Wastewater Quality

Annual Report 2024-25

WATER CORPORATION

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About this report

Water Corporation's 2024-25 Wastewater Quality Annual Report is a review of performance for the financial year ending 30 June 2025.

This report is specifically designed to provide the Department of Health, our customers and the Western Australian community with information on wastewater services and how we manage metropolitan and regional wastewater and recycled water schemes to meet quality and health requirements.

This is the sixth Wastewater Quality Annual Report made available to the public on our website. Publication of this report allows us to meet the requirements of our Water Services Licence with the Economic Regulation Authority and Memorandum of Understanding for Wastewater Services and Groundwater Replenishment (GWR) with the Department of Health.

In the spirit of reconciliation, Water Corporation acknowledges the Traditional Custodians of Country throughout Western Australia and their enduring connections to land, sea, and community. We pay our respects to Elders past and present and extend that respect to all Aboriginal and Torres Strait Islander peoples today.

Further information and feedback

For further information about the wastewater services we provide, or to provide feedback on this report:

- visit watercorporation.com.au/wastewaterquality
- contact us on-line
- call us on 13 13 85

Acronyms

Acronym	Description
ADWG	Australian Drinking Water Guidelines
AWRP	Advanced Water Recycling Plant
BOD	Biological Oxygen Demand
CCP	Critical Control Point
cfu/100ml	Colony forming units per 100ml
DEC	Department of Environment and Conservation
DWER	Department of Water and Environmental Regulation
DoH	Department of Health
GAR	Goldfields and Agricultural Region
GSR	Great Southern Region
GWR	Groundwater Replenishment
kL	Kilolitres
mg	Milligrams
µg	Micrograms
MAR	Managed Aquifer Recharge
ML	Megalitre
MoU	Memorandum of Understanding
MWR	Mid West Region
NWR	North West Region
ng/L	Nanograms per litre
NTU	Nephelometric Turbidity Units
pg/L	Picograms per litre
PCT	Process Control Table
pfu/100ml	Plaque forming units per 100ml
RO	Reverse Osmosis

Acronym	Description
RWQI	Recycled Water Quality Indicator
RWQMP	Recycled Water Quality Management Plan
RWQP	Recycled Water Quality Parameter
SWR	South West Region
TCL	Total chlorine
TWW	Treated wastewater
UF	Ultra-filtration
UV	Ultraviolet disinfection
WRRF	Water Resource Recovery Facility
WWTP	Wastewater Treatment Plant

Our commitment

Water Corporation is the principal wastewater service provider across Western Australia with the foremost responsibility for delivery of recycling and beneficial reuse of wastewater products. We manage wastewater from industry and the community and are committed to the responsible use and disposal of the products generated by our wastewater service to meet public health, environment, and social expectations. Our products are treated wastewater, recycled water, biosolids, gaseous emissions and residual wastes. We partner with our stakeholders and relevant agencies to deliver on our commitment to:

- Implement the Wastewater Quality Framework.
- Progressively adopt a best-practice management and multi-barrier approach to manage wastewater risks from source to end point. This ensures the quality of wastewater products.
- Meet public health, environmental, social and corporate expectations in the management of wastewater services as detailed in agreements, licences, regulations and corporate standards.
- Contribute to the development of wastewater regulations, guidelines, and other standards relevant to public health and the environment.
- Routinely monitor our systems and use effective reporting mechanisms to provide relevant and timely information on our performance.
- Use appropriate contingency planning and maintain incident response capability.
- Continually improve our practices by assessing performance against corporate objectives and stakeholder expectations.
- Engage with employees, contractors, stakeholders, and the community to inform them of relevant issues related to wastewater management and products and listen to their expectations to maintain our social licence to operate.
- Maintain communication and partnerships with relevant agencies and users of wastewater products to continually improve wastewater quality and environmental outcomes.
- Participate in appropriate research and development activities to develop the necessary skills and knowledge to support the operation of the Wastewater Quality Framework.
- Implement and maintain processes and procedures consistent with the WA Guidelines for Biosolids Management to safely and sustainably manage biosolids and sludge recovery.

Figure 1: Carnarvon treated wastewater storage ponds

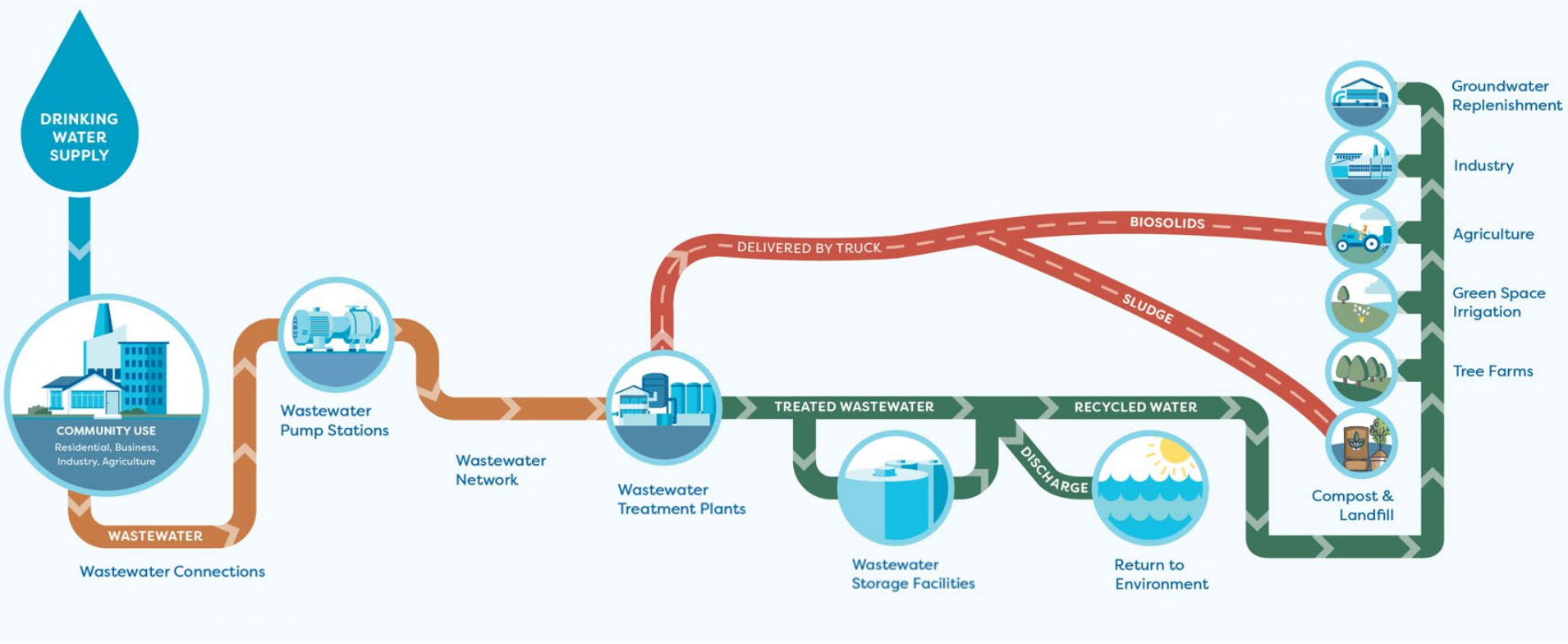


Figure 2: Wastewater - general scheme

Introduction

Water Corporation is committed to the safe and effective management of wastewater, recycled water, groundwater replenishment, and biosolids and sludge.

We are committed to ensuring the regulatory compliance of all our wastewater operations, and to transparently report to and discuss with our health regulator, Department of Health (DoH), any non-compliance. Our processes and procedures ensure the prompt response and management of any wastewater incidents and complaints.

Water Corporation provides wastewater services throughout Western Australia and the Indian Ocean Territories (Christmas and Cocos Islands)[1]. We manage the state's services through six regions: Goldfields and Agricultural Region, Great Southern Region, Mid West Region, North West Region, Perth Region and South West Region. As part of these services, we managed the daily treatment of more than 500 million litres of wastewater (more than 183 billion litres for the year) through 108 treatment plants across these regions and the Indian Ocean Territories.

Products that are generated following the treatment process are either recycled or safely disposed to the environment. There were 72 DoH approved recycled water schemes, owned, and operated by Water Corporation, local government, or other third-party recipients supplying recycled water for industrial use, irrigation of public open spaces, and woodlots. All wastewater treatment and recycling plants are listed in Appendix A.

To ensure we continue to provide a high level of service to customers and produce treated wastewater that is safe and fit-for-purpose, we have ongoing engagement with internal and external stakeholders, local government, and regulators.

Memorandum of Understanding

Water Corporation operates under the Memorandum of Understanding (MoU) for Wastewater Services and Groundwater Replenishment (GWR) with DoH.

The MoU applies to the entire wastewater service from collection to disposal and/or beneficial use, including the Groundwater Replenishment Scheme (GWRS).

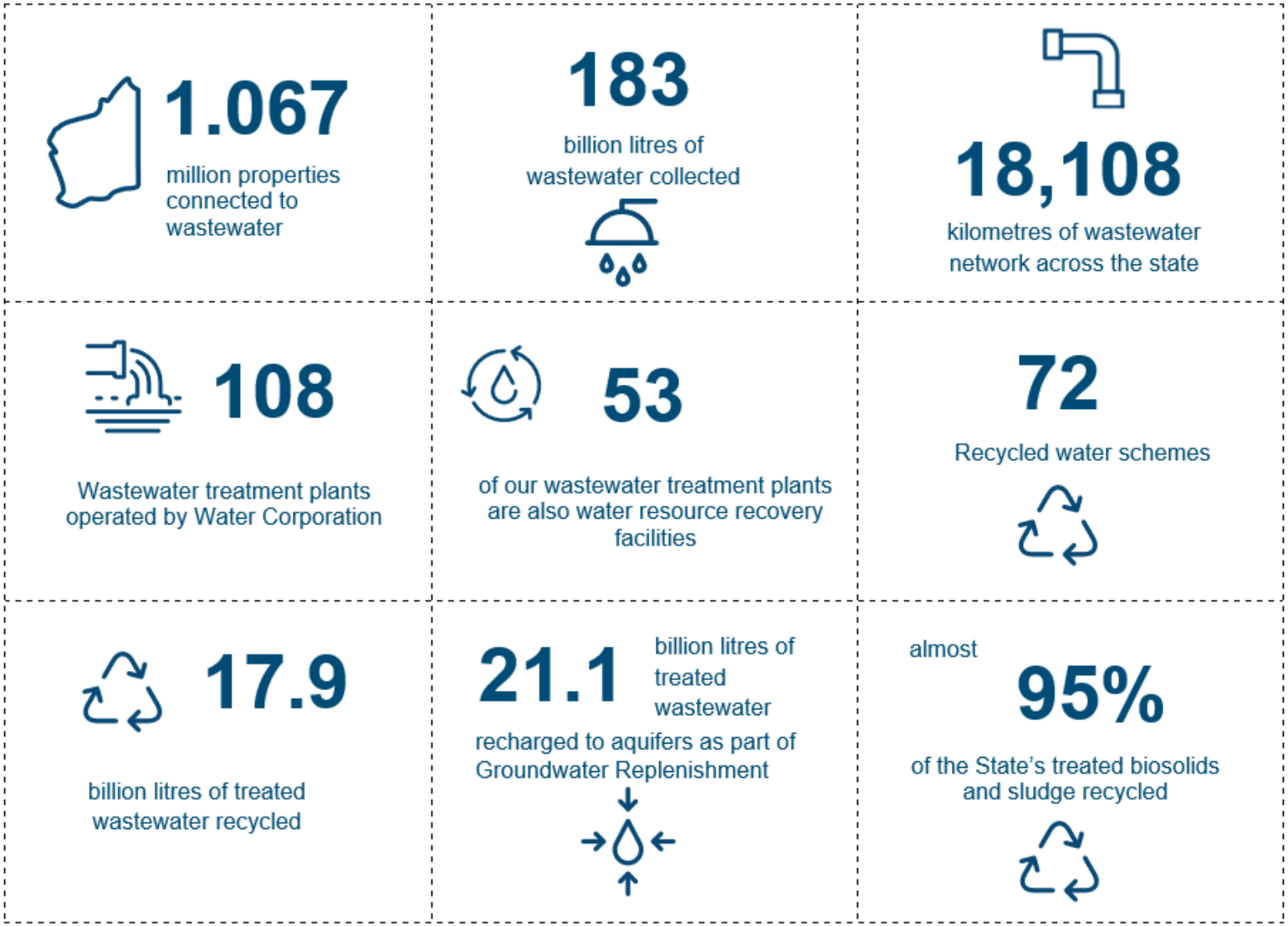
The intent of the MoU is to ensure our wastewater services and GWR meet all required public health regulations and therefore do not negatively affect public health across Western Australia.

The MoU was reviewed and updated on 16 August 2021 and is regularly audited (refer to *Evaluation, audit and continuous improvement*, page 12)

Both Water Corporation and DoH are committed to ensuring wastewater is managed in accordance with state and national guidelines to ensure public health is protected.

[1] All wastewater treatment schemes are owned, operated, and managed by Water Corporation, except for three schemes in the Indian Ocean Territories, which are operated and managed only.

Year at a glance



Wastewater Quality Framework

12 Elements of the Wastewater Quality Framework

Water Corporation manages wastewater from industry and the community to meet public health, environmental and social expectations. To achieve this, we are implementing the Wastewater Quality Framework; a risk-based approach to wastewater management aligned to the Australian Guidelines for Water Recycling, 2006.

Adherence to this management process ensures a consistent standard of wastewater quality performance.

The 12 elements of the Wastewater Quality Framework (Figure 3) cover fundamental concepts related to our commitment to deliver quality wastewater services, the analysis and management of these services, and their ongoing enhancement.

The structure of the Wastewater Quality Framework allows for and requires:

- articulation of our commitment to wastewater services quality
- clear definition of accountabilities and responsibilities across all risks
- identification of preventive measures and treatment barriers
- provision and documentation of processes and procedures for operational control
- continuous improvement, and review and optimisation of our systems.

Through our Wastewater Quality Policy, all employees or contractors involved in the wastewater services are responsible for understanding their role in implementing and continuously improving wastewater quality processes.

Figure 3: The 12 Elements of the Wastewater Quality Framework

Wastewater quality and wastewater recycling policies

Water Corporation's Wastewater Quality Policy supports and promotes responsible use and management of wastewater products generated by its wastewater service, including recycled water, treated wastewater, biosolids, gaseous emissions (odour/greenhouse gases) and residual waste.

Further to this, our Wastewater Recycling Policy outlines our commitment to sustainable management of WA's limited water resources by maximising wastewater recycling and providing a framework for the management of wastewater recycling schemes.

Our Biosolids and Sludge Management Policy commits us to the responsible use and disposal of biosolids and sludge products generated by our wastewater service.

Wastewater Quality Policy

Water Corporation is committed to the responsible use and disposal of the products generated by our wastewater service to meet public health, environmental and social expectations and the corporate objectives and vision. These products are treated wastewater, recycled water, biosolids, greenhouse gas emissions (scope 1)[1] and residual wastes.

To achieve this, and in partnership with our stakeholders and relevant agencies, we will:

Manage wastewater services

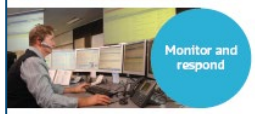
Implement the "Wastewater Quality Framework" through existing and new Water Corporation processes.

Progressively adopt a best-practice management and multi-barrier approach to manage wastewater risks from source to end point to ensure the quality of our wastewater products.

Meet health and environmental standards

Meet public health, environmental, social and corporate expectations in the management of wastewater services as detailed in agreements, licences, regulations and corporate standards.

Contribute to the development of wastewater regulations, guidelines, and other standards relevant to public health and the environment.



Monitor and respond

Routinely monitor our systems and use effective reporting mechanisms to provide relevant and timely information on our performance.

Use appropriate contingency planning and maintain incident response capability.

Engage with stakeholders

Maintain communication and partnerships with relevant agencies and users of wastewater products to continually improve public health and environmental outcomes.

Engage with employees, contractors, stakeholders and the community to inform them of relevant issues related to wastewater management and products and listen to their expectations.

Improve our practices

Continually improve our practices by assessing performance against corporate objectives and stakeholder expectations.

Participate in appropriate research and development activities to develop the necessary skills and knowledge to support the operation of the "Wastewater Quality Framework".

All Water Corporation employees, partners and contractors are responsible for understanding their role in implementing and continuously improving wastewater quality management and outcomes.

Water Corporation acknowledges the Traditional Custodians throughout Western Australia and their continuing connection to the land, water and community. We pay our respects to all members of the Aboriginal communities and their cultures; and to Elders past, present and emerging.

Pat Donovan
Chief Executive Officer, Water Corporation

PCY327
July 2023

[1] Scope 1 greenhouse gas emissions are the emissions released to the atmosphere as a direct result of an activity or series of activities at a facility level, as defined by the Clean Energy Regulator, Australia.

Biosolids and Sludge Management Policy

Water Corporation is committed to the vision of the Waste Avoidance and Resource Recovery Strategy 2030[1], for WA to become a sustainable, low-waste, circular economy in which human health and the environment are protected from the impacts of waste. Biosolids and sludge are the largest single contributors to Water Corporation's solid waste footprint, and we aim to recover[2] 100 per cent of this valuable resource from Perth metro region, and 75 per cent from regional areas. We are committed to the responsible use and disposal of biosolids and sludge products generated by our wastewater service to meet public health, environmental and social expectations, and our corporate objectives and vision.

Manage biosolids quality

Implement the *WA Guidelines for Biosolids Management* through existing and new Water Corporation processes.

Progressively adopt a best-practice and multi-barrier approach to manage wastewater quality risks from source to end point. Drive continuous improvement to ensure the quality of our biosolids and sludge products.

Meet health and environmental standards

Meet public health, environmental, social and corporate expectations in the management of biosolids and sludge services as detailed in agreements, licences, regulations and corporate standards.

Contribute to the development of regulations, guidelines, and standards relevant to public health and the environment for biosolids and sludge management.

Maximise biosolids and sludge recovery

Plan and design biosolids and sludge treatment processes according to the requirements of end users and available recovery markets. Only rely on third party treatment where providers demonstrate robust quality control.

Maintain access to multiple markets for sustainable management of biosolids and sludge. Use commercial agreements to ensure third parties meet quality requirements.

Engage with stakeholders

Collaborate with relevant agencies, biosolids customers and industry partners to continually improve biosolids and sludge management.

Engage with employees, contractors, stakeholders, and the community by informing them of relevant issues and listening to their expectations of biosolids and sludge management.

Improve our practices

Investigate, evaluate, and implement advanced treatment technologies to increase resource recovery, reduce risk, and improve biosolids and sludge management.

Collaborate with researchers and industry partners to manage emerging risks to biosolids and sludge recovery, public health, and the environment.

Water Corporation will implement and maintain processes and procedures consistent with the *WA Guidelines for Biosolids Management* to safely and sustainably manage biosolids and sludge recovery.

All Water Corporation employees, partners and contractors are responsible for understanding their role in implementing and continuously improving biosolids and sludge management.

Water Corporation acknowledges the Traditional Custodians throughout Western Australia and their continuing connection to the land, water and community. We pay our respects to all members of the Aboriginal communities and their cultures; and to Elders past, present and emerging.

Pat Donovan
Chief Executive Officer, Water Corporation

PCY310
July 2023

1 www.wasteauthority.wa.gov.au/publications/view/strategy/waste-avoidance-and-resource-recovery-strategy-2030
2 "Recovery" is defined to include reuse, reprocessing, recycling and/or energy recovery.

Process Control Tables

Water Corporation utilises a standard process reference document for each wastewater treatment plant and wastewater recycling scheme, termed a Process Control Table (PCT). Some complex wastewater treatment plants may have more than one PCT. The PCT contains key sampling, operating and performance target information and defines the minimum number of process parameters that must be monitored at each Wastewater Treatment Plant (WWTP) to ensure that regulatory requirements are met. All compliance samples are scheduled through the Wastewater Quality Management System. This information is used by Water Corporation's Wastewater Information Management Solution to compare laboratory/site analysis data with agreed alert and violation ranges derived from PCTs and provide notifications of potential/actual non-conformances. Corrective actions to manage such issues are undertaken, with feedback processes for continuous improvement of the PCT.

We have 116 WWTP PCTs, 11 of which incorporate a Water Corporation recycling scheme. We have 42 separate PCTs for non Water Corporation recycling schemes that are operated by third parties.

Critical Control Points

Critical Control Points are preventive measures that are amenable to operational control and are essential to prevent or eliminate a hazard or reduce it to an acceptable level (adapted from the Australian Guidelines for Water Recycling, 2006). They are part of a risk management and preventive approach to managing our wastewater systems, especially those that recycle treated wastewater or biosolids (refer to *Biosolids product quality compliance*, page 24 and *GWR scheme overview*, page 28).

Evaluation, audit, and continuous improvement.

We review our provision of wastewater services from operator to senior executive to ensure all schemes are managed to meet operational and regulatory requirements. PCTs are fully reviewed every 5 years, however changes may be made at any time to ensure updated information is captured and PCTs remain current. Our review processes engage all key stakeholders using internal and external reviews and audits, including an audit of the MoU for Wastewater Services and GWR with DoH.

An external audit for the DoH of our WWQ MoU was held in early 2025 and a copy of the abridged report will be available at: watercorporation.com.au/Wastewater-quality when it is completed.

Training and awareness

Water Corporation maintains a well-established operator training program from the training centre at Shenton Park and a New Starter Induction Block (NSIB), where trainees receive intensive two-week training when onboarded. All employees have a detailed, customised, online Learning Plan, ensuring training is aligned to the role being performed. The assigned training is monitored and managed effectively to ensure competence, safety, wellbeing, and compliance.

Also central to Water Corporation's operator competence is a nationally recognised water industry certification program (Certificate II, III & IV in Water Industry Operations), a Verification of Competence program, plus overarching training in everything from safety, leadership, and environment to personal growth and development.

The nationally recognised water industry certification program is developed and delivered entirely inhouse and overseen through an auspicing arrangement with North Metropolitan TAFE as the Registered Training Organisation.

A key theme woven into the certification program is the inclusion of water quality concepts to ensure employee awareness and training as per element seven of the Wastewater Quality framework (refer to *12 Elements of the Wastewater Quality Framework*, page 10).

General employee awareness of one of our core business processes, providing and operating fit for purpose wastewater systems that protect the health of the public and environment is also captured through various initiatives such as the eLearning module 'Water Quality Awareness', which is a mandatory requirement for all staff.

Training is complex, and constantly evolving and improving, as demonstrated by the new NSIB. The complexities include the coordination of all training required across the organisation with the challenge of vast distances and remoteness, sourcing providers, managing logistics and communicating broadly with stakeholders to support them in risk reduction and alignment with legislation, guidelines, and internal policy and standards.

Water Corporation strives to be a leader in operational training and continues to explore technologies like visual intelligence technologies that can provide hands-free point of vision capabilities, Artificial Intelligence and Augmented Reality, use of eLearning and adaptive technologies to supplement existing face-to-face courses and expand virtual delivery capability. We have recently embarked on developing an all-weather, 'real world', student centred Simulation Hub, with the first stage completed and featuring a fully functioning network system. Planning has already commenced on stage two, which will incorporate a fully functional wastewater vacuum sewer system, and laboratory and microscope facilities for problem solving wastewater issues. We continue to invest in developing our workforce through real world simulations and scanning the environment through sharing and participating in state and national water industry networks.

Figure 4: Learning hub at Shenton Park

Wastewater catchment

Wastewater in Western Australia generally comes from two sources, domestic wastewater and trade waste.

Figure 5: Portable sewer wastewater quality monitor

Domestic wastewater

Wastewater is usually considered to be 99.97 per cent fresh water and 0.03 per cent contaminants. Domestic wastewater is largely consistent in quality and quantity. The volume generally follows a diurnal cycle with a morning and evening peak and low overnight flows.

Controlled waste

Controlled waste is managed by Water Corporation in accordance with the requirements of the *Environmental Protection (Controlled Waste) Regulations 2004*. The substances considered to be controlled waste are listed in the regulations and include sewage waste from the reticulated sewerage system, septage waste, trade waste (e.g., from grease traps, industrial processing) and non-toxic salts. Private carriers must be licensed through the Environmental Protection Authority and can dispose of controlled waste to Water Corporation main sewers and wastewater treatment plants where they are licensed and adapted to receive waste. Transport of controlled waste is tracked using the Department of Water and Environmental Regulation (DWER) Controlled Waste Tracking System.

Septage

Septage, a type of controlled waste, is a by-product from the storage of household wastewater in a septic tank where the sludge accumulates over time and must be removed every 4 to 5 years and disposed in a dedicated disposal facility. Under the *Health Act (1911)* Local Government Authorities (LGAs) are responsible for the acceptance and disposal of septage and can charge ratepayers for this service.

Water Corporation's wastewater treatment is designed, operated, and maintained to treat domestic wastewater for subsequent disposal or recycling. The capacity of a wastewater scheme to receive septage, without detriment to the treatment process and quality of the treated wastewater, is governed by the quality and volume of septage, as well as the design, capacity, and operation of the plant.

Although Water Corporation is not legally responsible for accepting septage, a small number of wastewater treatment plants accepted septage in this financial year to assist LGAs under temporary arrangements. To ensure these plants operate continuously within their

licence and performance criteria, a management framework has been developed.

The management framework ensures formal agreements exist with each contractor who disposes of septage at each wastewater scheme. These agreements define the volume and quality of the septage that can be disposed to a plant, and the cost of disposal. The framework provides assurance that the wastewater scheme has ongoing capacity to receive septage, and the volume and quantity accepted will allow compliance with regulatory requirements for recycling and environmental disposal. These temporary arrangements are tightly managed to ensure we meet the regulatory requirements.

Trade waste

Trade waste is the wastewater discharged directly into our wastewater system from commercial or industrial premises other than domestic-type wastewater. At the end of June 2025 there were 15,396 trade waste customers connected to Water Corporation's wastewater system statewide. Trade waste can be highly variable in quality and quantity, and this can pose significant risks for the operation of the wastewater system. The most numerous trade waste dischargers are small retail food outlets such as restaurants and fast food chains, which generate greasy waste. Large industrial customers such as dairies, beverage manufacturers, meat processors, metal finishers, laundries and waste treatment facilities can be significant point sources of trade waste. Metal finishers, laboratories and chemical formulators typically discharge small to intermediate trade waste volumes, but these wastes may contain compounds of concern for the wastewater system.

Trade waste management and wastewater source control is focussed on five key objectives to manage wastewater input, as defined in the Australian Wastewater Quality Management Guidelines (Water Services Association of Australia, 2022):

- safety of people
- protection of assets (pipes, plant and equipment)
- protection of treatment processes
- facilitation of regulatory and licence compliance
- facilitate development of a circular economy.

Water Corporation has a centre of expertise for trade waste management. It manages trade waste operations statewide using a trade waste framework which includes:

Assessment and approval

Commercial and industrial customers must obtain approval to discharge trade waste to sewer, usually in the form of a trade waste permit. This permit will specify pre-treatment requirements and other conditions which may include limits on mass and volumetric discharge, monitoring and reporting requirements, and maintenance of pre-treatment and monitoring equipment.

Fats, oils, and grease management program

This program monitors the servicing of 8,475 grease arrestors (as at end June 2025) installed at businesses generating greasy waste, to ensure that the arrestors are pumped out at the required frequency and prevent the discharge of grease and solids into the wastewater system. Unmanaged discharges from these businesses can result in sewer blockages and overflows, and extra loading in treatment plants.

Surveillance of large and high-risk customers

An ongoing program of sampling and compliance inspections of industrial customers discharging large organic loads or waste streams of potential quality concern is maintained to monitor loading on the wastewater system and compliance with permit conditions.

Permit capture program

An ongoing program is maintained to identify trade waste customers (typically small, commercial businesses) discharging to sewer without a permit. Businesses seeking to discharge trade waste are required to obtain a permit and meet the relevant permit conditions.

Acceptance criteria and other information

A set of trade waste acceptance criteria is published on Water Corporation's website. These specify the levels of various wastewater quality parameters that may be discharged to sewer by trade waste customers under a permit. Compounds not included in the acceptance criteria are evaluated on a case by case basis and, as appropriate, published in the criteria. In addition to the acceptance criteria, there is a range of other information about trade waste on our website at: watercorporation.com.au/help-and-advice/trade-waste.

Investigations

Water Corporation conducts a range of investigations to assist trade waste management, including characterising wastewater from industry sectors, catchment reviews, assessing pre-treatment products, and investigating unusual discharges observed in the wastewater system.

Figure 6: Receival and storage tanks at a waste treatment facility

Wastewater treatment

Water Corporation managed 108 wastewater treatment schemes across Western Australia and three in the Indian Ocean Territories, treating nearly 183 billion litres of wastewater in 2024-25. The emphasis in wastewater treatment is on reducing biological oxygen demand (BOD), in the form of soluble carbon, for environmental, aquatic and public health protection. Effective management of the whole wastewater treatment process is essential in maintaining consistent treatment performance levels. This is achieved through implementation of a wastewater treatment management framework, progression of wastewater system improvements and upgrades, and implementation of research outcomes to improve wastewater treatment practices.

How wastewater is treated

Wastewater treatment is generally classified into the following stages:

Preliminary treatment – physical removal of larger inorganic solids that may damage or block equipment in later treatment stages:

- Screens – remove items such as rags, paper, cotton buds that may block equipment.
- Grit tanks – remove sand and grit.

Primary treatment – physical removal of fine solids using gravity to settle particles, in a primary sedimentation tank followed by the mechanical removal of these settled solids. Generally, also includes the mechanical removal of floating contaminants.

Secondary treatment – follows on from primary treatment and consists of biological treatment of biodegradable dissolved and suspended organic compounds by converting them into gas and biomass. Secondary sedimentation tanks are used to separate the solid biomass from the secondary treated water prior to the water being discharged or processed further. Secondary treatment processes used by Water Corporation include:

- Lagoons or ponds – have long detention times for the wastewater, typically in excess of one month. The larger the inflow volume the greater the area of the ponds. Treatment relies on natural biological processes at the various layers within the pond that will be anerobic at the base and aerobic at the surface, commonly referred to as facultative ponds. These natural processes require substantially less management than more complex treatment processes. Treatment may include aerators to increase the oxygen and mixing, allowing biological processes to occur at a faster rate and reduce the required detention time and pond size. Final treatment ponds are usually shallower with larger surface areas, which allows for natural UV disinfection, reducing pathogenic organisms.
- Biological filtration systems (e.g., trickling filters) – have filter media, such as crushed stone, with a large surface area to support a biofilm. Wastewater is trickled over the filter media and the organic content of the wastewater is used by the organisms in the biofilm to grow and reproduce, thus converting the organic matter to biomass. These processes can typically improve nitrogen and organic removal.
- Activated sludge, such as extended aeration (e.g., Intermittently Decanted and Extended Aeration plant - IDEA), oxidation ditches and sequencing batch reactors – uses returned biomass (activated sludge) and dissolved oxygen to rapidly convert the incoming organics into more biomass.

Advanced wastewater treatment (sometimes referred to as tertiary) – used when the removal of more intractable contaminants is required. This stage is generally employed to reduce nutrients (mostly nitrogen (ammonia), with phosphorus at some wastewater treatment plants) that may be required for environmental disposal options, and pathogens. For more specialised water recycling or disposal into sensitive environments other contaminants may also be targeted.

Disinfection – used to further protect public health by decreasing or inactivating pathogenic microorganisms. Not all disposal methods require disinfection.

All Water Corporation WWTPs are designed with sufficient redundancy for BOD reduction and are able to consistently reduce BOD to acceptable levels (filtered BOD of less than 20mg/L). Most of Water Corporation's WWTPs have secondary treatment, with the majority of regional plants being pond plants, with added disinfection where required for wastewater recycling. Appendix A contains a complete list of our WWTPs showing treatment type and associated recycling schemes.

The solid waste generated by the wastewater treatment process is termed biosolids or sludge cake depending on the treatment process. Both biosolids and sludge cake are rich in nutrients and organic matter making a great natural fertiliser and soil improver (refer to *Biosolids and sludge management*, page 21). For example, we supply biosolids to farms to help grow crops such as canola. Current design of wastewater treatment plants considers the intended sludge reuse or disposal options, while some older WWTPs require upgrades to accommodate this.

Water Resource Recovery Facilities

A number of our WWTPs have been renamed Water Resource Recovery Facilities (WRRF), to reflect their true functionality.

WRRFs recycle water, nutrients, biosolids and energy from treated wastewater, for a variety of safe and beneficial fit-for-purpose uses, including:

- Irrigating parks, ovals, and golf courses.
- Industrial processing.
- Growing tree farms and feedlots.
- Producing sustainable organic fertiliser.
- Replenishing underground aquifers.
- Generating sustainable energy.

The tables and maps in Appendix A list all WWTPs with water recycling.

Figure 7: Subiaco Water Resource Recovery Facility

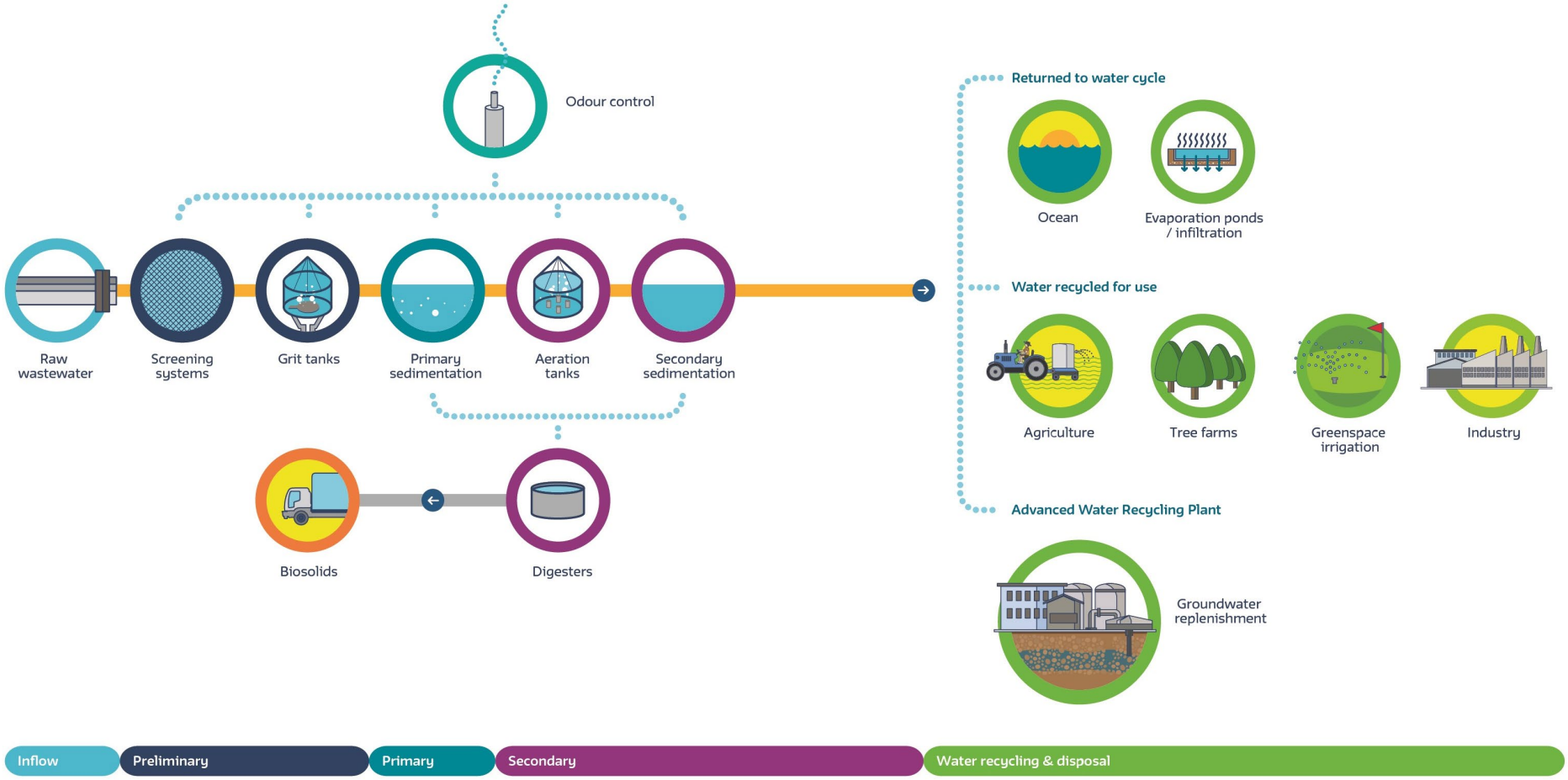


Figure 8: Wastewater treatment, recycling and disposal

Wastewater schemes - new and upgrades

Water Corporation's Asset Investment Program, which aims to maintain or improve wastewater treatment quality through prioritised and targeted capital expenditure delivered a key upgrade in 2024-25:

- Derby WRRF – new anaerobic pond.

Several additional scheme upgrades were commenced or continued, but not finalised, in 2024-25, these included:

- East Rockingham WRRF upgrade underway.
- Alkimos WRRF upgrade underway.
- Waroona WWTP upgrade underway.
- Northam WRRF – design to install new Oxidation Ditch.
- Geraldton #2 WWTP – aeration system upgrade.
- Woodman Point WRRF– sludge treatment upgrade underway.

Alkimos WRRF upgrade

- Upgrade capacity to 26 billion litres per day.
- Replacement of inlet works, existing aerators and existing pumps to higher capacity.
- Equipping of Oxidation Ditch 3 to increase treatment capacity.

Waroona WWTP upgrade

- Treatment capacity upgrade to 440 kilolitres per day.
- Biological nutrient removal using an Oxidation Ditch and Secondary clarifier prior to disposal to Drakesbrook Drain.

Figure 9: Alkimos WRRF secondary clarifiers

Figure 10: Waroona WWTP

Biosolids and sludge management

All WWTPs and WRRFs produce solid waste which, depending on the treatment method, is categorised as biosolids or sludge cake.

Biosolids is organic sludge from domestic and industrial wastewater that has undergone treatment to significantly reduce pathogens and volatile organic matter. This product is a recovered resource suitable for beneficial end uses. This treatment method is only available at our larger metropolitan WRRFs.

Biosolids are classified according to pathogen grade (P) from P1 to P4 and contaminant grade (C) from C1 to C3. All biosolids are classed as P4 C3, unless proven otherwise. Biosolids with a P3 C2 rating can be beneficially reused in broad-acre agriculture, forestry, or mine site rehabilitation (Western Australian Guidelines for Biosolids Management, Department of Environment and Conservation (DEC), 2012). Table 2 (page 24) shows the metropolitan biosolids compliance to these classifications.

Sludge cake is partially treated dewatered organic sludge that has not undergone the process of controlled stabilisation and therefore requires further treatment prior to beneficial use (e.g. composting which results in a P1C1 biosolids-derived product for unrestricted use).

Water Corporation is committed to the vision of the Waste Avoidance and Resource Recovery Strategy 2030, for WA to become a sustainable, low-waste, circular economy in which human health and the environment are protected from the impacts of waste. Biosolids and sludge cake are the largest single contributors to Water Corporation's solid waste footprint, and we aim to recover 100 per cent of these valuable resources from Perth Region and at least 75 per cent from regional areas. We are committed to the responsible use and disposal of biosolids and sludge products generated by our wastewater service to meet public health, environmental and social expectations.

Figures 12 and 13 show the volumes of biosolids and sludge cake produced in our metropolitan water resource recovery facilities.

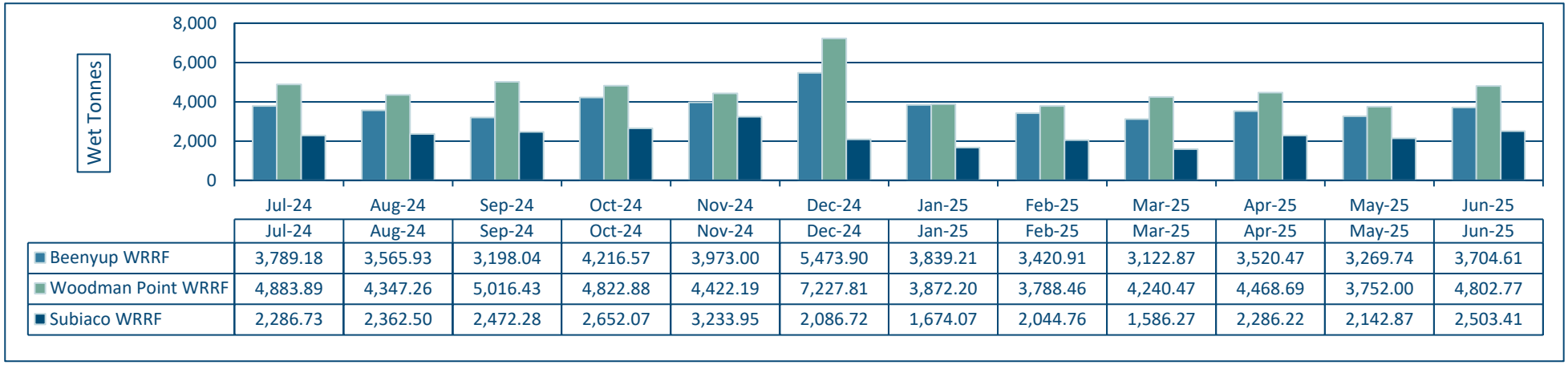
Figure 13 depicts regional sludge cake volumes produced with Table 1 (page 23) showing the percentage of resource recovered.

The majority of regional wastewater schemes are pond systems that do not produce a continuous solid waste stream. Therefore, sludge is removed intermittently through an asset maintenance program called pond desludging. Consequently, annual regional sludge volumes are variable. Given WA's geography, where reuse is not a feasible mechanism, sludge disposal from regional towns (P4C3 classification) is sent to landfill.

Water Corporation engages with research to seek new and innovative ways for beneficial end uses of our treatment products.

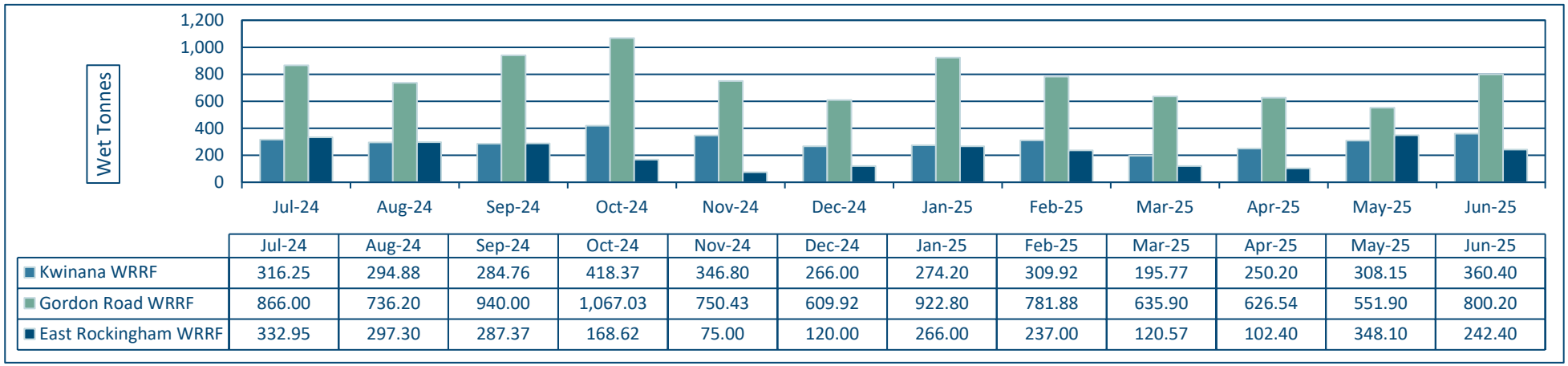
Figure 11: Biosolids application to broadacre agriculture

Metropolitan (Perth-Peel) biosolids & sludge cake production



	Jul-24	Aug-24	Sep-24	Oct-24	Nov-24	Dec-24	Jan-25	Feb-25	Mar-25	Apr-25	May-25	Jun-25
Beenyup WRRF	3,789.18	3,565.93	3,198.04	4,216.57	3,973.00	5,473.90	3,839.21	3,420.91	3,122.87	3,520.47	3,269.74	3,704.61
Woodman Point WRRF	4,883.89	4,347.26	5,016.43	4,822.88	4,422.19	7,227.81	3,872.20	3,788.46	4,240.47	4,468.69	3,752.00	4,802.77
Subiaco WRRF	2,286.73	2,362.50	2,472.28	2,652.07	3,233.95	2,086.72	1,674.07	2,044.76	1,586.27	2,286.22	2,142.87	2,503.41

Figure 12: Biosolids produced for beneficial use in agriculture (100 per cent recovery)



	Jul-24	Aug-24	Sep-24	Oct-24	Nov-24	Dec-24	Jan-25	Feb-25	Mar-25	Apr-25	May-25	Jun-25
Kwinana WRRF	316.25	294.88	284.76	418.37	346.80	266.00	274.20	309.92	195.77	250.20	308.15	360.40
Gordon Road WRRF	866.00	736.20	940.00	1,067.03	750.43	609.92	922.80	781.88	635.90	626.54	551.90	800.20
East Rockingham WRRF	332.95	297.30	287.37	168.62	75.00	120.00	266.00	237.00	120.57	102.40	348.10	242.40

Figure 13: Sludge cake produced for beneficial use in composting (100 per cent recovery)

Regional sludge cake management

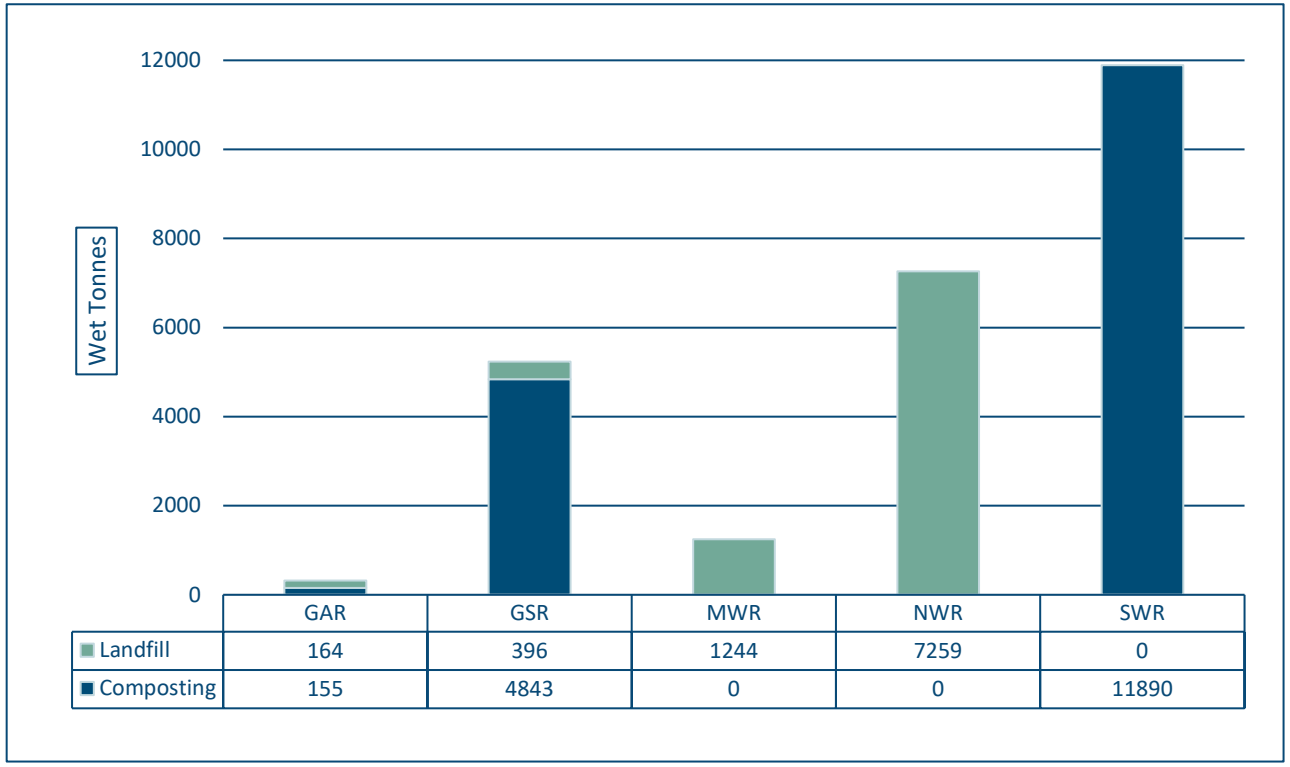


Figure 14: Regional sludge cake volume and distribution 2024-25

Note:

GAR = Goldfields & Agricultural region

GSR = Great Southern region

MWR = Mid West region

NWR = North West region

SWR = South West region

Table 1: Regional sludge cake recovery for beneficial use 2024-25

Region	GAR	GSR	MWR	NWR	SWR	Regional total
% Recovery	49%	92%	0%	0%	100%	65%

Biosolids product quality compliance

As per the WA Guidelines for Biosolids Management (DEC 2012), pathogen grade 3, contaminant grade 2 (P3 C2) biosolids is suitable for direct beneficial use in broad-acre agriculture, forestry, and/or mine site rehabilitation. Critical control points (CCP) for:

- Biosolids cake from anaerobic digestion:
  - Sludge Retention Time (SRT) ≥ 15 days,
  - Temperature 35°C ± 3°C.
- Lime amended biosolids (LAB):
  - Lime amendment pH ≥ 12 for > 3 hrs.

Table 2: Biosolids product quality compliance

Treatment Plant	Sludge treatment process	Biosolids product name (grade)	Biosolids product quality compliance											
			Jul-24	Aug-24	Sep-24	Oct-24	Nov-24	Dec-24	Jan-25	Feb-25	Mar-25	Apr-25	May-25	Jun-25
Beenyup WRRF	Anaerobic digestion	Biosolids cake (P3 C2)	✓	✓	✓	✓	✓	✓	✓	✓	✓	(1)	✓	✓
Subiaco WRRF	Lime amendment	LAB (P3 C2)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Woodman Point WRRF	Anaerobic digestion	Biosolids cake (P3 C2)	✓	✓	✓	✓	✓	✓	(2)	✓	✓	✓	✓	✓

Comments:

(1) Biosolids cake from Beenyup WRRF returned high Cr(VI) result, the sample upstream was within guideline values (<1mg/kg) and the result from re-sampling was under guideline values.

(2) Biosolids cake from Woodman Point WRRF exceeded the *E. coli* guideline value (>2,000,000 CFU/g). Onsite review showed the process operating within CCPs, and the product met compliance conditions according to the Guidelines.

All incidents were discussed with DoH.

Wastewater recycling and disposal

Water Corporation is committed to the safe, sustainable and effective management of wastewater and recycled water. We operated 53 water resource recovery facilities (WRRF) in 2024-25, with one or more recycling schemes or recycled water recipients. We have 72 DoH approved recycling schemes, supplying 93 third -party recycled water recipients. Water Corporation directly owns and manages 13 of these recycling schemes.[1] A complete list of recycling schemes is available in Appendix A.

Recycled water is used for a range of purposes including industrial uses, irrigation of public open space and irrigation of woodlots. We had 33 WRRFs with recycling as the only disposal option, while 21 had recycling with environmental disposal. We recycled approximately 17.9 billion litres of treated wastewater this financial year, not including the Groundwater Replenishment Scheme, which recycled 21.1 billion litres.

We provide recycled water of an agreed quality to our third-party recipients, with further treatment and an obligation to meet DoH requirements being the responsibility of the third party.

Recycling scheme management

Our approach to managing the treated wastewater recycling process is based on the 12-element framework of the Australian Guidelines for Water Recycling and the DoH *Guidelines for the Non-Potable Uses of Recycled Water in Western Australia*. We have systems in place to fulfil the criteria of the 12 elements and we continue on our journey for ongoing improvement in scheme performance.

Figure 15: Irrigation of Jubilee Oval in Northam

Water Corporation operations

Water Corporation operates 13 of its own wastewater recycling schemes with formal DoH approval. The schemes are mostly irrigation of woodlots with one Rhodes Grass crop in Broome North. We also recycle treated wastewater internally for on-site irrigation and treatment processes at WRRFs; however, this recycling is not subject to formal DoH approval under the Guidelines for Non-potable Uses of Recycled Water in Western Australia.

The different end uses of recycled water schemes are categorised into Exposure Risk levels by the DoH. For recycled water schemes with managed controls and barriers, and where there is minimal contact by the public, these schemes present a low risk to public health and are considered low exposure risk schemes. For medium exposure risk schemes, there is a slightly higher risk of exposure to the public due to lesser barriers. Due to the increased exposure risk, medium exposure risk

[1] This does not include GWR.

schemes have stricter water quality conditions compared to a low exposure risk scheme and may have other operational conditions.

Water Corporation's water quality performance against DoH approval conditions, where Water Corporation is responsible for the scheme or to point of supply in third-party water recycling schemes, are presented in Appendix C. This provides a summary of 4,573 results from relevant sampling points. The data demonstrates water quality sampling guideline values were met for the various recycled water scheme potential 'exposure risk' levels (extra low, low and medium).

Capital and operational investment

Capital investment within the water recycling investment portfolio to improve infrastructure at recycling only schemes continue to progress. We continued to progress new disinfection facilities at Kellerberrin and Wyalkatchem. Improvements also included upgrades to tertiary barriers such as recycled water signage at storage and irrigation sites.

Figure 16: Wundowie water recycling tank

Works have completed at Broome North, Corrigin, and the tanks at the Northam Shire site. Planning and design are under way for improvements in the Exmouth, Esperance, and Pingelly recycling schemes.

Internal audit process

Water Corporation supports DoH and the ongoing compliance of recycling schemes with DoH approval conditions, by undertaking audits of third-party recycling schemes. These internal audits are a compliance requirement of the DoH Approval. Audits are conducted by representatives from the Water Corporation and the third party.

Water Corporation undertook 6 audits in 2024-25 and plan to undertake 15 audits across the state in 2025-26 as part of a state-wide audit plan agreed with the DoH.

Figure 17: Auditing recycled water assets – Northam Harness Racing Club tank

Future focus

The 2025-26 key points of focus for wastewater recycling are:

- Provide support to recycled water recipients to help them address the audit findings.
- Regularly review recycled water recipients' water sampling results to aid the proactive management of emerging water quality issues.
- Work with recycled water recipients to provide support in the development and management of key recycling documentation such as Recycled Water Quality Management Plans.
- Work to improve the environmental management of recycling schemes.
- Assisting Department of Education with development and implementation of a wastewater framework for their recycled water schemes across schools in Western Australia.

Figure 18: Shire of Irwin – Dongara Golf Club

Groundwater replenishment

Introduction

Groundwater replenishment (GWR) is the process by which secondary treated wastewater undergoes advanced treatment, at an Advanced Water Recycling Plant (AWRP). Water, which meets or exceeds the Australian Drinking Water Guidelines (ADWG), is produced prior to being recharged to the Leederville and Yarragadee aquifers for later use as a drinking water source. Groundwater replenishment has been identified by Water Corporation as a climate independent, safe, sustainable water source option for the Perth Integrated Water Supply Scheme (IWSS).

The Perth Groundwater Replenishment Scheme was built in 2 stages. Stage 1 gained approval to recharge in 2017. Approval for Stage 2 was granted in 2020 with commissioning completed in early 2023. The completed GWR scheme is now licensed to recharge up to 28 billion litres each year, providing a climate independent water source.

For the financial year to 30 June 2025, the GWR scheme recharged a total of 21.1 billion litres.

GWR scheme overview

The treatment systems for the GWR scheme include the Beenyup WRRF, the AWRPs and eight recharge bores. The scheme also includes a monitoring borefield (consisting of eight bores) which is used to monitor the flow and quality of recycled water in the Leederville and Yarragadee aquifers. They also overlay a superficial aquifer around the recharge bores, as defined by the GWR Recharge Management Zone and monitoring requirements.

Figure 19: GWR stages 1 and 2

The GWR scheme takes treated wastewater from the Beenyup WRRF. This catchment is in the northern suburbs of Perth extending from Quinns Beach through to Scarborough and inland through Dianella and Bayswater to the foothills of East Midland.

The majority of wastewater collected in the Beenyup wastewater catchment is from domestic and commercial premises. Trade waste, which is process wastewater from industrial and commercial customers, represents around three per cent by volume of the wastewater flow to Beenyup WRRF. There are trade waste controls in sewer catchments where potable recycling of treated wastewater occurs as part of the approval requirements, including in the Beenyup wastewater catchment. .

Beenyup WRRF treatment comprises preliminary screening and grit removal, primary sedimentation, and secondary biological nutrient removal before feeding the treated wastewater to the AWRPs. Treated wastewater is prioritised for use by the two AWRPs. Treated wastewater that is not used by the AWRPs is discharged via two adjacent outlets known collectively as the Ocean Reef Ocean Outlet.

Each AWRP uses a process of ultrafiltration, reverse osmosis, and ultra-violet disinfection to further treat the treated wastewater before it is recharged to the Leederville and Yarragadee aquifers. These deep aquifers provide dilution with the groundwater and additional natural filtration

The details of the GWR treatment system are illustrated in Figure 20.

The AWRP treatment process is operated in accordance with the Hazard Analysis and Critical Control Points (HACCP) philosophy and the 12-element risk management framework (refer to *12 Elements of the Wastewater Quality Framework*, page 10). This is based on the National Water Quality Management Strategy - Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 1) and Australian Guidelines for Water Recycling: Augmentation of Drinking Water Supplies (Phase 2). There is a total of 20 critical control points (CCPs) maintained across the WRRF and the two AWRPs. These CCPs are continuously monitored online and assure recycled water is of drinking water quality before being recharged to the Leederville and Yarragadee aquifers. If any one of these parameters should fall outside of specification, then an automated corrective action is implemented. The operational philosophy of the automated control system ensures that all CCPs will fail-safe. These CCPs are supported by a number of process control points.

Verification monitoring has shown that all recycled water recharged to the aquifers has met the water quality requirements specified in the Wastewater Services and GWR MoU and DWER licence.

Groundwater quality in the recharge zone is monitored via monitoring bores for each recharge bore to determine the effect of recharged water on the Leederville, Yarragadee and superficial aquifers. All treated water and bore field water samples were taken and results were satisfactory for the period 1 July 2024 to 30 June 2025.

Figure 20: GWR scheme overview

Water quality monitoring objectives

The monitoring of the Perth GWR scheme consists of testing/measurement of the following:

- Recycled water quality indicators (RWQI)
- Recycled water quality parameters (RWQP)
- Membrane integrity testing
- Groundwater monitoring to assess Leederville, Yarragadee and superficial aquifer response to recharge.

All sampling requirements for the RWQI and RWQP have been endorsed by the DoH.

Recycled water quality indicators and parameters

An RWQI is an individual chemical or microbiological parameter that represents a class of chemicals or pathogens with similar characteristics. Choice of RWQI considers the parameter's toxicity and its source in the wastewater catchment. The purpose of the RWQI is to demonstrate safety of recycled water with respect to specific chemical and microbiological groups and hence provide additional confidence that all chemical hazards are mitigated. Table 3 (page 36) provides a summary of the RWQI monitored in the GWR scheme from 1 July 2024 to 30 June 2025, including the chemical or microbiological groups they represent.

RWQP refers to the water quality parameters to be achieved in the treated water, as agreed with the DoH. Compliance with the recycled water quality parameters will represent protection of human health and health-related environmental values (drinking water resource and industrial water), including protection for primary industry environmental values.

We take samples for 169 RWQP at the GWR scheme. For the 2024-25 year all RWQP were within the guideline as set out in the MoU and represented by the RWQI. These compliant RWQP results indicate the AWRP produced water at a quality within regulatory specifications.

We routinely report our performance to DoH.

All RWQP results from 1 July 2024 to 30 June 2025 are given in Appendix B.

Incident and emergency management

Water Corporation manages the GWR scheme incidents and emergencies as defined by the Wastewater Services and GWR MoU and outlined in the GWR Incident Management Plan. The plan defines:

- alert and violation levels
- communication protocols
- response plans for dealing with GWR scheme incidents.

There were two reportable incidents at the GWR scheme from 1 July 2024 to 30 June 2025.

One of these incidents was a loss of historical online analyser data due to a network failure. There was no impact to public health and the plant was operating normally for this period.

The second incident was a UF unit start up anomaly which has been resolved through improvements to process logic control.

Table 3: RWQI summary (1 July 2024 to 30 June 2025)

Indicator	Group Represented	Units	Guideline Value	Limit of Reporting	Total Number of Readings		Max Reported Value		Requirement Met
					Stage 1	Stage 2	Stage 1	Stage 2	
MS2 Coliphage	Microorganisms (pathogens including viruses)	pfu/100 mL	<1	1	12	12	<1	<1	✓
Boron	Inorganic compounds, metals and metalloids	mg/L	4	0.02	12	12	0.14	0.16	✓
Nitrate as nitrogen		mg/L	11	0.01	12	12	1.7	3.0	✓
N-nitrosodimethylamine	Nitrosamine disinfection by-products	ng/L	100	2	12	12	3.2	4.2	✓
Chlorate	Inorganic disinfection by-products	mg/L	0.7	0.01	4	4	<0.01	0.01	✓
Chloroform	Other disinfection by-products	µg/L	200	0.05	12	12	<1.0	<1.0	✓
Carbamazepine	Pharmaceuticals and personal care products	µg/L	100	0.1	12	12	<0.1	<0.1	✓
Diclofenac		µg/L	1.8	0.1	12	12	<0.1	<0.1	✓
Estrone	Hormones	ng/L	30	1	4	4	<1.0	<1.0	✓
Trifluralin	Pesticides and herbicides	µg/L	90	1	4	4	<0.1	<0.1	✓
1,4-Dioxane	Other organic chemicals	µg/L	50	0.1	12	12	<0.1	<0.1	✓
1,4-dichlorobenzene		µg/L	40	1	12	12	<1.0	<1.0	✓
Ethylenediamine tetraacetic acid (EDTA)		µg/L	250	10	12	12	<10	<10	✓
Fluorene		µg/L	140	0.001	2	2	<0.001	<0.001	✓
Octadioxin		pg/L	9,000	2	2	2	<4	<3	✓
Alpha particle activity	Radioactivity	mBq/L	500	10	4	4	85	83	✓
Beta particle activity (-K40)		mBq/L	500	10	4	4	<72	<110	✓

All RWQI results from 1 July 2024 – 30 June 2025 were below their respective MoU guideline limit.

Case Study – Infiltration of treated wastewater for non-potable reuse

What is Managed Aquifer Recharge

Managed Aquifer Recharge (MAR) is the intentional recharge of water into an aquifer for environmental benefit or later use. Treated wastewater (TWW) can be used to recharge aquifers used for drinking water by injection into a confined aquifer, as used by the GWR scheme at Beenyup, or infiltration into an unconfined aquifer not used for public water supply and used for irrigation by our recycling schemes in Mandurah and Geraldton. The quality of the pre-injection TWW for potable reuse requires a significantly higher standard of catchment management and treatment than infiltration for non-potable reuse. As GWR is discussed in detail separately (refer to *Groundwater Replenishment,* page 28) this case study focusses on MAR for non-potable reuse.

Infiltration MAR can follow a basic pond treatment plant, Geraldton, or a more advanced activated sludge treatment plant, Mandurah (refer to *Wastewater treatment – How wastewater is treated,* page 17). The treatment type is chosen based on wastewater volumes, aquifer characteristics and receiving environment sensitivity. MAR also requires the availability of land for the infiltration ponds and abstraction bores.

Water Corporation has around 30 infiltration schemes with four infiltration MAR schemes providing water for 11 DoH approved reuse schemes, providing for around 106 hectares of irrigation.

Passive aquifer treatment

Infiltration of TWW passively removes nutrients and allows pathogen die-off while permeating through the soil (unsaturated zone) to the groundwater (saturated zone – unconfined aquifer). Contaminant removal efficiency varies depending on factors such as soil type, depth to groundwater, geology, aquifer residence time and climatic conditions.

Benefits of TWW infiltration MAR for irrigation

- The passive aquifer treatment following wastewater treatment can produce good quality recycled water suitable for many reuse applications, including irrigation at a venue with medium exposure risk e.g. Geraldton.
- TWW Infiltration MAR reduces the volume of:
  - local groundwater used for irrigation.
  - potable water supplies used for irrigation.
- Infiltration into brackish or saline aquifers can improve the ‘freshness’ of the aquifer allowing beneficial reuse from the aquifer.
- As it is using natural rather than engineered treatment to enhance the TWW quality, there is less chemicals (chlorine) and energy use, and infiltration MAR is relatively low cost. Additionally, the Mandurah MAR schemes utilise solar energy for the groundwater abstraction pumps.
- Infiltration MAR is operationally simple to manage.

Regulation of TWW MAR for irrigation

Recycled water from Infiltration MAR is primarily regulated by the DoH and must meet strict criteria for approval. Environmental Risk Assessments and Nutrient Operational Management Plans (NOMPs) are undertaken by Water Corporation to evaluate and mitigate environmental risks at reuse sites. DWER may require a Nutrient and Irrigation Management Plan (NIMP) to ensure a reuse scheme is environmentally sustainable and has appropriate recycled water quality analysis undertaken. Infiltration MAR schemes for third party recipients may also go through the formal DWER regulatory process as per the Gordon Road MAR scheme operated by the City of Mandurah.

Where can Infiltration MAR be used

Although infiltration MAR has many benefits, it can only be used where there is a suitable aquifer, available land area for the infiltration scheme, and a reuse opportunity. In general, Western Australia is fortunate to have limestone aquifers along the southern, southwestern, and mid-west coastline that are often suitable for this TWW disposal and reuse method.

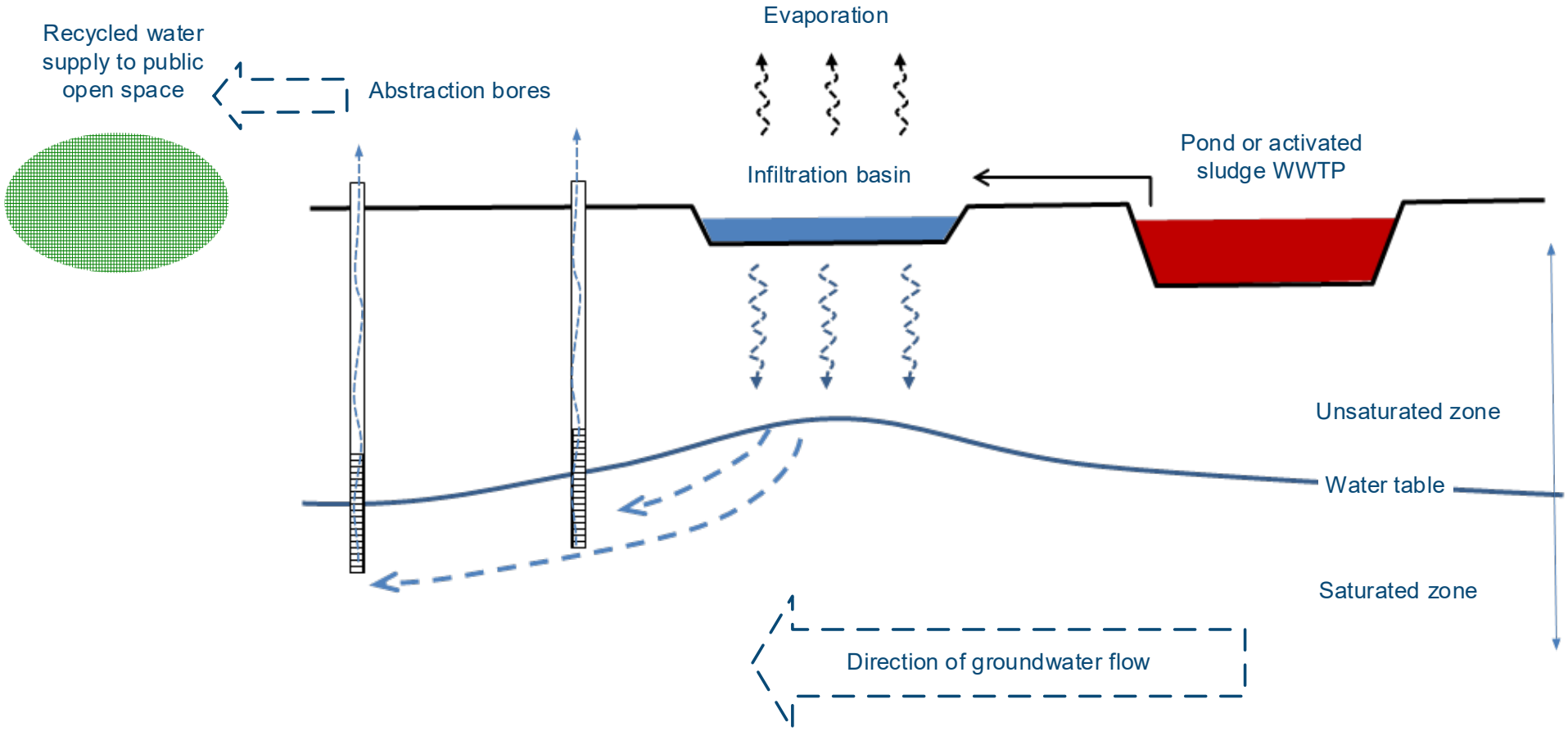


Figure 21: Infiltration MAR concept diagram

Wastewater performance, incidents, and complaints

Background

WWTPs/WWRFs are designed to reduce biological oxygen demand (BOD) and have sufficient redundancy to ensure Water Corporation's wastewater treatment systems should always be able to reduce BOD to acceptable levels (filtered BOD of less than 20mg/L). Water Corporation regularly monitors the hydraulic and organic loading of its WWTPs/WWRFs to prioritise operational and capital improvements at plants reaching their capacity. Treated wastewater recycled on public open space or anywhere human contact may occur must be also adequately disinfected under the Guidelines for Non-potable Uses of Recycled Water in Western Australia to protect public health.

Appropriate water quality for a receiving environment may not be achieved as a result of hydraulic or organic overloading of a WWTP/WRRF, an algal bloom in a wastewater pond, a contaminant introduced in the sewerage system, or treatment issues.

In addition, overflows from treatment plants or mains may occur due to hydraulic overloading, blockages or burst mains.

Wastewater treatment scheme incident management

We report to the DoH, wastewater treatment scheme incidents with a potential public health impact, not including overflows. There were no incidents of public health impact in the 2024-25 financial year.

Wastewater quality incidents at recycling schemes

In the period 2024-25, there was one reportable incident at the Broome North recycled water scheme. Two consecutive E. coli exceedances to the DoH regulatory limit was recorded. Following investigations, the chlorine disinfection dosing was increased, and the following resampling returned compliant results.

Sewer network performance

The performance of our assets directly influences our ability to deliver essential wastewater conveyance and treatment services.

Sewer main blockages, often the cause of service interruptions and compliance breaches, are proactively managed through ongoing corrective and preventive maintenance. As a result, we keep blockage rates below the target threshold of 40 blockages per 100 kilometres of sewer main (see figure 22).

In 2024-25, a total of 2,502 blockages were recorded across 18,108 km of sewer main, resulting in approximately 13.8 blockages per 100 km — a decrease of around 8.1 per cent.

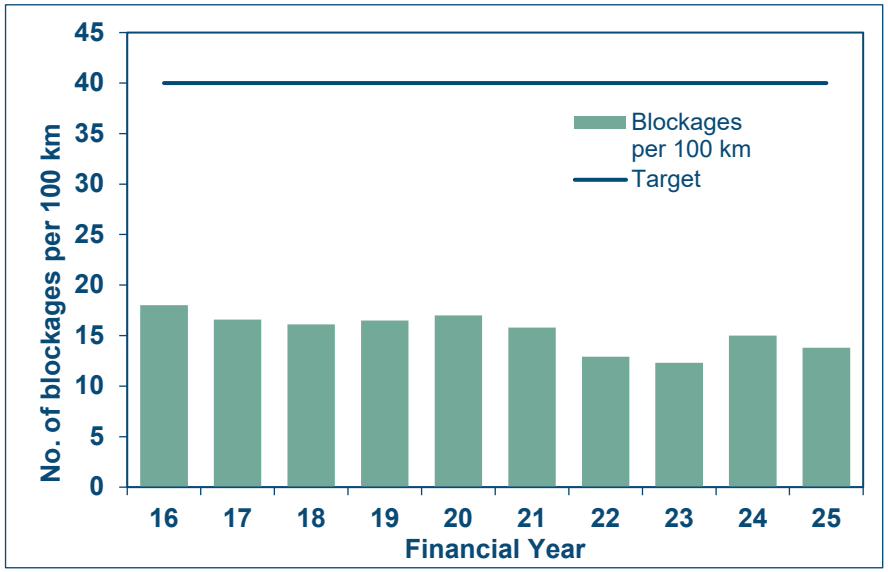


Figure 22: Sewer blockages - number per 100 km – all regions (2015-16 to 2024-25)

Wastewater blockages reported in 2024-25 have declined. This improvement aligns with enhanced training and strengthened process controls introduced to operational teams, particularly around the classification of specific corrective tasks during the initial data capture phase. These changes have led to more accurate identification and reporting of wastewater blockages and breaks-related corrective tasks.

The statewide rate of 13.8 blockages per 100 km is well below the target of 40 blockages per 100 km.

Additionally, sewer pipe length increased by approximately 1.1 per cent statewide, driven by residential subdivision growth and changes to wastewater main infrastructure.

Wastewater overflows

We operated with 18,108 kilometres of sewer mains and moved more than 183 billion litres of untreated wastewater through these pipes to WWTPs in 2024-25. Blockages and bursts within these pipes may result in overflows of wastewater into the environment or residential/commercial property. Water Corporation follows strict guidelines to manage these overflows to reduce both the public health and environmental impacts. The DoH and/or DWER are alerted to these overflows and provide advice in their management as required.

Where overflows occur on residential or commercial property, Water Corporation works with owners and occupiers to remediate any damage and reduce any inconvenience caused by the overflows.

Overflows can be symptomatic of underlying asset or scheme issues but are more often caused by tree roots or solid items that have been put into the sewer system through a sink or toilet. Items such as fats and cooking oils, kitchen scraps, cotton buds, hygiene products and wet wipes don't break down and can create a blockage in a sewer. They can also be caused by damage to our sewer reticulation. Water Corporation investigates root causes of overflows and provides recommendations for future work to decrease the number of overflows occurring each year. See watercorporation.com.au/blockage for more information.

The number of overflow events for 2024-25 was 1350 and included volumes as low as 1 litre. The largest volume overflow was of 18,300 kilolitres and was due to a severe storm event, Tropical Cyclone Zelia. Figure 24 shows the numbers of overflows for the 2024-25 financial year presented by volume range, wastewater type (i.e., treated, or untreated wastewater) and by location of the overflow (to the environment or residential/commercial property).

Figure 23 shows a comparison of the number of wastewater overflows for the last six years. Improvements to Water Corporation's overflow reporting system has contributed to the increase in overflows reported for 2024-25.

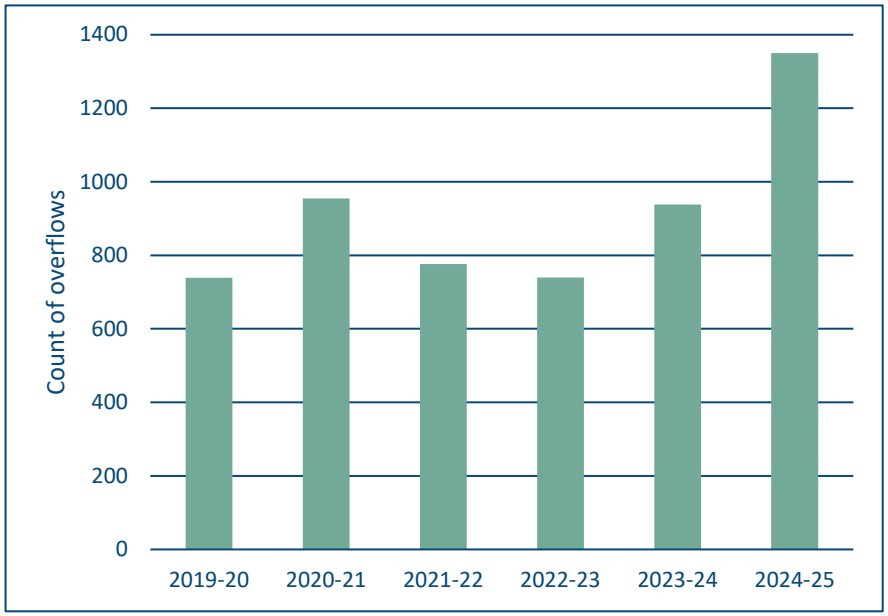


Figure 23: Comparison of wastewater overflows per year

Notable overflow incidents included Wellington Street, Perth, and Spearwood - Beaconsfield.

In the February 2025 Wellington Street event, a large fatberg caused a blockage in one of the key wastewater mains. This event created an opportunity to engage with the public and remind them of the 'three Ps' our wastewater infrastructure is designed to carry - **p**ee, **p**oo, and toilet **p**aper. For further information, please visit 'What not to flush'.

Figure 24: What not to put into the wastewater system

In June 2025, the Spearwood-Beaconsfield sewer main burst due to external corrosion to the underside of the pipe. Approximately 9,400 kilolitres were discharged during this event. Water Corporation liaised closely with regulators, DoH and DWER, local government authorities, and community groups to establish open and consistent communication for collaborative and swift management, including directing wastewater to low lying and manageable areas to reduce public health risk, erecting health signage and barricades, and taking extensive water quality sampling. Ensuring public understanding of the incident aided in minimising health risks, and the successful clean-up, disinfection and restoration of areas such as Kitj Park and Bruce Lee Reserve (Figure 24).

Figure 25: Remediation progress and completed restoration at Kitj Park, Spearwood (photos above) and Bruce Lee Reserve, Beaconsfield (photos below)

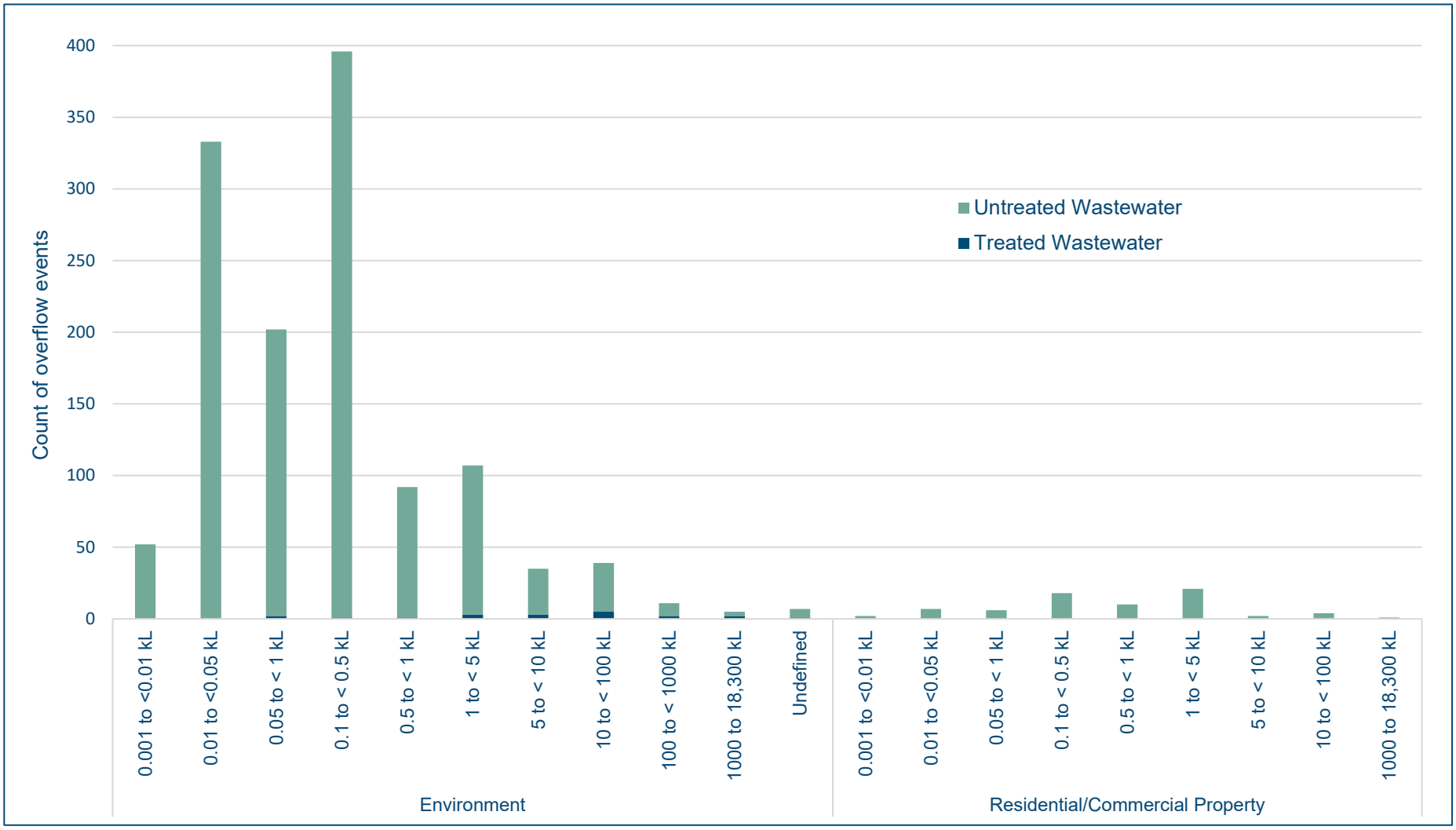


Figure 26: All wastewater overflows from Water Corporation assets 2024-25 by property/environment and range

Biosolids complaints and incidents

There were eight incidents associated with biosolids in 2024-25:

- Two biosolids quality non-compliance at Beenyup and Woodman point (refer to Table 2, page 24).
- Four biosolids handling.
- Two transport related.

All incidents were reported and discussed with the DoH.

Odour contacts

We are committed to providing high quality management of wastewater; odour buffering and treatment forms part of this management process. Odour is monitored regularly throughout the wastewater treatment process. However, due to the extensive nature of wastewater collection systems and the maintenance of wastewater treatment plants, as well as environmental factors such as high rainfall, wastewater odours can escape the sewer network or the boundaries of wastewater treatment plants.

Although wastewater odours are not a health hazard to the community, we are committed to reducing these odours to maintain the amenity and aesthetic values of surrounding land. Therefore, as part of the commitment to customers to provide wastewater services, we investigate all wastewater odour contacts.

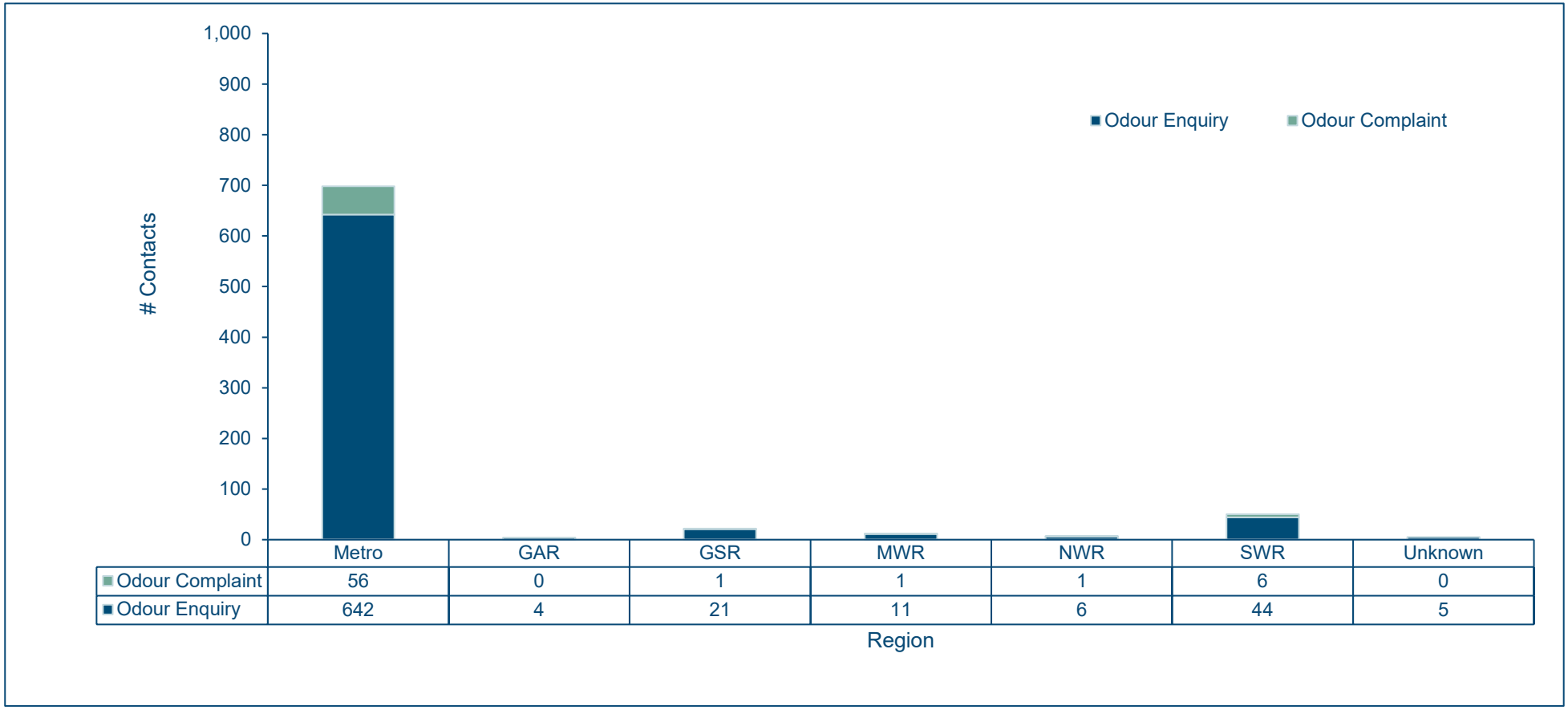
Odours may be related to manholes, wastewater pump stations, overflows, or cracked pipes in the conveyance system, WWTP maintenance, odour scrubbers or process upsets.

A total of 798 customer contacts relating to odour were received for 2024-25. Of these contacts, 733 were recorded as enquiries and 65 as complaints.[1]

Any instance of odour may result in numerous customer contacts, so multiple contacts related to the same odour instance may be recorded here. Figure 26 shows the total odour contacts received per region.

Figure 27: Subiaco WWTP odour control

[1] An enquiry is a request for information or a specific action; a complaint is recorded when an expression of dissatisfaction is made related to a wastewater odour.



	Metro	GAR	GSR	MWR	NWR	SWR	Unknown
Odour Complaint	56	0	1	1	1	6	0
Odour Enquiry	642	4	21	11	6	44	5

Figure 28: Odour contacts from 1 July 2024 to 30 June 2025 (total contacts = 798)

Notes:

This includes biosolids odour contacts.

Unknown = odour contact where the region and district details have not been stored in the database

Appendix A - Wastewater treatment plants and recycling schemes

Table 4: Goldfields and Agricultural Region

Region	Location	Treatment type	Recycling
GAR	BEVERLEY	Pond	Shire of Beverley
	BRUCE ROCK	Septic Tank Effluent Disposal	
	CORRIGIN	Pond	Shire of Corrigin
	CUNDERDIN	Pond	
	KAMBALDA	Activated sludge	Private scheme
	KELLERBERRIN	Pond	Shire of Kellerberrin
	LAVERTON	Pond	
	LEONORA	Pond	Shire of Leonora
	MECKERING	Pond	
	MERREDIN	Pond	Shire of Merredin
	MUKINBUDIN	Pond	Shire of Mukinbudin
	NAREMBEEN	Pond	Shire of Narembeen
	NORTHAM	Pond	Shire of Northam 3 Private schemes
	QUAIRADING	Pond	
	TOODYAY	Pond	Water Corporation
	WILUNA	Septic Tank Effluent Disposal	
	WONGAN HILLS	Pond	Shire of Wongan-Ballidu
	WUNDOWIE	Pond	Shire of Northam (Wundowie and Bakers Hill Ovals)
	WYALKATCHEM	Pond	Shire of Wyalkatchem
	YORK	Pond	Water Corporation

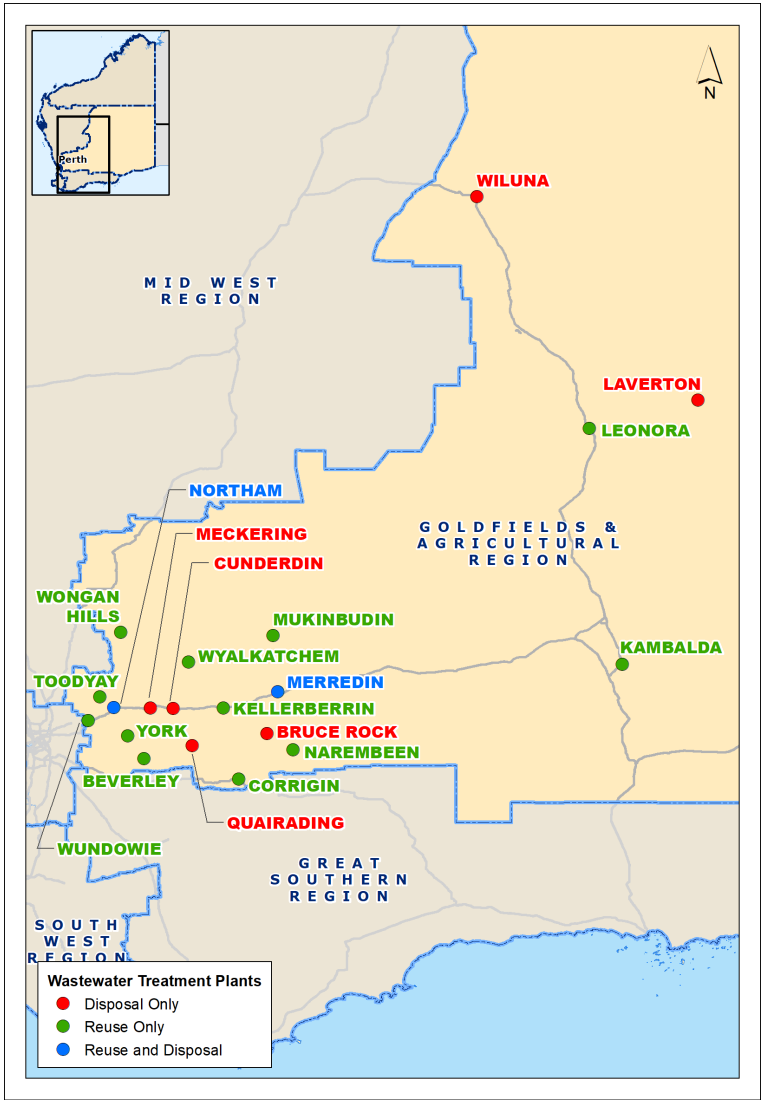


Figure 29: Map of Goldfields and Agricultural Region WWTPs

Table 5: Great Southern Region

Region	Location	Treatment type	Recycling
GSR	ALBANY	Activated sludge	Water Corporation
	BODDINGTON	Pond	Private scheme
	BREMER BAY	Pond	
	CRANBROOK	Pond	
	DENMARK	Activated sludge	
	ESPERANCE	Pond	Shire of Esperance 3 Private schemes
	GNOWANGERUP	Pond	
	HOPETOUN	Pond	
	HYDEN	Septic Tank Effluent Disposal	
	KATANNING	Pond	Shire of Katanning 4 Private schemes
	KOJONUP	Pond	Shire of Kojonup
	KULIN	Pond	Shire of Kulin
	MOUNT BARKER	Pond	Water Corporation
	NARROGIN	Pond	Town of Narrogin 3 Private schemes
	NEWDEGATE	Pond	
	PINGELLY	Pond	Shire of Pingelly
	TAMBELLUP	Pond	Shire of Tambellup-Broomehill
	WAGIN	Pond	
	WALPOLE	Activated sludge	Water Corporation
	WILLIAMS	Pond	Shire of Williams

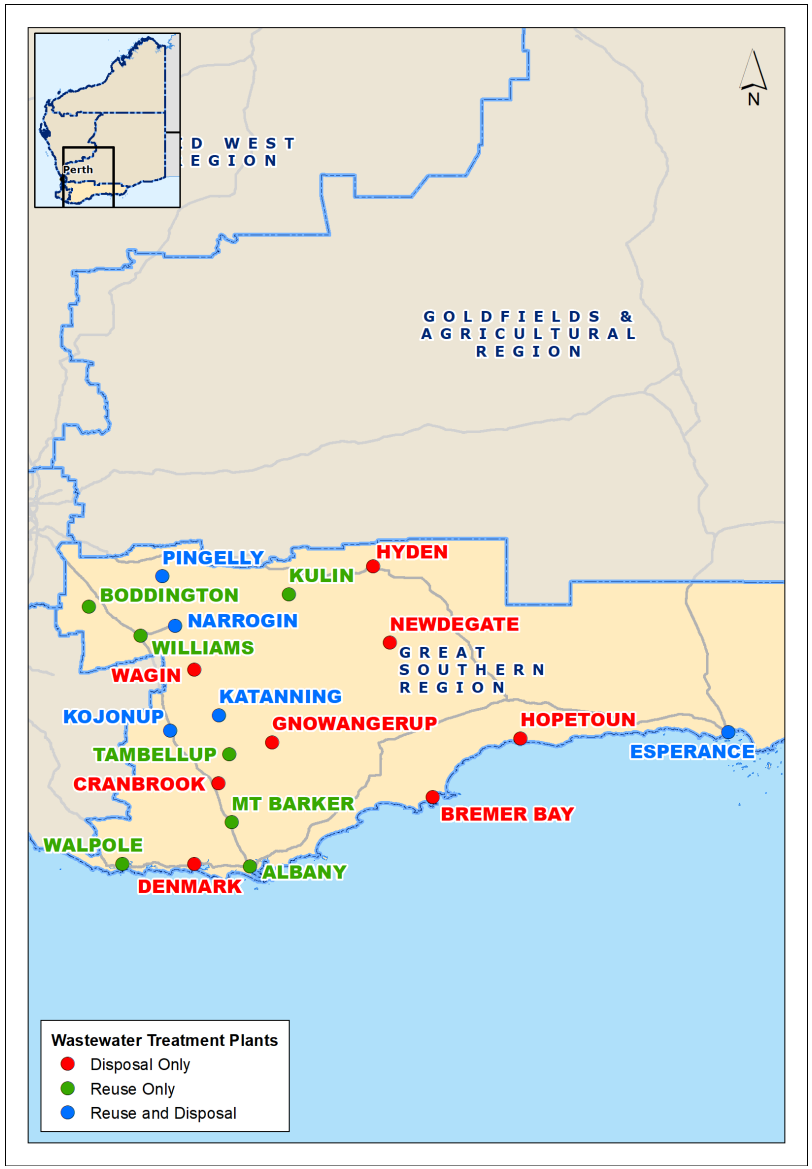


Figure 30: Map of Great Southern Region WWTPs

Table 6: Mid West Region

Region	Location	Treatment type	Recycling
MWR	BOOTENAL (GREENOUGH-ON-SEA)	Pond	
	CARNARVON	Pond	Shire of Carnarvon Private scheme
	CERVANTES	Pond	
	CORAL BAY	Pond	
	DENHAM	Pond	
	DONGARA	High Performance Aerated Lagoon	Shire of Irwin
	ENEABBA	Pond	
	EXMOUTH	Pond	Shire of Exmouth Private scheme
	GERALDTON NORTH GLENFIELD	Pond	
	GERALDTON NO 2	Pond	City of Geraldton [1] 4 Private schemes
	GREEN HEAD	Pond	
	HORROCKS	Pond	
	JURIEN BAY	Pond	
	KALBARRI	Pond	Shire of Northampton
	LANCELIN	Pond	
	LEDGE POINT	Pond	
	LEEMAN	Pond	
	NARNGULU (SOUTH GERALDTON)	High Performance Aerated Lagoon	
	THREE SPRINGS	Pond	

[1] This scheme is a Managed Aquifer Recharge (MAR) scheme (refer to *Case study – infiltration of treated wastewater for non-potable reuse*, page 33).

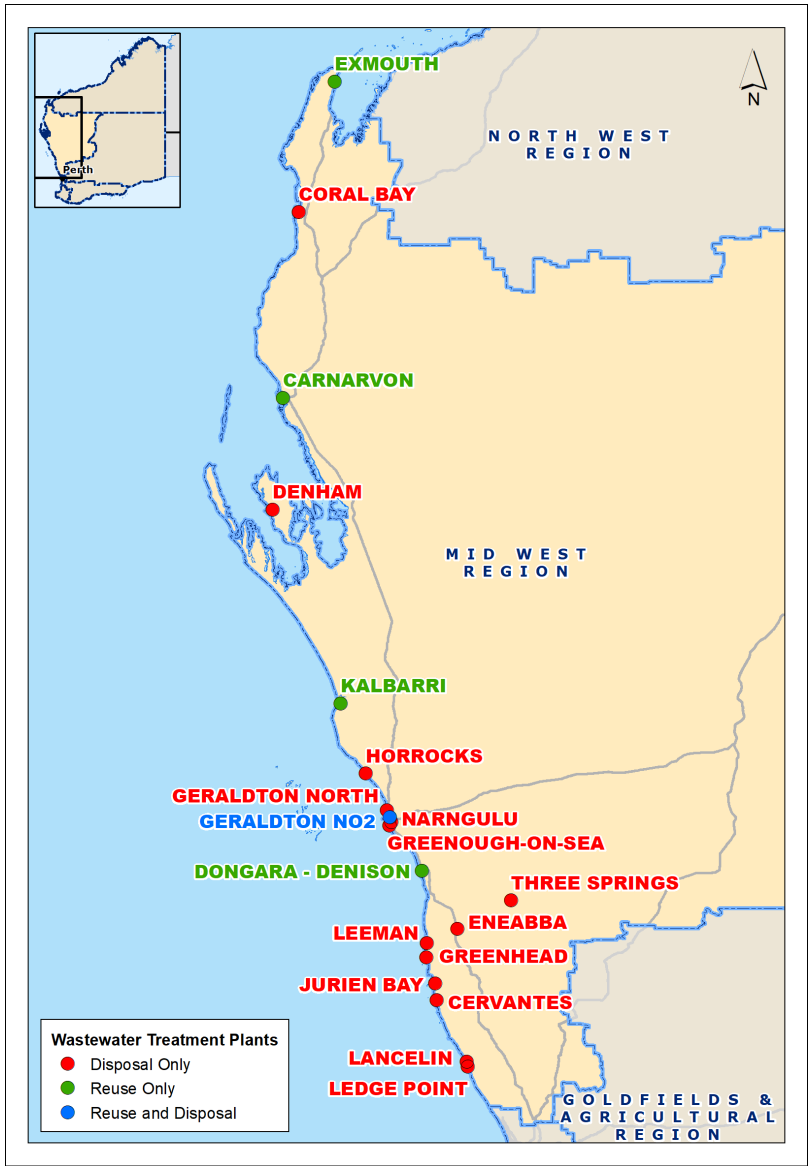


Figure 31: Map of Mid West Region WWTPs

Table 7: North West Region

Region	Location	Treatment type	Recycling
NWR	BROOME NORTH	Pond	Water Corporation Private scheme
	DERBY	Pond	Private scheme
	FITZROY CROSSING	Pond	
	HALLS CREEK	Pond	
	KARRATHA NO 1	Pond	City of Karratha Private scheme
	KARRATHA NO 2	Pond	
	KARRATHA LIA	Septic Tank Effluent Disposal	
	KUNUNURRA	Pond	
	MOWANJUM	Pond	
	ONSLOW	Pond	
	ROEBOURNE	Pond	
	SOUTH HEDLAND	Pond	Private scheme
	WICKHAM	Pond UF and UV disinfection for recycling	City of Karratha 2 Private schemes
	WYNDHAM	Septic Tank Effluent Disposal	
	CHRISTMAS IS [1]	Activated sludge	
	COCOS HOME IS [1]	Activated sludge	
	COCOS WEST IS [1]	Activated sludge	

[1] Includes Indian Ocean Territories (IOT) owned by Commonwealth, managed by Water Corporation – not shown on map.

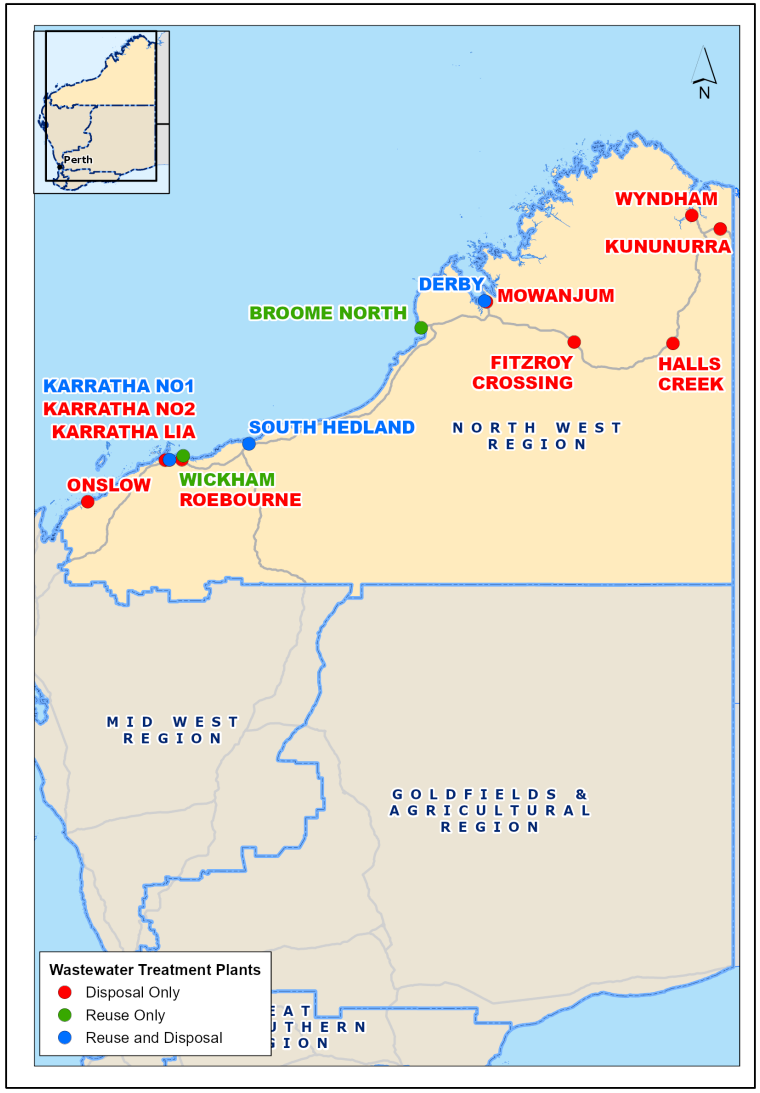


Figure 32: Map of North West Region WWTPs

Table 8: Perth Region

Region	Location	Treatment type	Recycling
Perth	ALKIMOS	Activated sludge	
	BEENYUP	Activated sludge UF, RO and UV Disinfection for GWRS	Groundwater Replenishment Scheme (refer to page 28)
	CADDADUP, MANDURAH 3	Activated sludge	City of Mandurah [1] Private scheme
	EAST ROCKINGHAM	Activated sludge	
	KWINANA	Activated sludge	
	MANDURAH 1, GORDON RD	Activated sludge	City of Mandurah [1]
	MANDURAH 2, HALLS HEAD	Activated sludge	City of Mandurah [1] Private scheme
	MUNDARING	Activated sludge	Shire of Mundaring Private scheme
	PINJARRA	Pond	Private scheme
	POINT PERON	Primary; sludge thickening	
	SUBIACO	Activated sludge	Water Corporation 3 Private schemes
	WOODMAN POINT	Activated sludge UF and RO at KWRP for recycled water	6 Private industrial schemes

[1] These schemes are Managed Aquifer Recharge (MAR) schemes (refer to *Case study – infiltration of treated wastewater for non-potable reuse*, page 33).

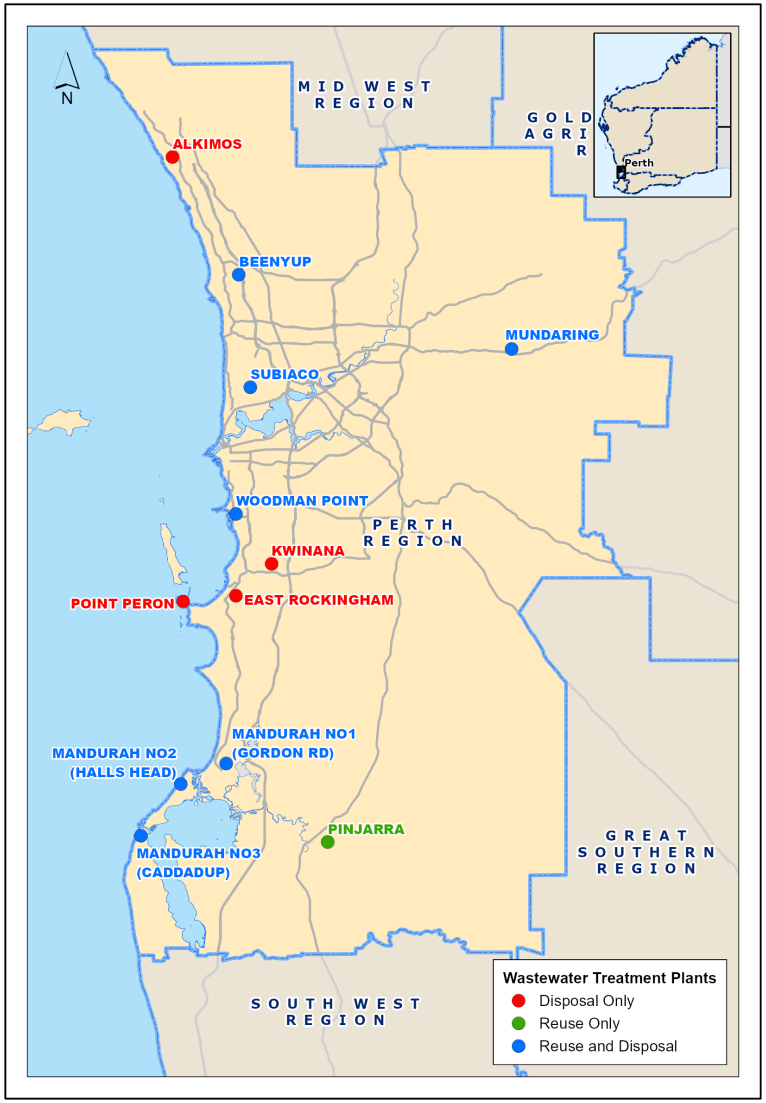


Figure 33: Map of Perth Region WWTPs

Table 9: South West Region

Region	Location	Treatment type	Recycling
SWR	AUGUSTA	Pond	
	BINNINGUP	Pond	
	BRIDGETOWN	Activated sludge	Private scheme
	BRUNSWICK	Pond	
	BUNBURY	Activated sludge	
	BUREKUP	Pond	
	BUSSELTON (YUNDERUP)	Activated sludge	2 Private schemes
	CAPEL	Pond	
	COLLIE	Activated sludge	
	DARDANUP	Pond	
	DONNYBROOK (BOYANUP)	Pond	Water Corporation
	DUNSBOROUGH 2	Activated sludge	Water Corporation
	GNARABUP BEACH (PREVELLY)	Activated sludge	
	HARVEY	Pond	
	KEMERTON (AUSTRALIND)	Activated sludge	Water Corporation
	MANJIMUP	Pond	Water Corporation Private scheme
	MARGARET RIVER 2 (COWARAMUP)	Activated sludge	Water Corporation Shire of Augusta and Margaret River 4 Private schemes
	NANNUP	Pond	Water Corporation
	PEMBERTON	Activated sludge	Shire of Manjimup
	WAROONA	Pond	

Figure 34: Map of South West Region WWTPs

Appendix B - Groundwater replenishment – all recycled water quality parameters (RWQP)

Table 10: Annual recycled water quality parameter results

Parameter	Units	Guideline	LOR	Value Reported		Requirement Met
				Stage 1	Stage 2	
1,4-Dichlorobenzene	µg/L	40	1	<1.0	<1.0	✓
1,4-Dioxane	µg/L	50	0.1	<0.1	<0.1	✓
17alpha-estradiol	ng/L	175	1	<1.0	<1.0	✓
17beta-estradiol	ng/L	175	1	<1.0	<1.0	✓
1-methylnaphthalene	µg/L	0	0.1	<0.1	<0.1	✓
2,4,6-trichlorophenol	µg/L	20	1	<1.0	<1.0	✓
2,4-dichlorophenol	µg/L	200	1	<1.0	<1.0	✓
2,4-dichlorophenoxyacetic acid	µg/L	30	0.5	<0.5	<0.5	✓
2,6-dichlorophenol	µg/L	10	1	<1.0	<1.0	✓
2,6-di-tert-butylphenol	µg/L	2	0.05	<0.05	<0.05	✓
2-chlorophenol	µg/L	300	1	<1.0	<1.0	✓
2-methyl-naphthalene	µg/L	-	0.1	<0.1	<0.1	✓
2-nitrophenol	µg/L	0.7	0.5	<0.5	<0.5	✓
2-phenylphenol	µg/L	20	1	<1.0	<1.0	✓
2-propyltoluene	µg/L	0.7	0.5	<0.5	<0.5	✓
4-chloro-2-methylphenoxy acetic acid (MCPA)	µg/L	35	1	<1.0	<1.0	✓
4-chlorophenol	µg/L	10	1	<1.0	<1.0	✓
4-cumylphenol	µg/L	0.35	0.05	<0.05	<0.05	✓
4-nitrophenol	µg/L	30	1	<1.0	<1.0	✓
4-nonylphenol	µg/L	500	10	<10	<10	✓
4-tert-octylphenol	µg/L	50	10	<10	<10	✓
Acenaphthene	µg/L	-	0.001	<0.001	<0.001	✓
Acenaphthylene	µg/L	-	0.001	<0.001	<0.001	✓
Aluminium	mg/L	0.2	0.005	<0.005	0.03	✓

Parameter	Units	Guideline	LOR	Value Reported		Requirement Met
				Stage 1	Stage 2	
Ammonia as nitrogen	mg/L	0.5	0.01	0.64	0.63	✓
Androstenedione	ng/L	9	2	<2.0	<2.0	✓
Anthracene	µg/L	150	0.001	<0.001	<0.001	✓
Antimony	mg/L	0.003	0.0001	<0.0001	<0.0001	✓
Arsenic Unfiltered	mg/L	0.01	0.001	<0.001	<0.001	✓
Atrazine	µg/L	40	0.1	<0.1	<0.1	✓
Barium	mg/L	2	0.002	<0.002	<0.002	✓
Benzidine	ng/L	0.2	20	<20	<20	✓
Benzo(a)anthracene	µg/L	-	0.001	<0.001	<0.001	✓
Benzo(a)pyrene	µg/L	0.01	0.001	<0.001	<0.001	✓
Benzo(b)fluoranthene	µg/L	-	0.001	<0.001	<0.001	✓
Benzo(g,h,i)perylene	µg/L	-	0.001	<0.001	<0.001	✓
Benzo(k)fluoranthene	µg/L	-	0.001	<0.001	<0.001	✓
Benzotriazole	µg/L	20	1	<1.0	<1.0	✓
Beryllium	mg/L	0.004	0.0001	<0.0001	<0.0001	✓
Bisphenol A	µg/L	200	1	<10	<10	✓
Boron	mg/L	4	0.02	0.14	0.16	✓
Bromochloroacetic acid	µg/L	0.7	0.7	<0.7	<0.7	✓
Bromochloromethane	µg/L	40	1	<1.0	<1.0	✓
Bromodichloromethane	µg/L	6	1	<1.0	<1.0	✓
Bromoform	µg/L	100	1	<1.0	<1.0	✓
Cadmium	mg/L	0.002	0.0001	<0.0001	<0.0001	✓
Carbamazepine	µg/L	100	0.1	<0.1	<0.1	✓
Carbon disulfide	µg/L	700	1	<1.0	<1.0	✓
Chlorate	mg/L	0.7	0.01	<0.01	0.01	✓
Chloride	mg/L	250	1	7	9	✓
Chloroacetic acid	µg/L	150	2	<2.0	<2.0	✓
Chloroform	µg/L	200	1	<1.0	<1.0	✓

Parameter	Units	Guideline	LOR	Value Reported		Requirement Met
				Stage 1	Stage 2	
Chlorophene	µg/L	0.35	0.05	<0.05	<0.05	✓
Chromium	mg/L	0.05	0.0005	<0.0005	<0.0005	✓
Chrysene	µg/L	-	0.001	<0.001	<0.001	✓
Clostridium perfringens spores	cfu/100mL	<1	1	<1.0	<1.0	✓
Cobalt	mg/L	0.001	0.0001	<0.0001	<0.0001	✓
Coliphage (MS2)	pfu/100mL	<1	1	<1.0	<1.0	✓
Coliphage (somatic)	pfu/100mL	<1	1	<1.0	<1.0	✓
Copper	mg/L	2	0.0001	0.0013	0.0006	✓
Dibenzo(a,h)anthracene	µg/L	-	0.001	<0.001	<0.001	✓
Dibromochloroacetic acid	µg/L	0.7	<0.7	<0.7	<0.7	✓
Dibromomonochloromethane	µg/L	100	1	<1.0	<1.0	✓
Dichloroacetic acid	µg/L	100	2	<2.0	<2.0	✓
Dichloromethane	µg/L	4	1	<1.0	<1.0	✓
Diclofenac	µg/L	1.8	0.1	<0.1	<0.1	✓
DTPA	µg/L	20	10	<10	<10	✓
Equilenin	ng/L	30	2	<2.0	<2.0	✓
Equilin	ng/L	30	2	<2.0	<2.0	✓
Estriol	ng/L	50	1	<1.0	<1.0	✓
Estrone	ng/L	30	1	<1.0	<1.0	✓
Ethinyl Estradiol	ng/L	1.5	1	<1.0	<1.0	✓
Ethylenediamine tetraacetic acid	µg/L	250	10	<10	<10	✓
Etiocholanolone	ng/L	7	2	<2.0	<2.0	✓
Fluoranthene	µg/L	-	0.001	<0.001	<0.001	✓
Fluorene	µg/L	140	0.001	<0.001	<0.001	✓
Fluoride	mg/L	1.5	0.05	0.14	0.12	✓
Flupropanate	ug/L	9	0.5	<0.5	<0.5	✓
Galaxolide	µg/L	1800	1	<1.0	<1.0	✓
Glyphosate	µg/L	1000	100	<100	<100	✓

Parameter	Units	Guideline	LOR	Value Reported		Requirement Met
				Stage 1	Stage 2	
Gross alpha activity	mBq/L	500	0.01	85	83	✓
Gross beta activity minus K40	mBq/L	500	0.01	<72	<110	✓
HeptaCDD (1,2,3,4,6,7,8-HpCDD)	pg/L	-	2	<1.0	<1.0	✓
HeptaCDF (1,2,3,4,6,7,8-HpCDF)	pg/L	-	1	<1.0	<1.0	✓
HeptaCDF (1,2,3,4,7,8,9-HpCDF)	pg/L	-	1	<1.0	<1.0	✓
HexaCDD (1,2,3,4,7,8-HxCDD)	pg/L	-	1	<1.0	<1.0	✓
HexaCDD (1,2,3,6,7,8-HxCDD)	pg/L	-	1	<1.0	<1.0	✓
HexaCDD (1,2,3,7,8,9-HxCDD)	pg/L	-	1	<1.0	<1.0	✓
HexaCDF (1,2,3,4,7,8-HxCDF)	pg/L	-	1	<1.0	<1.0	✓
HexaCDF (1,2,3,6,7,8-HxCDF)	pg/L	-	1	<1.0	<1.0	✓
HexaCDF (1,2,3,7,8,9-HxCDF)	pg/L	-	1	<1.0	<1.0	✓
HexaCDF (2,3,4,6,7,8-HxCDF)	pg/L	-	1	<1.0	<1.0	✓
Indeno(1,2,3-c,d)pyrene	µg/L	-	0.001	<0.001	<0.001	✓
Iodide	mg/L	0.1	0.02	<0.02	<0.02	✓
Iron	mg/L	0.3	0.005	<0.005	<0.005	✓
Iron unfiltered	mg/L	0.3	0.01	<0.01	<0.01	✓
Lead	mg/L	0.1	0.0001	<0.0001	<0.0001	✓
Lithium	mg/L	0.15	0.0001	0.0004	0.0007	✓
Magnesium	mg/L	800	0.1	<0.1	<0.1	✓
Manganese	mg/L	0.5	0.001	<0.001	<0.001	✓
Mercury	mg/L	0.001	0.0001	<0.0001	<0.0001	✓
Mestranol	ng/L	2.5	2	<2.0	<2.0	✓
Methyl-tert-butyl ether	µg/L	13	1	<1.0	<1.0	✓
Metolachlor	µg/L	300	0.1	<0.1	<0.1	✓
Molybdenum	mg/L	0.5	0.001	<0.001	<0.001	✓
N,N-diethyl-m-toluamide	µg/L	2500	0.1	<0.1	<0.1	✓
Nickel	mg/L	0.02	0.001	<0.001	<0.001	✓
Nitrate as nitrogen	mg/L	11	0.01	1.7	3.0	✓

Parameter	Units	Guideline	LOR	Value Reported		Requirement Met
				Stage 1	Stage 2	
Nitrite as nitrogen	mg/L	1	0.01	<0.01	<0.01	✓
N-nitrosodiethylamine (NDEA)	ng/L	10	2	<0.2	<0.2	✓
N-nitrosodimethylamine (NDMA)	ng/L	100	2	3.2	4.2	✓
N-nitrosodi-n-butylamine (NDBA)	ng/L	6	2	5.6	4.4	✓
N-nitrosodi-n-propylamine (NDPA)	ng/L	5	2	<2.0	<2.0	✓
N-nitroso-diphenylamine (NDPhA)	ng/L	7000	10	<10	<10	✓
N-nitrosoethylmethylamine (NEMA)	ng/L	2	2	<2.0	<2.0	✓
N-nitrosomorpholine (NMOR)	ng/L	5	2	<2.0	<2.0	✓
N-nitrosopiperidine (NPIP)	ng/L	4	2	<2.0	<2.0	✓
N-nitrosopyrrolidine (NPYR)	ng/L	20	2	<2.0	<2.0	✓
Norethindrone	ng/L	250	100	<100	<100	✓
Octadioxin	pg/L	9000	2	<4	<2	✓
Octafuran	pg/L	-	4	<2.0	<2.0	✓
PCB 105	pg/L	-	20	<20	<20	✓
PCB 114	pg/L	-	4	<7	<8	✓
PCB 118	pg/L	-	100	<100	<100	✓
PCB 123	pg/L	-	2	<7	<7	✓
PCB 126	pg/L	-	1	<2	<3	✓
PCB 156	pg/L	-	10	<10	<10	✓
PCB 157	pg/L	-	1	<5	<4	✓
PCB 167	pg/L	-	10	<10	<10	✓
PCB 169	pg/L	-	1	<4	<4	✓
PCB 189	pg/L	-	2	<4	<5	✓
PCB 77	pg/L	-	1	3	<2	✓
PCB 81	pg/L	-	1	<2	<2	✓
PentaCDD (1,2,3,7,8-PeCDD)	pg/L	-	1	<4	<4	✓
PentaCDF (1,2,3,7,8-PeCDF)	pg/L	-	1	<1	<2	✓
PentaCDF (2,3,4,7,8-PeCDF)	pg/L	-	1	<1	<1	✓

Parameter	Units	Guideline	LOR	Value Reported		Requirement Met
				Stage 1	Stage 2	
Pentachlorophenol	µg/L	10	1	<1.0	<1.0	✓
Perchlorate	µg/L	6	0.5	<0.5	<0.5	✓
Perfluorooctane sulfonate (PFOS)	µg/L	0.07	0.05	<0.01	<0.01	✓
Perfluorooctanoic acid (PFOA)	µg/L	0.56	0.05	<0.05	<0.05	✓
pH measured in laboratory	No unit	6.0-8.5	0.1	7.3	7.2	✓
Phenanthrene	µg/L	150	0.001	<0.001	<0.001	✓
Progesterone	ng/L	105	100	<100	<100	✓
Propiconazole	µg/L	100	0.1	<0.05	<0.05	✓
Pyrene	µg/L	150	0.001	<0.001	<0.001	✓
Selenium	mg/L	0.01	0.001	<0.001	<0.001	✓
Silver	mg/L	0.1	0.0001	<0.0001	<0.0001	✓
Simazine	µg/L	20	0.1	<0.1	<0.1	✓
Sodium	mg/L	180	0.1	8.2	9.6	✓
Strontium	mg/L	4	0.0001	<0.002	<0.002	✓
Sulphate	mg/L	500	0.01	<0.1	<0.1	✓
Testosterone	ng/L	7	2	<2.0	<2.0	✓
TetraCDD(2,3,7,8-TCDD)	pg/L	-	1	<2	<2	✓
TetraCDF (2,3,7,8-tetraCDF)	pg/L	-	1	<3	<3	✓
Thallium	mg/L	0.002	0.0001	<0.0001	<0.0001	✓
Thermotolerant coliforms	cfu/100 mL	<1	1	<1	<1	✓
Tin	mg/L	14	0.0001	<0.0001	<0.0001	✓
Tolyltriazole	µg/L	20	1	<1	<1	✓
Total cyanide	mg/L	0.08	0.01	<0.01	<0.01	✓
Total dissolved solids by evaporation	mg/L	500	10	36	46	✓
Total trihalomethanes	µg/L	250	4	<4	<4	✓
Tribromoacetic acid	µg/L	0.7	0.7	<0.7	<0.7	✓
Trichloroacetic acid	µg/L	100	1	<1	<1	✓
Trifluralin	µg/L	90	0.1	<0.1	<0.1	✓

Parameter	Units	Guideline	LOR	Value Reported		Requirement Met
				Stage 1	Stage 2	
Turbidity	NTU	5	0.5	<0.5	<0.5	✓
Uranium	mg/L	0.02	0.0001	<0.0001	<0.0001	✓
Vanadium	mg/L	0.015	0.005	<0.0001	<0.0001	✓
Zinc	mg/L	3	0.005	0.012	0.005	✓

Note: All data statistics are calculated assuming <limit of reporting (LOR) data are equal to LOR (e.g. <0.1 µg/L is 0.1 µg/L for calculation purposes).

Table 11: Description of units

Abbreviation	Full name	Relative to grams per litre (g/L)
mg/L	Milligrams per litre	10^{-3} or 0.001
µg/L	Micrograms per litre	10^{-6} or 0.000001
ng/L	Nanograms per litre	10^{-9} or 0.000000001
pg/L	Picograms per litre	10^{-12} or 0.000000000001
cfu/100 mL	Colony forming units per 100ml	Not applicable
NTU	Nephelometric Turbidity Units	Not applicable

Appendix C – Recycled Water Quality Data - sampling undertaken by Water Corporation as per MoU

Data shown in the tables below is based on the following assumptions drawn from the MoU and the notes below.

- Managed aquifer recharge (MAR) schemes are not shown.
- Schemes where disinfection is owned and operated by another party are not shown.
- Residual total chlorine (TCL) monthly, pH and *E.coli* samples are shown for Water Corporation end use schemes only.
- Suspended solids is shown for activated sludge plants only.

Table 12: Low and medium exposure risk recycling schemes

Region	WWTP	Primary Recipient	Residual TCl monthly compliance (# samples)	Samples <0.2 mg/L	Requirement met	Residual TCl wkly check (# samples)	Samples <0.2 mg/L residual	Requirement met	Suspended Solids (# samples)	Samples >30 mg/L	Requirement met	pH (# samples)	samples outside 6.5-9	Requirement met	*E. coli* (# samples)	samples >1000cfu/ 100mL (for low risk)	Requirement met
GAR	Beverley	Shire of Beverley	-	-	(2)	9	4	(4)	-	-	(3)	-	-	(2)	-	-	(2)
GAR	Corrigin	Shire of Corrigin	-	-	(2)	-	-	(2)	-	-	(3)	-	-	(2)	-	-	(2)
GAR	Kambalda	Private Scheme	-	-	(2)	33	3	(4)	16	2	(4)	-	-	(2)	-	-	(2)
GAR	Leonora	Shire of Leonora	-	-	(2)	31	7	(4)	-	-	(3)	-	-	(2)	-	-	(2)
GAR	Mukinbudin	Shire of Mukinbudin	-	-	(2)	81	0	✓	-	-	(2)	-	-	(2)	-	-	(2)
GAR	Narembeen	Shire or Narembeen	-	-	(2)	22	0	✓	-	-	(3)	-	-	(2)	-	-	(2)
GSR	Boddington	Private Scheme	-	-	(2)	36	0	✓	-	-	(3)	-	-	(2)	-	-	(2)
GSR	Esperance	Shire of Esperance 1	-	-	(2)	-	-	(2)	-	-	(3)	-	-	(2)	-	-	(2)
GSR	Katanning	Private Scheme 1	-	-	(2)	89	18	(4)	-	-	(3)	-	-	(2)	-	-	(2)
GSR	Katanning	Private Scheme 2	-	-	(2)	89	18	(4)	-	-	(3)	-	-	(2)	-	-	(2)
GSR	Katanning	Shire of Katanning	-	-	(2)	89	18	(4)	-	-	(3)	-	-	(2)	-	-	(2)
GSR	Kojonup	Shire of Kojonup	-	-	(2)	53	0	✓	-	-	(3)	-	-	(2)	-	-	(2)
GSR	Kulin	Shire of Kulin	-	-	(2)	8	2	(4)	-	-	(3)	-	-	(2)	-	-	(2)
GSR	Narrogin	Shire of Narrogin	-	-	(2)	48	0	✓	-	-	(3)	-	-	(2)	-	-	(2)
GSR	Tambellup	Shire of Tambellup-Broomehill	-	-	(2)	82	0	✓	-	-	(3)	-	-	(2)	-	-	(2)
GSR	Williams	Shire of Williams	-	-	(2)	55	1	(4)	-	-	(3)	-	-	(2)	-	-	(2)
MWR	Dongara	Shire of Irwin	-	-	(2)	49	0	✓	-	-	(3)	-	-	(2)	-	-	(2)
MWR	Kalbarri	Shire of Northampton	-	-	(2)	48	0	✓	-	-	(3)	-	-	(2)	-	-	(2)
NWR	Broome North	Water Corporation	15	4	(4)	89	4	(4)	-	-	(3)	12	0	✓	15	3	(6)
NWR	Derby	Private Scheme	13	8	(4)	73	8	(4)	-	-	(3)	13	0	✓	13	1	(6)
NWR	South Hedland	Private Scheme	13	0	✓	95	0	✓	-	-	(3)	13	0	✓	13	0	✓
Perth	Mundaring	Shire of Mundaring	-	-	(2)	67	0	✓	12	0	✓	-	-	(2)	-	-	(2)
Perth	Mundaring	Private scheme	3	3	(4)	67	3	✓	12	0	✓	-	-	(2)	13	0	✓
SWR	Bridgetown	Private Scheme	9	0	✓	62	0	✓	-	-	(3)	9	0	✓	9	0	✓
SWR	Busselton	Private Scheme	-	-	(1)	-	-	(1)	12	0	✓	-	-	(2)	-	-	(2)
SWR	Busselton	Private Scheme	-	-	(1)	-	-	(1)	12	0	✓	-	-	(2)	-	-	(2)
SWR	Manjimup	Private Scheme	-	-	(2)	28	1	(4)	-	-	(3)	-	-	(2)	-	-	(2)
SWR	Margaret River	Shire of Margaret River	-	-	(2)	128	0	✓	12	0	✓	-	-	(2)	-	-	(2)
SWR	Margaret River	Private Scheme	-	-	(2)	128	0	✓	12	0	✓	-	-	(2)	-	-	(2)
SWR	Margaret River	Water Corporation	48	0	✓	128	0	✓	12	0	✓	12	1	(4)	48	0	✓

Notes:

(1) UV disinfection
(2) This sampling is not the responsibility of Water Corporation
(3) Suspended Solids not applicable to these schemes
(4) Operational exception – health compliance still achieved
(6) Continuous online sampling of chlorine residual, therefore no requirement to undertake monthly compliance or weekly check samples
(8) Sample exceedance; review of barriers showed no elevated public health risk.

Table 13: Low and medium exposure risk recycling schemes with continuous online analysis of chlorine residual

Region	WWTP	Primary Recipient	Residual TCl monthly compliance (#samples)	Samples <0.2 mg/L	Requirement met	Residual TCl wkly check (# samples)	Samples <0.2 mg/L residual	Requirement met	Suspended Solids (#samples)	Samples >30 mg/L	Requirement met	pH (samples taken)	samples outside 6.5-9	Requirement met	*E. coli* (#samples)	samples >1000cfu/ 100mL (for low risk)	Requirement met
NWR	Karratha 1	City of Karratha	-	-	(6)	-	-	(6)	12	0	✓	24	0	✓	62	0	✓
NWR	Wickham	Private Scheme	-	-	(2)	-	-	(2)	-	-	(2)	-	-	(2)	-	-	(2)
Perth	Subiaco	Water Corporation	-	-	(6)	-	-	(6)	7	0	✓	7	0	✓	7	1	(6)
		Private Scheme															
		Private Scheme															
		Private Scheme															
SWR	Pemberton	Shire of Manjimup	-	-	(6)	-	-	(6)	9	0	✓	9	0	✓	9	0	✓

Notes:

(2) This sampling is not the responsibility of Water Corporation
(6) Continuous online sampling of chlorine residual, therefore no requirement to undertake monthly compliance or weekly check samples
(8) Sample exceedance; review of barriers showed no elevated public health risk.

Table 14: Extra low exposure risk recycling schemes (all schemes wholly operated and maintained by the Water Corporation)

Region	WWTP	Primary Recipient	Residual TCl monthly compliance (#samples)	Samples <0.2 mg/L	Requirement met	Residual TCl wkly check (# samples)	Samples <0.2 mg/L residual	Requirement met	Suspended Solids (#samples)	Samples >30 mg/L	Requirement met	pH (samples taken)	samples outside 6.5-9	Requirement met	*E. coli* (#samples)	samples >10000cfu/100mL (for low risk)	Requirement met
GAR	Toodyay	Water Corporation	-	-	(5)	-	-	(5)	-	-	(5)	5	0	✓	5	0	✓
GAR	York	Water Corporation	-	-	(5)	-	-	(5)	-	-	(5)	8	1	(8)	8	0	✓
GSR	Albany	Water Corporation	-	-	(5)	-	-	(5)	-	-	(5)	24	4	(8)	24	0	✓
GSR	Mt Barker	Water Corporation	-	-	(5)	-	-	(5)	-	-	(5)	12	0	✓	12	0	✓
GSR	Walpole	Water Corporation	-	-	(5)	-	-	(5)	-	-	(5)	7	3	(8)	7	0	✓
SWR	Donnybrook	Water Corporation	13	0	✓	-	-	(5)	-	-	(5)	13	1	(8)	13	0	✓
SWR	Dunsborough	Water Corporation	8	0	✓	-	-	(5)	-	-	(5)	8	0	✓	8	0	✓
SWR	Kemerton	Water Corporation	-	-	(5)	-	-	(5)	-	-	(5)	36	0	✓	36	1	(8)
SWR	Manjimup	Water Corporation	-	-	(5)	-	-	(5)	-	-	(5)	12	3	(8)	12	0	✓
SWR	Nannup	Water Corporation	-	-	(5)	-	-	(5)	-	-	(5)	12	9	(8)	12	0	✓

Notes:

(2) This sampling is not the responsibility of Water Corporation
(5) This sampling is not required in the DoH approval
(6) Continuous online sampling of chlorine residual, therefore no requirement to undertake monthly compliance or weekly check samples
(8) Sample exceedance; review of barriers showed no elevated public health risk.