005	<0.0001	<0.005	<0.002	1	PASS	<0.001	<0.01	0.00011
	2	2	2	2	2	2	3	2	2	2
	<0.001	0.3	<0.0001	<0.005	0.002	0.4	PASS	<0.001	<0.01	0.00007
	6	6	6	6	6	6	4	6	6	6
	<0.001	0.3	<0.0001	<0.005	<0.002	<0.1	PASS	<0.001	<0.01	<0.00001
	2	2	2	2	2	2	6	2	2	2
	<0.001	0.3	<0.0001	<0.005	<0.002	0.8	0.1	<0.001	<0.01	0.00004
	10	10	10	10	10	12	9	10	10	10
	<0.001	0.2	<0.0001	<0.005	<0.002	2	PASS	<0.001	<0.01	0.00002
	9	9	9	9	9	9	6	9	9	9
	<0.001	<0.005	<0.0001	<0.005	<0.002	0.1	PASS	<0.001	<0.01	<0.00001
	2	2	2	2	2	2	3	2	2	2
	<0.001	<0.005	<0.0001	<0.005	<0.002	0.3	PASS	<0.001	<0.01	0.00004
	3	3	3	3	3	3	6	3	3	3

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

	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Copper*	Fluoride*
ADWG	0.003	0.01	2	0.06	4	0.002	0.05	2	1.5
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Umbakumba	<0.0002[1]	<0.0005[1]	<0.05[1]	<0.001[1]	0.02[1]	<0.0002[1]	<0.005[1]	<0.01[1]	1.3
No. Samples	2	2	2	2	2	2	2	2	21
Wadeye	<0.0002	<0.0005	0.05	<0.001	<0.02	<0.0002	<0.005	0.02	0.8
No. Samples	3	3	3	3	3	3	3	3	103
Warruwi	<0.0002	<0.0005	0.2	<0.001	0.04	<0.0002	<0.005	0.05	0.62
No. Samples	5	5	5	5	5	5	5	5	5
Wurrumiyanga	<0.0002	<0.0005	<0.05	<0.001	<0.02	<0.0002	<0.005	0.03	0.7
No. Samples	3	3	3	3	3	3	3	3	66
Yirrkala	<0.0002	<0.0005	<0.05	<0.001	0.02	<0.0002	<0.005	0.05	<0.1
No. Samples	3	3	3	3	3	3	3	3	4

Numbers in bold exceed the guideline value.

Legend: *HU – Hazen Units | NTU – Nephelometric Turbidity Units | [1] Value indicates data from 2014 - 2015*
mg/L – milligrams per litre | µS/cm – microsiemens per centimeter | mSv/yr – millisieverts per year

	Lead	Manganese	Mercury	Molybdenum	Nickel	Nitrate*	Radiological	Selenium	Silver	Uranium
	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
	0.001[1]	0.04[1]	<0.0001[1]	0.02[1]	<0.002[1]	1	PASS	<0.001[1]	<0.01[1]	0.00001[1]
	2	2	2	2	2	2	11	2	2	2
	0.002	0.03	<0.0001	<0.005	0.004	0.2	PASS	<0.001	<0.01	0.00016
	3	3	3	3	3	3	4	3	3	3
	0.004	0.02	<0.0001	<0.005	0.004	0.4	PASS	<0.001	<0.01	0.00069
	5	5	5	5	5	4	20	5	5	5
	0.002	<0.005	<0.0001	<0.005	<0.002	0.1	PASS	<0.001	<0.01	<0.00001
	3	3	3	3	3	3	9	3	3	3
	<0.001	<0.005	<0.0001	<0.005	<0.002	0.5	PASS	<0.001	<0.01	0.00009
	3	3	3	3	3	4	4	3	3	3

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

	Aluminium	Chloride	Copper*	Hardness (as CaCO3)	Iodine (taste threshold)	Iron	Manganese	pH	Silica	Sodium
ADWG	0.2	250	1	200	0.15	0.3	0.1	6.5-8.5	80	180
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	pH Units	mg/L	mg/L
Community	**Aesthetic parameters – mean values**									
Acacia Larrakia	**0.27**	5.6	<0.01	**232**	<0.01	**0.39**	0.024	7.7	19	5
No. Samples	2	2	2	2	2	2	2	2	2	2
Angurugu	<0.02	10.7	0.06	11	<0.01	0.07	0.006	**5.4**	12	7
No. Samples	2	2	2	2	2	2	2	2	2	2
Belyuen	<0.02	6.7	<0.01	11	<0.01	0.12	0.014	7.0	41	10
No. Samples	2	2	2	2	2	2	2	2	2	2
Galiwinku	<0.02	12.3	0.02	5	<0.01	0.04	<0.005	**5.9**	13	8
No. Samples	2	2	2	2	2	2	2	2	2	2
Gapuwiyak	<0.02	10.2	0.01	6	<0.01	0.11	<0.005	**6.0**	11	8
No. Samples	2	2	2	2	2	2	2	2	2	2
Gunbalanya	0.03	4.1	0.01	8	<0.01	0.19	0.005	**5.7**	12	3
No. Samples	3	2	3	2	3	3	3	2	2	2
Gunyangara	<0.02	16.0	0.07	6	<0.01	0.04	<0.005	7.3	10	10
No. Samples	2	2	2	2	2	2	2	2	2	2
Maningrida	<0.02	8.3	0.01	8	<0.01	0.03	<0.005	**6.1**	13	6
No. Samples	3	3	3	3	3	3	3	3	3	3
Milikapiti	0.03	8.8	0.02	33	<0.01	0.06	<0.005	**5.4**	11	7
No. Samples	2	2	2	2	2	2	2	2	2	2
Milingimbi	0.02	109	0.02	43	<0.01	0.03	0.006	**5.5**	18	58
No. Samples	2	4	2	4	2	2	2	4	4	4
Milyakburra	<0.02	87.3	0.13	31	0.03	0.04	<0.005	**5.6**	14	51
No. Samples	2	2	2	2	2	2	2	2	2	2
Minjilang	0.16	24	0.01	4	<0.01	<0.02	<0.005	**5.0**	12	16
No. Samples	2	2	2	2	2	2	2	2	2	2
Nauiyu	<0.02	6	<0.01	109	<0.01	0.16	**0.191**	7.4	36	15
No. Samples	6	6	6	6	6	6	6	6	6	6
Nganmarriyanga	<0.02	27	<0.01	86	<0.01	**0.53**	**0.203**	7.7	37	42
No. Samples	2	2	2	2	2	2	2	2	2	2
Numbulwar	<0.02	29	<0.01	186	<0.01	**0.97**	**0.140**	8.1	16	22
No. Samples	10	12	10	12	10	10	10	12	12	12
Peppimenarti	<0.02	13	<0.01	45	<0.01	**0.37**	0.079	7.0	21	15
No. Samples	9	9	9	9	9	9	9	9	9	9
Pirlangimpi	0.08	9	<0.01	10	<0.01	0.05	<0.005	**6.4**	10	7
No. Samples	2	2	2	2	2	2	2	2	2	2

	Sulfate	TDS	True Colour	Turbidity	Zinc	Alkalinity (as CaCO3)	Bromine	Calcium	Electrical Conductivity	Magnesium	Potassium	Tin
	250	600	15	5	3							
	mg/L	mg/L	HU	NTU	mg/L	mg/L	mg/L	mg/L	µS/cm	mg/L	mg/L	mg/L
						Other parameters – mean values						
	<0.3	226	<2	**9.1**	<0.01	220	0.015	48	419	27.25	1.4	<0.01
	2	2	2	2	2	2	2	2	2	2	2	2
	<0.3	51	<2	1.9	0.04	<20	0.017	3.005	49.9	0.79	0.195	<0.01
	2	2	2	2	2	2	2	2	2	2	2	2
	<0.3	67	<2	1.2	0.02	25	0.006	3.34	72.75	0.7	4.25	<0.01
	2	2	2	2	2	2	2	2	2	2	2	2
	0.44	35	<2	0.8	0.01	<20	0.016	0.507	56.8	0.84	0.675	<0.01
	2	2	2	2	2	2	2	2	2	2	2	2
	<0.3	36	<2	0.9	0.04	<20	0.019	1.032	51.25	0.87	0.12	<0.01
	2	2	2	2	2	2	2	2	2	2	2	2
	<0.3	35	<2	1.6	0.02	<20	0.019	1.93	22.55	0.69	0.215	<0.01
	2	2	2	2	3	2	3	2	2	2	2	3
	<0.3	43	<2	0.5	<0.01	<20	0.017	1.785	63.05	0.4	0.215	<0.01
	2	2	2	2	2	2	2	2	2	2	2	2
	<0.3	27	Not Tested	0.6	<0.01	<20	0.017	2.06	42.2	0.76	1.15	<0.01
	3	3		3	3	3	3	3	3	3	3	3
	<0.3	44	<2	0.6	0.01	<20	0.021	11.756	40.8	0.99	0.155	<0.01
	2	2	2	2	2	2	2	2	2	2	2	2
	9.4	214	<2	0.3	<0.01	<20	0.214	5.87	426.5	7	1.075	<0.01
	4	4	4	4	2	4	2	4	4	4	4	2
	0.65	175	<2	0.8	0.16	<20	0.129	6.765	328	3.35	0.445	<0.01
	2	2	2	2	2	2	2	2	2	2	2	2
	2.9	73	<2	1.5	0.14	<20	0.089	0.176	102	0.84	0.135	<0.01
	2	2	2	2	2	2	2	2	2	2	2	2
	<0.3	169	<2	**6.4**	0.03	126.7	0.02	25.383	276.67	11	0.783	<0.01
	6	6	6	6	6	6	6	6	6	6	6	6
	12	235	4	2.7	<0.01	130	0.079	23.5	390	6.5	6.2	<0.01
	2	2	2	2	2	2	2	2	2	2	2	2
	5.6	245	3	**11.4**	<0.01	167.5	0.092	58.35	443.83	9.625	1.95	<0.01
	12	12	12	12	10	12	10	12	12	12	12	10
	0.53	104	<2	2.4	<0.01	61.89	0.022	11.612	180	3.856	5.544	<0.01
	9	9	9	9	9	9	9	9	9	9	9	9
	<0.3	47	4	1.4	<0.01	<20	0.014	3.718	40.4	0.28	0.08	<0.01
	2	2	2	2	2	2	2	2	2	2	2	2

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

	Aluminium	Chloride	Copper*	Hardness (as CaCO3)	Iodine (taste threshold)	Iron	Manganese	pH	Silica	Sodium
ADWG	0.2	250	1	200	0.15	0.3	0.1	6.5-8.5	80	180
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	pH Units	mg/L	mg/L
Ramingining	0.02	10	0.02	4	<0.01	0.10	<0.005	**5.5**	14	8
No. Samples	3	3	3	3	3	3	3	3	3	3
Umbakumba	<0.02[1]	40	<0.01[1]	14	<0.01[1]	0.03[1]	0.025[1]	**5.5**	10	24
No. Samples	2	2	2	2	2	2	2	2	2	2
Wadeye	<0.02	6	0.01	3	<0.01	0.05	0.014	**5.9**	15	5
No. Samples	3	3	3	3	3	3	3	3	3	3
Warruwi	**1.27**	**416**	0.03	**262**	<0.01	0.18	0.012	**4.8**	13	**193**
No. Samples	5	5	5	5	5	5	5	5	5	5
Wurrumiyanga	<0.02	7	0.02	11	<0.01	<0.02	<0.005	**5.5**	13	5
No. Samples	3	3	3	3	3	3	3	3	3	3
Yirrkala	<0.02	12	0.02	6	<0.01	<0.02	<0.005	**5.6**	12	8
No. Samples	3	4	3	4	3	3	3	4	4	4

Numbers in bold exceed the guideline value.

Legend: *HU – Hazen Units | NTU – Nephelometric Turbidity Units | [1] Value indicates data from 2014 - 2015*
mg/L – milligrams per litre | µS/cm – microsiemens per centimeter | mSv/yr – millisieverts per year

Sulfate	TDS	True Colour	Turbidity	Zinc	Alkalinity (as CaCO3)	Bromine	Calcium	Electrical Conductivity	Magnesium	Potassium	Tin
250	600	15	5	3							
mg/L	mg/L	HU	NTU	mg/L	mg/L	mg/L	mg/L	µS/cm	mg/L	mg/L	mg/L
<0.3	30	<2	1.1	0.02	<20	0.0087	0.573	47.567	0.647	0.223	<0.01
3	3	3	3	3	3	3	3	3	3	3	3
1.7	90	3	1.0	<0.01[1]	<20	0.054[1]	1.365	166	2.5	0.675	<0.01[1]
2	2	2	2	2	2	2	2	2	2	2	2
<0.3	20	2	0.6	<0.01	<20	0.013	0.362	32.636	0.54	0.257	<0.01
3	3	3	3	3	3	3	3	3	3	3	3
28	**703**	<2	1.3	0.03	<20	1.097	17.956	1512	52.68	0.654	<0.01
5	5	4	5	5	5	5	5	5	5	5	5
<0.3	29	Not Tested	0.6	0.01	<20	0.019	3.484	31.7	0.493	0.13	<0.01
3	3		3	3	3	3	3	3	3	3	3
0.6	31	<2	0.7	<0.01	<20	0.019	1.03	55.725	0.795	0.513	<0.01
4	4	4	4	3	4	3	4	4	4	4	3

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

	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Copper*	Fluoride*
ADWG	0.003	0.01	2	0.06	4	0.002	0.05	2	1.5
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Community	**Health parameters – 95th percentile or maximum values**								
Amanbidji	0.0004	0.002	0.2	<0.001	0.8	0.0004	<0.005	0.02	0.43
No. Samples	9	9	9	9	9	9	9	9	11
Barunga	<0.0002	<0.0005	<0.05	<0.001	<0.02	<0.0002	<0.005	<0.01	<0.1
No. Samples	2	2	2	2	2	2	2	2	2
Beswick	**0.007**	0.007	0.2	<0.001	0.02	<0.0002	<0.005	0.2	0.12
No. Samples	8	8	8	8	8	8	8	8	6
Binjari	<0.0002[2]	0.002[2]	0.2[2]	<0.001[2]	0.04[2]	<0.0002[2]	<0.005[2]	0.03[2]	0.45[2]
No. Samples	2	2	2	2	2	2	2	2	2
Bulla	<0.0002	0.004	**10**	<0.001	0.2	<0.0002	<0.005	0.06	1.4
No. Samples	10	10	10	10	10	10	10	10	13
Bulman	<0.0002	<0.0005	<0.05	<0.001	0.02	<0.0002	<0.005	<0.01	0.1
No. Samples	2	2	2	2	2	2	2	2	2
Daguragu	<0.0002	0.002	0.05	<0.001	0.1	<0.0002	<0.005	0.01	0.22
No. Samples	2	2	2	2	2	2	2	2	2
Jilkminggan	<0.0002	<0.0005	<0.05	<0.001	0.4	<0.0002	<0.005	<0.01	0.49
No. Samples	2	2	2	2	2	2	2	2	2
Kalkarindji	<0.0002	0.001	0.1	<0.001	0.1	<0.0002	<0.005	0.01	0.26
No. Samples	2	2	2	2	2	2	2	2	2
Kybrook Farm	0.0004	0.003	<0.05	<0.001	0.02	<0.0002	<0.005	0.1	0.86
No. Samples	12	12	12	12	12	12	12	12	7
Lajamanu	<0.0002	<0.0005	0.1	<0.001	0.2	<0.0002	<0.005	0.06	0.31
No. Samples	2	2	2	2	2	2	2	2	2
Manyallaluk	<0.0002	<0.0005	<0.05	<0.001	<0.02	<0.0002	<0.005	0.04	<0.1
No. Samples	2	2	2	2	2	2	2	2	2
Minyerri	<0.0002	0.003	0.4	<0.001	0.2	<0.0002	<0.005	0.09	0.32
No. Samples	7	7	7	7	7	7	7	7	8
Ngukurr	<0.0002	0.001	0.6	<0.001	0.1	<0.0002	<0.005	0.01	0.32
No. Samples	8	8	8	8	8	8	8	8	8
Pigeon Hole	<0.0002	<0.0005	<0.05	<0.001	0.08	<0.0002	<0.005	0.02	0.26
No. Samples	2	2	2	2	2	2	2	2	2
Rittarangu	<0.0002	<0.0005	0.3	<0.001	0.04	<0.0002	<0.005	<0.01	<0.1
No. Samples	2	2	2	2	2	2	2	2	2
Robinson River	<0.0002	<0.0005	1	<0.001	0.1	<0.0002	<0.005	0.02	1.1
No. Samples	8	8	8	8	8	8	8	8	4
Weemol	<0.0002	0.002	0.05	<0.001	0.6	<0.0002	<0.005	<0.01	0.14
No. Samples	3	3	3	3	3	3	3	3	2
Yarralin	<0.0002	<0.0005	0.5	<0.001	0.08	<0.0002	<0.005	<0.01	0.12
No. Samples	2	2	2	2	2	2	2	2	2

Numbers in bold exceed the guideline value.

Legend: *HU – Hazen Units | NTU – Nephelometric Turbidity Units | [2] Value indicates data from 2015 - 2016*
mg/L – milligrams per litre | μS/cm – microsiemens per centimeter | mSv/yr – millisieverts per year

Lead	Manganese	Mercury	Molybdenum	Nickel	Nitrate*	Radiological	Selenium	Silver	Uranium
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
0.01	0.3	<0.0001	<0.005	0.006	3	PASS	<0.001	<0.01	0.0016
9	9	9	9	9	11	9	9	9	9
<0.001	0.01	<0.0001	<0.005	<0.002	0.1	PASS	<0.001	<0.01	0.00003
2	2	2	2	2	2	3	2	2	2
0.002	<0.005	0.0003	<0.005	<0.002	0.3	PASS	<0.001	<0.01	0.00024
8	8	8	8	8	6	2	8	8	8
<0.001[2]	<0.005[2]	<0.0001[2]	<0.005[2]	<0.002[2]	<0.1[2]	0.3[2]	<0.001[2]	<0.01[2]	0.0014[2]
2	2	2	2	2	2	20	2	2	2
0.001	0.2	<0.0001	<0.005	<0.002	0.4	0.2	<0.001	<0.01	0.00004
10	9	10	10	10	13	4	10	10	10
<0.001	<0.005	<0.0001	<0.005	0.004	0.4	PASS	<0.001	<0.01	0.00027
2	2	2	2	2	2	2	2	2	2
<0.001	<0.005	<0.0001	<0.005	<0.002	4	PASS	<0.001	<0.01	0.0017
2	2	2	2	2	2	2	2	2	2
<0.001	0.06	<0.0001	<0.005	<0.002	0.2	0.03	<0.001	<0.01	0.0088
2	2	2	2	2	2	3	2	2	2
0.001	<0.005	<0.0001	<0.005	<0.002	4	0.1	<0.001	<0.01	0.0016
2	2	2	2	2	2	2	2	2	2
0.002	0.05	<0.0001	<0.005	<0.002	0.3	PASS	<0.001	<0.01	0.00039
12	12	12	12	12	7	5	12	12	12
<0.001	<0.005	<0.0001	<0.005	<0.002	4	PASS	<0.001	<0.01	0.0013
2	2	2	2	2	2	5	2	2	2
0.003	<0.005	<0.0001	<0.005	<0.002	0.2	PASS	<0.001	<0.01	0.00008
2	2	2	2	2	2	2	2	2	2
0.002	0.3	<0.0001	<0.005	0.002	0.2	PASS	<0.001	<0.01	0.00001
7	7	7	7	7	8	6	7	7	7
0.004	0.1	<0.0001	<0.005	0.002	2	PASS	<0.001	<0.01	0.001
8	8	8	8	8	8	8	8	8	8
0.002	<0.005	<0.0001	<0.005	<0.002	20	PASS	<0.001	<0.01	0.0019
2	2	2	2	2	2	2	2	2	2
<0.001	<0.005	0.0003	<0.005	<0.002	1	PASS	<0.001	<0.01	0.00047
2	2	2	2	2	2	4	2	2	2
0.002	0.02	<0.0001	<0.005	<0.002	20	PASS	<0.001	<0.01	0.0032
8	8	8	8	8	4	5	8	8	8
<0.001	<0.005	<0.0001	<0.005	<0.002	0.2	0.07	0.004	<0.01	0.0004
3	3	3	3	3	2	3	3	3	2
<0.001	<0.005	<0.0001	<0.005	<0.002	9	PASS	0.001	<0.01	0.0031
2	2	2	2	2	2	6	2	2	2

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

	Aluminium	Chloride	Copper*	Hardness (as CaCO3)	Iodine (taste threshold)	Iron	Manganese	pH	Silica	Sodium
ADWG	0.2	250	1	200	0.15	0.3	0.1	6.5-8.5	80	180
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	pH Units	mg/L	mg/L
Community	**Aesthetic parameters – mean values**									
Amanbidji	<0.02	136	<0.01	**400**	0.013	0.12	0.059	7.9	31	166
No. Samples	9	11	9	11	9	9	9	11	11	11
Barunga	0.08	10	<0.01	5	<0.01	**0.68**	0.008	**6.3**	17	8
No. Samples	2	2	2	2	2	2	2	2	2	2
Beswick	0.05	6	0.1	**268**	<0.01	0.02	<0.005	7.4	20	5
No. Samples	8	6	8	6	8	8	8	6	6	6
Binjari	<0.02[2]	8[2]	0.02[2]	**346[2]**	<0.01[2]	<0.02[2]	<0.005[2]	7.3[2]	27[2]	9[2]
No. Samples	2	2	2	2	2	2	2	2	2	2
Bulla	<0.02	52	0.01	**228**	<0.01	0.29	0.062	8.1	17	36
No. Samples	10	13	10	13	10	10	9	13	13	13
Bulman	<0.02	13	<0.01	**296**	<0.01	<0.02	<0.005	7.8	21	11
No. Samples	2	2	2	2	2	2	2	2	2	2
Daguragu	<0.02	20	<0.01	**299**	0.01	<0.02	<0.005	7.7	26	32
No. Samples	2	2	2	2	2	2	2	2	2	2
Jilkminggan	<0.02	199	<0.01	**573**	0.13	<0.02	0.043	7.3	46	150
No. Samples	2	2	2	2	2	2	2	2	2	2
Kalkarindji	<0.02	24	<0.01	**276**	0.02	0.04	<0.005	7.6	22	31
No. Samples	2	2	2	2	2	2	2	2	2	2
Kybrook Farm	<0.02	9	0.02	149	<0.01	0.05	0.016	7.3	36	46
No. Samples	12	7	12	7	12	12	12	7	7	7
Lajamanu	<0.02	50	0.03	**208**	0.1	<0.02	<0.005	7.6	**94**	59
No. Samples	2	2	2	2	2	2	2	2	2	2
Manyallaluk	0.04	6	0.03	3	<0.01	0.07	<0.005	**5.2**	23	5
No. Samples	2	2	2	2	2	2	2	2	2	2
Minyerri	<0.02	15	0.03	106	<0.01	0.64	0.115	7.3	31	24
No. Samples	7	8	7	8	7	7	7	8	8	8
Ngukurr	0.06	**491**	<0.01	**745**	0.012	**0.40**	0.015	7.5	21	137
No. Samples	8	8	8	8	8	8	8	8	8	8
Pigeon Hole	<0.02	15	0.02	**333**	<0.01	<0.02	<0.005	7.4	51	28
No. Samples	2	2	2	2	2	2	2	2	2	2
Rittarangu	<0.02	22	<0.01	**277**	<0.01	<0.02	<0.005	7.6	20	12
No. Samples	2	2	2	2	2	2	2	2	2	2
Robinson River	<0.02	36	<0.01	**524**	0.019	0.02	<0.005	7.9	33	19
No. Samples	8	4	8	4	8	8	8	4	4	4
Weemol	<0.02	13	<0.01	**350**	0.06	<0.02	<0.005	7.4	29	12
No. Samples	3	2	3	2	3	3	3	2	2	2
Yarralin	<0.02	17	<0.01	**352**	<0.01	0.06	<0.005	7.8	33	17
No. Samples	2	2	2	2	2	2	2	2	2	2

Numbers in bold exceed the guideline value.

***Legend:** HU – Hazen Units | NTU – Nephelometric Turbidity Units | [2] Value indicates data from 2015 - 2016*
mg/L – milligrams per litre | µS/cm – microsiemens per centimeter | mSv/yr – millisieverts per year

Sulfate	TDS	True Colour	Turbidity	Zinc	Alkalinity (as CaCO3)	Bromine	Calcium	Electrical Conductivity	Magnesium	Potassium	Tin
250	600	15	5	3							
mg/L	mg/L	HU	NTU	mg/L	mg/L	mg/L	mg/L	µS/cm	mg/L	mg/L	mg/L
					Other parameters – mean values						
120	**843**	<2	1.5	0.32	431.8	0.214	58.545	1498.2	61.64	3.891	<0.01
11	11	11	11	9	11	9	11	11	11	11	9
<0.3	45	8	2.7	0.04	<20	0.026	0.726	56.55	0.67	0.57	<0.01
2	2	2	2	2	2	2	2	2	2	2	2
<0.3	268	<2	0.8	0.07	273.3	0.02	52.883	515.67	32.9	1.6	<0.01
6	6	6	6	8	6	8	6	6	6	6	8
8.4[2]	363[2]	<2[2]	0.3[2]	0.01[2]	310[2]	0.042[2]	82.45[2]	601[2]	33.85[2]	4.65[2]	<0.01[2]
2	2	2	2	2	2	2	2	2	2	2	2
<0.3	323	<2	2.0	0.01	238.5	0.137	44.477	623.54	28.32	6.892	<0.01
13	13	13	13	10	13	10	13	13	13	13	10
<0.3	336	<2	0.3	<0.01	335	0.019	58	643	36.65	2.1	<0.01
2	2	2	2	2	2	2	2	2	2	2	2
<0.3	336	<2	0.6	0.01	300	0.119	58.5	633	37.05	4.2	<0.01
2	2	2	2	2	2	2	2	2	2	2	2
135	**1100**	<2	0.9	0.01	500	0.58	98	1855	79.6	20.5	<0.01
2	2	2	2	2	2	2	2	2	2	2	2
<0.3	319	<2	0.7	<0.01	280	0.122	57.5	612	32.5	4.8	<0.01
2	2	2	2	2	2	2	2	2	2	2	2
<0.3	264	<2	0.9	0.01	234.3	0.025	29.7	462.86	18.16	1.486	<0.01
7	7	7	7	12	7	12	7	7	7	7	12
<0.3	416	<2	0.8	0.02	235	0.361	31.5	639	31.25	7.7	<0.01
2	2	2	2	2	2	2	2	2	2	2	2
<0.3	31	<2	0.6	0.05	<20	0.015	0.218	32.45	0.53	0.37	<0.01
2	2	2	2	2	2	2	2	2	2	2	2
7.9	192	<2	**5.5**	0.14	127.5	0.036	22.4	327	12.04	5.4	<0.01
8	8	8	8	7	8	7	8	8	8	8	7
19	**1051**	<2	3.7	0.03	328.8	1.371	121.63	2258.8	107.1	7.6	<0.01
8	8	8	8	8	8	8	8	8	8	8	8
<0.3	398	<2	0.6	0.02	330	0.072	73	712	36.5	1.9	<0.01
2	2	2	2	2	2	2	2	2	2	2	2
<0.3	314	<2	0.3	<0.01	280	0.047	52	589	35.55	2.8	<0.01
2	2	2	2	2	2	2	2	2	2	2	2
<0.3	515	<2	0.4	0.03	475	0.125	45.875	990.5	99.38	3.65	<0.01
4	4	4	4	8	4	8	4	4	4	4	8
<0.3	390	<2	0.6	0.02	390	0.209	64.5	739	45.75	2.4	<0.01
2	2	2	2	3	2	3	2	2	2	2	3
<0.3	388	<2	0.8	0.03	360	0.086	73.5	735	40.75	2.7	<0.01
2	2	2	2	2	2	2	2	2	2	2	2

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

	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Copper*	Fluoride*
ADWG	0.003	0.01	2	0.06	4	0.002	0.05	2	1.5
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Community	**Health parameters – 95th percentile or maximum values**								
Ali Curung	<0.0002	<0.0005	<0.05	<0.001	0.8	<0.0002	<0.005	0.03	1.5
No. Samples	6	6	6	6	6	6	6	6	4
Alpurrurulam	<0.0002	0.002	0.1	<0.001	0.3	<0.0002	<0.005	0.04	**1.8**
No. Samples	5	5	5	5	5	5	5	5	4
Canteen Creek	<0.0002	<0.0005	0.2	<0.001	0.3	<0.0002	<0.005	0.02	0.5
No. Samples	4	4	4	4	4	4	4	4	2
Imangara	<0.0002	0.001	0.5	<0.001	0.3	<0.0002	<0.005	<0.01	0.85
No. Samples	2	2	2	2	2	2	2	2	2
Nturiya	<0.0002	<0.0005	<0.05	<0.001	0.6	<0.0002	<0.005	0.01	1.1
No. Samples	2	2	2	2	2	2	2	2	2
Tara	<0.0002	0.001	0.05	<0.001	0.6	<0.0002	<0.005	0.1	0.94
No. Samples	2	2	2	2	2	2	2	2	4
Willowra	<0.0002	0.003	0.05	<0.001	0.6	<0.0002	<0.005	0.05	0.88
No. Samples	7	7	7	7	7	7	7	6	10
Wilora	0.0002	0.002	0.05	<0.001	0.9	<0.0002	<0.005	0.1	1
No. Samples	6	6	6	6	6	6	6	6	8
Wutunugurra	<0.0002	0.001	0.5	<0.001	0.1	<0.0002	<0.005	0.02	0.24
No. Samples	4	4	4	4	4	4	4	4	2

Numbers in bold exceed the guideline value.

Legend: *HU – Hazen Units | NTU – Nephelometric Turbidity Units | mg/L – milligrams per litre*
µS/cm – microsiemens per centimeter | mSv/yr – millisieverts per year

Lead	Manganese	Mercury	Molybdenum	Nickel	Nitrate*	Radiological	Selenium	Silver	Uranium
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
0.001	<0.005	<0.0001	<0.005	<0.002	40	0.1	<0.001	<0.01	0.0003
6	6	6	6	6	4	4	6	6	6
<0.001	<0.005	<0.0001	<0.005	<0.002	3	0.1	0.002	<0.01	0.012
5	5	5	5	5	4	12	5	5	5
<0.001	<0.005	<0.0001	<0.005	<0.002	10	0.4	0.001	<0.01	0.0021
4	4	4	4	4	2	6	4	4	4
<0.001	<0.005	<0.0001	<0.005	<0.002	7	0.03	<0.001	<0.01	0.011
2	2	2	2	2	2	2	2	2	2
0.001	<0.005	<0.0001	<0.005	<0.002	40	0.04	0.004	<0.01	0.015
2	2	2	2	2	2	2	2	2	2
0.002	0.02	<0.0001	<0.005	0.006	30	0.1	0.002	<0.01	0.0051
2	2	2	2	2	4	4	2	2	2
<0.001	<0.005	<0.0001	<0.005	0.006	40	0.04	0.004	<0.01	**0.033**
7	7	7	7	7	10	7	7	7	7
0.003	<0.005	<0.0001	<0.005	<0.002	20	0.05	0.005	<0.01	**0.023**
6	6	6	6	6	8	12	6	6	6
<0.001	0.01	<0.0001	<0.005	<0.002	3	0.2	<0.001	<0.01	0.0018
4	4	4	4	4	2	6	4	4	4

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

	Aluminium	Chloride	Copper*	Hardness (as CaCO3)	Iodine (taste threshold)	Iron	Manganese	pH	Silica	Sodium
ADWG	0.2	250	1	200	0.15	0.3	0.1	6.5-8.5	80	180
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	pH Units	mg/L	mg/L
Community	**Aesthetic parameters – mean values**									
Ali Curung	<0.02	71	0.02	11	0.09	<0.02	<0.005	8.0	55	112
No. Samples	6	4	6	4	6	6	6	4	4	4
Alpurrurulam	<0.02	183	0.02	**485**	0.10	0.02	<0.005	7.6	60	140
No. Samples	5	4	5	4	5	5	5	4	4	4
Canteen Creek	<0.02	100	0.01	184	0.085	0.10	<0.005	7.1	47	89
No. Samples	4	2	4	2	4	4	4	2	2	2
Imangara	<0.02	23	<0.01	**274**	0.045	0.04	<0.005	7.9	71	33
No. Samples	2	2	2	2	2	2	2	2	2	2
Nturiya	<0.02	**345**	<0.01	**297**	**0.24**	<0.02	<0.005	7.7	72	**270**
No. Samples	2	2	2	2	2	2	2	2	2	2
Tara	<0.02	**352**	0.08	**316**	**0.27**	0.30	0.009	7.0	20	**207**
No. Samples	2	4	2	4	2	2	2	4	4	4
Willowra	<0.02	172	0.01	**248**	**0.17**	0.02	<0.005	7.9	74	134
No. Samples	7	10	6	10	7	7	7	10	10	10
Wilora	<0.02	**533**	0.03	**615**	**0.22**	<0.02	<0.005	7.9	74	**311**
No. Samples	6	8	6	8	6	6	6	8	8	8
Wutunugurra	<0.02	40	0.01	187	0.043	0.03	<0.005	7.4	54	33
No. Samples	4	2	4	2	4	4	4	2	2	2

Numbers in bold exceed the guideline value.

Legend: *HU – Hazen Units | NTU – Nephelometric Turbidity Units | mg/L – milligrams per litre*
µS/cm – microsiemens per centimeter | mSv/yr – millisieverts per year

	Sulfate	TDS	True Colour	Turbidity	Zinc	Alkalinity (as CaCO3)	Bromine	Calcium	Electrical Conductivity	Magnesium	Potassium	Tin
	250	600	15	5	3							
	mg/L	mg/L	HU	NTU	mg/L	mg/L	mg/L	mg/L	µS/cm	mg/L	mg/L	mg/L
						Other parameters – mean values						
	1.5	360	<2	0.6	0.02	160	0.375	1.615	621	1.65	20.075	<0.01
	4	4	4	4	6	4	6	4	4	4	4	6
	58	**887**	<2	0.6	0.01	455	0.57	63.475	1600	79.275	6.875	<0.01
	4	4	4	4	5	4	5	4	4	4	4	5
	22	447	<2	2.8	0.01	210	0.377	26.3	830	28.65	12.9	<0.01
	2	2	2	2	4	2	4	2	2	2	2	4
	<0.3	442	<2	<0.1	<0.01	320	0.186	42.8	720	40.55	29.6	<0.01
	2	2	2	2	2	2	2	2	2	2	2	2
	165	**1200**	<2	0.8	0.07	200	3.04	72	1980	28.35	23.5	<0.01
	2	2	2	2	2	2	2	2	2	2	2	2
	126	**1005**	<2	4.4	0.15	200	1.036	36.175	1850	54.9	26.7	<0.01
	4	4	4	4	2	4	2	4	4	4	4	2
	59	**754**	<2	0.2	0.04	242	0.775	49.76	1266	30.01	30.85	<0.01
	10	10	10	10	7	10	7	10	10	10	10	7
	186	**1661**	<2	0.5	0.04	381.25	3.24	96.875	2865	90.538	56.525	<0.01
	8	8	8	8	6	8	6	8	8	8	8	6
	2	321	<2	0.3	0.06	190	0.169	42.75	530	19.4	7.45	<0.01
	2	2	2	2	4	2	4	2	2	2	2	4

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

	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Copper*	Fluoride*	Lead
ADWG	0.003	0.01	2	0.06	4	0.002	0.05	2	1.5	0.01
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Community	**Health parameters – 95th percentile or maximum values**									
Amoonguna	<0.0002	0.0005	0.1	<0.001	0.2	<0.0002	<0.005	0.06	0.5	0.007
No. Samples	6	6	6	6	6	6	6	6	6	6
Ampilatwatja	<0.0002	0.0005	<0.05	<0.001	0.4	<0.0002	<0.005	0.01	1.2	0.001
No. Samples	4	4	4	4	4	4	4	4	4	4
Areyonga	<0.0002	<0.0005	0.1	<0.001	0.2	<0.0002	<0.005	0.01	0.43	<0.001
No. Samples	4	4	4	4	4	4	4	4	4	4
Atitjere	<0.0002	<0.0005	0.05	<0.001	0.1	<0.0002	<0.005	<0.01	0.63	<0.001
No. Samples	2	2	2	2	2	2	2	2	4	2
Engawala	<0.0002	<0.0005	0.2	<0.001	0.3	<0.0002	<0.005	<0.01	0.67	<0.001
No. Samples	4	4	4	4	4	4	4	4	2	4
Finke	<0.0002	0.0005	0.2	<0.001	0.08	<0.0002	<0.005	0.02	0.19	<0.001
No. Samples	2	2	2	2	2	2	2	2	4	2
Haasts Bluff	<0.0002	<0.0005	0.05	<0.001	0.4	<0.0002	<0.005	0.02	0.57	<0.001
No. Samples	2	2	2	2	2	2	2	2	4	2
Hermannsburg	<0.0002	0.0005	<0.05	<0.001	0.2	<0.0002	<0.005	<0.01	0.38	<0.001
No. Samples	4	4	4	4	4	4	4	4	4	4
Imanpa	<0.0002	0.001	<0.05	<0.001	0.9	<0.0002	0.005	0.02	0.87	<0.001
No. Samples	6	6	6	6	6	6	6	6	6	6
Kaltukatjara	<0.0002	<0.0005	<0.05	<0.001	0.1	<0.0002	<0.005	0.02	0.41	<0.001
No. Samples	2	2	2	2	2	2	2	2	2	2
Kintore	<0.0002	0.001	0.05	<0.001	0.3	<0.0002	<0.005	0.02	0.81	0.001
No. Samples	17	17	17	17	17	17	17	17	15	17
Laramba	<0.0002	0.001	0.3	<0.001	0.6	<0.0002	<0.005	0.03	1.2	0.005
No. Samples	12	12	12	12	12	12	12	12	6	12
Mt Liebig	<0.0002	<0.0005	0.05	<0.001	0.3	<0.0002	<0.005	0.02	<0.1	<0.001
No. Samples	4	4	4	4	4	4	4	4	4	4
Nyirripi	<0.0002	0.002	0.1	<0.001	0.4	<0.0002	<0.005	<0.01	**1.9**	<0.001
No. Samples	8	8	8	8	8	8	8	8	8	8
Papunya	<0.0002	<0.0005	0.2	<0.001	0.4	<0.0002	<0.005	0.02	1.1	<0.001
No. Samples	2	2	2	2	2	2	2	2	4	2
Pmara Jutunta	<0.0002	0.001	0.1	<0.001	0.4	<0.0002	<0.005	0.01	0.83	<0.001
No. Samples	2	2	2	2	2	2	2	2	2	2
Santa Teresa	<0.0002	<0.0005	0.4	<0.001	0.08	<0.0002	<0.005	0.02	0.2	0.001
No. Samples	2	2	2	2	2	2	2	2	4	2
Titjikala	<0.0002	0.001	0.4	<0.001	0.1	<0.0002	<0.005	0.02	0.59	<0.001
No. Samples	2	2	2	2	2	2	2	2	4	2
Wallace Rockhole	<0.0002	0.001	<0.05	<0.001	0.4	<0.0002	**0.06**	0.03	0.95	<0.001
No. Samples	4	4	4	4	4	4	4	4	4	4
Yuelamu	<0.0002[2]	<0.0005[2]	<0.05[2]	<0.001[2]	2[2]	<0.0002[2]	<0.005[2]	<0.01[2]	1.1[2]	<0.001[2]
No. Samples	2	2	2	2	2	2	2	2	1	2
Yuendumu	<0.0002	<0.0005	<0.05	<0.001	0.3	<0.0002	<0.005	0.02	0.61	<0.001
No. Samples	4	4	4	4	4	4	4	4	2	4

	Manganese	Mercury	Molybdenum	Nickel	Nitrate*	Radiological	Selenium	Silver	Uranium
	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
	0.3	<0.0001	<0.005	<0.002	8	PASS	0.001	<0.01	0.0099
	6	6	6	6	6	3	6	6	6
	<0.005	<0.0001	<0.005	<0.002	30	0.03	0.002	<0.01	0.0095
	4	4	4	4	4	4	4	4	4
	<0.005	<0.0001	<0.005	0.004	8	0.1	0.002	<0.01	0.0095
	4	4	4	4	4	4	4	4	4
	<0.005	<0.0001	<0.005	<0.002	20	PASS	0.002	<0.01	0.0063
	2	2	2	2	4	6	2	2	2
	<0.005	<0.0001	<0.005	<0.002	30	PASS	0.004	<0.01	0.0089
	4	4	4	4	2	12	4	4	4
	<0.005	<0.0001	<0.005	<0.002	9	PASS	<0.001	<0.01	0.003
	2	2	2	2	4	2	2	2	2
	<0.005	<0.0001	<0.005	0.006	9	0.2	0.002	<0.01	0.013
	2	2	2	2	4	6	2	2	2
	0.08	<0.0001	<0.005	0.004	5	PASS	0.001	<0.01	0.0049
	4	4	4	4	4	6	4	4	4
	<0.005	0.0001	<0.005	0.006	30	0.34	0.004	<0.01	0.013
	6	6	6	6	6	12	6	6	6
	0.005	<0.0001	<0.005	<0.002	0.1	PASS	<0.001	<0.01	<0.00001
	2	2	2	2	2	6	2	2	2
	<0.005	<0.0001	<0.005	<0.002	50	0.3	0.004	<0.01	0.0018
	17	17	17	17	15	11	17	17	17
	<0.005	<0.0001	<0.005	<0.002	40	0.05	0.004	<0.01	**0.047**
	12	12	12	12	6	15	12	12	12
	<0.005	<0.0001	<0.005	<0.002	20	PASS	0.002	<0.01	0.0065
	4	4	4	4	4	4	4	4	4
	<0.005	<0.0001	<0.005	<0.002	40	0.2	0.002	<0.01	0.01
	8	8	8	8	8	6	8	8	8
	<0.005	<0.0001	<0.005	<0.002	30	PASS	0.009	<0.01	0.013
	2	2	2	2	4	6	2	2	2
	<0.005	<0.0001	<0.005	<0.002	50	PASS	0.002	<0.01	0.009
	2	2	2	2	2	2	2	2	2
	<0.005	<0.0001	<0.005	<0.002	10	PASS	0.003	<0.01	0.0039
	2	2	2	2	4	6	2	2	2
	<0.005	<0.0001	<0.005	0.004	20	PASS	<0.001	<0.01	0.0039
	2	2	2	2	4	4	2	2	2
	<0.005	<0.0001	<0.005	<0.002	20	0.2	0.004	<0.01	0.0068
	4	4	4	4	4	4	4	4	4
	0.03[2]	<0.0001[2]	<0.005[2]	<0.002[2]	20[2]	0.5[2]	<0.001[2]	<0.01[2]	0.0078[2]
	2	2	2	2	1	17	2	2	2
	<0.005	<0.0001	<0.005	<0.002	5	0.1	0.001	<0.01	0.011
	4	4	4	4	2	14	4	4	4

Numbers in bold exceed the guideline value.

Legend:

HU – Hazen Units

NTU – Nephelometric Turbidity Units

[2] Value indicates data from 2015 - 2016

mg/L – milligrams per litre

µS/cm – microsiemens per centimeter

mSv/yr – millisieverts per year

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

	Aluminium	Chloride	Copper*	Hardness (as CaCO3)	Iodine (taste threshold)	Iron	Manganese	pH	Silica	Sodium
ADWG	0.2	250	1	200	0.15	0.3	0.1	6.5-8.5	80	180
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	pH Units	mg/L	mg/L
Community	**Aesthetic parameters – mean values**									
Amoonguna	0.04	72	0.04	**229**	0.04	0.02	0.083	7.4	17	82
No. Samples	6	6	6	6	6	6	6	6	6	6
Ampilatwatja	<0.02	179	<0.01	**502**	0.11	<0.02	<0.005	7.7	36	133
No. Samples	4	4	4	4	4	4	4	4	4	4
Areyonga	<0.02	117	<0.01	**460**	0.06	0.02	<0.005	7.7	16	62
No. Samples	4	4	4	4	4	4	4	4	4	4
Atitjere	<0.02	66	<0.01	**229**	0.04	<0.02	<0.005	8.1	33	77
No. Samples	2	4	2	4	2	2	2	4	4	4
Engawala	<0.02	76	<0.01	**356**	0.07	<0.02	<0.005	7.8	63	64
No. Samples	4	2	4	2	4	4	4	2	2	2
Finke	0.04	166	0.01	**214**	0.01	0.08	<0.005	7.6	16	93
No. Samples	2	4	2	4	2	2	2	4	4	4
Haasts Bluff	<0.02	**387**	0.01	**593**	0.19	0.03	<0.005	7.5	43	161
No. Samples	2	4	2	4	2	2	2	4	4	4
Hermannsburg	<0.02	109	<0.01	**318**	0.055	0.17	0.031	8.0	14	62
No. Samples	4	4	4	4	4	4	4	4	4	4
Imanpa	<0.02	**395**	<0.01	**510**	**0.3**	0.02	<0.005	8.0	27	**254**
No. Samples	6	6	6	6	6	6	6	6	6	6
Kaltukatjara	<0.02	68	0.01	**264**	0.06	0.07	<0.005	7.6	11	44
No. Samples	2	2	2	2	2	2	2	2	2	2
Kintore	<0.02	62	<0.01	149	0.052	<0.02	<0.005	7.5	**82**	84
No. Samples	17	15	17	15	17	17	17	15	15	15
Laramba	<0.02	112	0.01	**304**	**0.18**	<0.02	<0.005	7.6	**85**	83
No. Samples	12	6	12	6	12	12	12	6	6	6
Mt Liebig	0.02	119	0.01	**316**	0.12	0.04	<0.005	7.6	45	107
No. Samples	4	4	4	4	4	4	4	4	4	4
Nyirripi	<0.02	98	<0.01	**250**	0.081	<0.02	<0.005	8.0	**81**	89
No. Samples	8	8	8	8	8	8	8	8	8	8
Papunya	<0.02	233	0.01	**277**	**0.18**	<0.02	<0.005	8.1	57	**240**
No. Samples	2	4	2	4	2	2	2	4	4	4
Pmara Jutunta	<0.02	71	<0.01	**205**	0.1	<0.02	<0.005	7.7	80	68
No. Samples	2	2	2	2	2	2	2	2	2	2
Santa Teresa	0.03	11	0.01	**269**	<0.01	0.02	<0.005	7.8	18	8
No. Samples	2	4	2	4	2	2	2	4	4	4
Titjikala	<0.02	31	0.02	**229**	0.02	<0.02	<0.005	7.6	31	31
No. Samples	2	4	2	4	2	2	2	4	4	4
Wallace Rockhole	<0.02	156	0.02	**310**	0.083	0.19	<0.005	7.7	11	102
No. Samples	4	4	4	4	4	4	4	4	4	4
Yuelamu	<0.02[2]	54[2]	<0.01[2]	33[2]	**0.16[2]**	<0.02[2]	0.016[2]	7.5[2]	80[2]	65[2]
No. Samples	2	1	2	1	2	2	2	1	1	1
Yuendumu	<0.02	215	<0.01	**430**	**0.16**	0.1	<0.005	7.9	13	124
No. Samples	4	2	4	2	4	4	4	2	2	2

Numbers in bold exceed the guideline value.

Legend: *HU – Hazen Units | NTU – Nephelometric Turbidity Units | [2] Value indicates data from 2015 - 2016*
mg/L – milligrams per litre | µS/cm – microsiemens per centimeter | mSv/yr – millisieverts per year

Sulfate	TDS	True Colour	Turbidity	Zinc	Alkalinity (as CaCO3)	Bromine	Calcium	Electrical Conductivity	Magnesium	Potassium	Tin
250	600	15	5	3							
mg/L	mg/L	HU	NTU	mg/L	mg/L	mg/L	mg/L	µS/cm	mg/L	mg/L	mg/L
					Other parameters – mean values						
44	432	<2	**6.7**	0.02	230	0.197	52.717	794.333	23.55	6.117	<0.01
6	6	6	6	6	6	6	6	6	6	6	6
189	**992**	<2	0.3	0.02	295	0.852	107.75	1617.5	56.65	23.3	<0.01
4	4	4	4	4	4	4	4	4	4	4	4
62	**636**	<2	0.5	0.02	335	0.391	86.65	1180	59.05	8.775	<0.01
4	4	4	4	4	4	4	4	4	4	4	4
60	462	<2	0.4	<0.01	215	0.181	36.4	818.5	33.55	7.775	<0.01
4	4	4	4	2	4	2	4	4	4	4	2
18	547	<2	0.7	0.08	330	0.491	73	945	42.1	6.3	<0.01
2	2	2	2	4	2	4	2	2	2	2	4
56	504	<2	0.7	0.05	120	0.243	62.3	937.5	14.275	6.725	<0.01
4	4	4	4	2	4	2	4	4	4	4	2
232	**1213**	<2	0.5	0.10	225	1.7	114.25	2085	74.55	27.475	<0.01
4	4	4	4	2	4	2	4	4	4	4	2
39	491	<2	2.0	0.01	233.5	0.304	63.675	917.5	38.35	7.025	<0.01
4	4	4	4	4	4	4	4	4	4	4	4
233	**1360**	<2	0.5	0.02	206.67	2.073	101.017	2265	62.517	30.617	<0.01
6	6	6	6	6	6	6	6	6	6	6	6
35	412	<2	0.4	0.04	230	0.263	51.45	765	32.9	9.45	<0.01
2	2	2	2	2	2	2	2	2	2	2	2
4	420	<2	0.3	<0.01	204	0.468	23.233	663.333	22.073	2.793	<0.01
15	15	15	15	17	15	17	15	15	15	15	17
25	**647**	<2	0.3	0.02	293.33	0.271	62.317	1085	36.1	37.867	<0.01
6	6	6	6	12	6	12	6	6	6	6	12
90	**649**	<2	0.8	0.03	255	0.278	71.375	1110	33.35	13.875	<0.01
4	4	4	4	4	4	4	4	4	4	4	4
21	590	<2	0.2	<0.01	270	0.201	49.713	957.5	30.538	35.725	<0.01
8	8	8	8	8	8	8	8	8	8	8	8
73	**1005**	<2	0.5	0.02	415	1.06	57.85	1737.5	32.075	11.675	<0.01
4	4	4	4	2	4	2	4	4	4	4	2
20	519	<2	0.7	<0.01	205	0.34	46	809	21.6	16	<0.01
2	2	2	2	2	2	2	2	2	2	2	2
<0.3	297	<2	0.3	0.02	240	0.044	69.85	526	23.05	4.15	<0.01
4	4	4	4	2	4	2	4	4	4	4	2
7	344	<2	**6.2**	0.02	225	0.083	67.575	591.5	14.75	3.875	<0.01
4	4	4	4	2	4	2	4	4	4	4	2
62	593	<2	1.5	0.03	220	0.383	74.65	1097.5	29.85	9.375	<0.01
4	4	4	4	4	4	4	4	4	4	4	4
7[2]	266[2]	<2[2]	0.2[2]	<0.01[2]	80[2]	0.528[2]	10[2]	370[2]	5[2]	5[2]	<0.01[2]
1	1	1	1	2	1	2	1	1	1	1	2
94	**822**	2	1.7	0.07	265	0.677	93	1450	47.9	18.55	<0.01
2	2	2	2	4	2	4	2	2	2	2	4

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