

# Review of the Regulatory Requirements for the Maintenance of Aerobic Treatment Units and Greywater Treatment Systems in Western Australia

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## Abstract

Aerobic Treatment Units (ATU) and Greywater Treatment Systems (GTS) are onsite wastewater treatment systems (OWTS) designed to treat wastewater to secondary effluent quality standards. Consequently, the electrical, mechanical and chemical components of these OWTS need to be regularly maintained to ensure their consistent and reliable operation to the required standards. In Western Australia (WA), the Department of Health set out the regulatory requirements for the maintenance of OWTS as well as when and how it is to occur. This paper reviews the maintenance requirements for ATU and GTS in WA and provides recommendations for the proposed changes in guidelines and regulations. State and national guidelines were reviewed and information from industry and regulators was obtained through surveys. The review found that although the guidelines are generally satisfactory there are a number of areas which could be improved and specific recommendations are discussed.

## Keywords

On-Site Wastewater System, Wastewater Management, Environmental Health, Regulatory Requirements, Maintenance

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## 1. Introduction

Aerobic Treatment Units (ATU) and Greywater Treatment Systems (GTS) are designed to treat wastewater to

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secondary effluent quality. However, these systems require consistent maintenance to ensure that they continue to output treated effluent to the designated standard. This paper reviews the current maintenance requirements for ATU and GTS in WA and provides recommendations to ensure the delivery of effluent water quality standards in a reliable manner during the life of the systems.

In WA, the Department of Health Western Australia (DOHWA) is primarily responsible for regulating OWTS, including maintenance requirements for ATU and GTS. Currently the key documents administered by the DOHWA relating to the maintenance of domestic ATU and GTS are the:

- Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974, hereafter referred to as the “Health Regulations” [1],
- Code of Practice for Product Approval of Onsite Wastewater Systems in Western Australia (2011), hereafter referred to as the “Product Approval Code”,
- Code of Practice for the Design, Manufacture, Installation and Operation of Aerobic Treatment Units (ATUs) (2001), hereafter referred to as the “ATU Code”,
- Code of Practice for the Reuse of Greywater in Western Australia 2010 (2010), hereafter referred to as the “Greywater Code”, and the
- Guidelines for Becoming an Authorised Service Agent for Domestic Aerobic Treatment Units (2009) [2].

Also under development, currently in the draft stage, is the Code of Practice for Onsite Sewage Management (2012), hereafter referred to as the “Draft Code”. The introduction of this code is intended to update the current guidelines by replacing the ATU Code and Health Regulations.

The purpose of this project is to:

- Review the current maintenance requirements for domestic ATU and GTS within WA;
- Identify and discuss areas of the guidelines requiring improvements; and
- Provide recommendations with a view to:
  - Rectify current weakness,
  - Improve governance, and
  - Increase flexibility while ensuring adequate service of the systems.

## 1.1. Onsite Wastewater Treatment Systems

OWTS provide an effective method of decontaminating wastewater and disposing of treated effluent onsite. Total treatment systems which treat both blackwater and greywater, such as ATU, are of particular use when reticulated sewage is impractical and there is sufficient room to dispose of effluent onsite. Partial treatment systems treating only greywater, such as GTS, are used mainly as a water conservation measure. In WA, GTS can only be used when there is reticulated sewage or another type of onsite OWTS available and capable of treating the greywater if the GTS fails. A range of other treatment systems are available, including septic tanks and composting toilets, however only ATU and GTS are considered in this review.

Despite the usefulness of OWTS, they can present a risk to human health and the environment when they fail or are used inappropriately. This is due to the contaminants present and the nature of the wastewater they treat [3]. Therefore, maintenance is important for ensuring optimal performance [4], and, along with monitoring, assists in minimising the risks associated with the systems.

### 1.1.1. Human Health Risks

The greatest risk wastewater poses to human health comes from pathogenic organisms. The three main types of pathogenic organisms, which are present in untreated wastewater, are described in **Table 1**. Pathogenic organisms can cause diseases by either direct or indirect contact [5]. However, testing for the presence of pathogens can be difficult and expensive. Hence, where testing is required, instead of testing the effluent for the pathogens themselves it is generally tested for the presence of indicator bacteria, most commonly *Escherichia coli* (*E. coli*). In addition to pathogenic organisms, wastewater can also contain excess nutrients, most notably nitrogen and phosphorus. The consequences of which are detailed in **Table 2**. However, most treatment systems are not designed to reduce nutrient levels and they may have a negative impact on the surrounding environment, but they rarely pose a direct risk to human health. Some ATU are designed to remove nutrients and the requirement to install those systems is directed by local government for use in environmentally sensitive areas.

Two methods are used to minimise the potential for humans to come into contact with the potentially harmful

**Table 1.** Pathogenic organisms [6].

Bacteria	Domestic wastewater contains a wide variety and concentration of pathogenic bacteria. Infectious doses of disease causing bacteria in wastewater can lead to illness.
Parasites	Domestic wastewater has the potential to contain a range of parasites. Of greatest concern in wastewater are protozoan parasites, cryptosporidium and giardia, and helminths or intestinal worms. Protozoan parasites are often resistant to standard disinfection methods, while helminths release millions of environmentally resilient eggs throughout their lifespan.
Viruses	Domestic wastewater has the potential to contain viruses. Viruses are more common and diverse than bacteria and can cause widespread illness.

**Table 2.** Nutrients [7].

Nitrogen	Excess nitrogen in surface waters can cause dissolved oxygen loss, surface waters eutrophication and algal blooms.
Phosphorus	Excess phosphorus in surface waters can cause dissolved oxygen loss, surface waters eutrophication and algal blooms.

contaminants present in wastewater. Through the treatment of wastewater to remove contaminants, different systems are available to treat wastewater to differing levels, depending on the requirements. Descriptions of the different treatment levels, as detailed in AS/NZS 1547:2012 [8], are provided in **Table 3**. The second method is achievable by limiting the disposal options depending on the treatment level. Systems capable of treating effluent to a higher quality have a wider range of disposal options, while systems treating effluent to a lower quality have limited disposal options designed to avoid human exposure. Allowable effluent disposal options based on treatment levels are outlined in **Table 4**.

### 1.1.2. Aerobic Treatment Units

ATU are electrically driven OWTS in which sewage is treated, either wholly or partially, by aerobic means. They are designed to treat wastewater, both blackwater and greywater, from all areas of the house [10]. All ATU incorporate the following processes: primary sedimentation, biological treatment, secondary sedimentation, and, usually, disinfection. Descriptions of the typical treatment processes are included in **Table 5**.

Since ATU are electrically driven mechanical systems and most of them have a disinfection systems, they require regular servicing to ensure that they perform optimally [10]. When an ATU fails, inadequately treated effluent can be discharged from the system and present a risk to human health. However, even when an ATU is functioning properly human contact with effluent should be avoided as there is still the potential for pathogenic organisms to be present in the wastewater. As such, ATU effluent must not be used to irrigate vegetable gardens, food crops, or for surface irrigation in areas to be used for recreational purposes [10].

### 1.1.3. Greywater Treatment Systems

GTS are electrically driven onsite wastewater treatment systems which are designed to treat greywater only [5]. GTS typically consist of the following treatment processes: filtration or screening, biological treatment, and disinfection. Descriptions of the typical treatment processes are included in **Table 6**.

Since GTS are electrically driven mechanical systems and most of them have a disinfection system, they require regular servicing to ensure that they perform optimally. When a GTS fails, the system is required to redirect the influent, automatically, to either the reticulated sewage system or another onsite treatment system. Because of this the maintenance of GTS, while important, is not as critical as for ATU. Additionally, although contact with effluent should still be avoided, there are fewer restrictions on the disposal options. The main restriction on the use of effluent, in the garden, is that it cannot be used for watering of unprocessed foods such as vegetables that will be eaten raw [5].

### 1.1.4. Standards, Guidelines and Regulations

In Australia most state guidelines require each system design to be approved by the relevant government department acting as the regulatory authority prior to system sale and installation. For a system design to be approved,

**Table 3.** Effluent treatment levels [8].

Primary	The separation of suspended material from wastewater in septic tanks, primary settling chambers, or other structure, before effluent discharge to either a secondary treatment process, or to a land application system.
Secondary	Aerobic, biological processing and settling or filtering of effluent received from a primary treatment unit.
Disinfected	The method of treatment of wastewater which kills or inactivates microbial pathogens to an acceptable level, satisfactory for the intended use. Its effectiveness is typically measured by the reduction in faecal indicator bacteria <i>E. coli</i>

**Table 4.** Disposal options based on treatment level [5] [9].

Treatment level (example system)	Sub-surface trench	Sub-surface irrigation	Above ground drip irrigation	Above ground spray irrigation	Toilet flushing	Cold water laundry washing
Primary (traditional septic tank)	√	×	×	×	×	×
Secondary (ATU or GTS)-without disinfection	√	√	×	×	×	×
Secondary with disinfection, blackwater (ATU)	√	√	√	√	×	×
Secondary with disinfection, greywater (GTS)	√	√	√	√	√	√

√: Allowed; ×: Not allowed.

**Table 5.** ATU treatment processes [9] [10].

Primary sedimentation	Primary sedimentation is achieved through settlement and flotation in the primary chamber.
Biological treatment	Biological treatment is achieved through anaerobic treatment followed by aerobic stabilisation with media for biological growth contained in the chamber.
Secondary sediment	This chamber is designed to minimise turbulence to allow settlement of suspended solids (SS), and automatic return of settled materials to the primary chamber. At this point the wastewater is clarified.
Disinfection (optional)	Disinfection is used to reduce the bacteria levels of clarified effluent. The most common method is chlorination, followed by ultraviolet (UV) radiation and occasionally ozonation.

**Table 6.** GTS treatment processes [11] [12].

Filtration/screening	Filters, or similar, trap suspended solids (SS) effectively removing them the wastewater.
Biological	Biological treatment is used to break down organic matter, generally through aeration and aerobic stabilisation.
Disinfection (optional)	Disinfection is used to reduce the bacteria levels of clarified effluent. Most commonly via ultraviolet (UV) radiation, followed by chlorination.

manufacturers must provide, among other design documentation, detailed maintenance schedules and proof that systems can treat wastewater to the quality specified in the relevant Code. In WA the DOHWA is the regulatory authority through the Product Approval Code. In addition, to be considered for approval by the DOHWA, ATU must have a nationally accredited Standards Mark certification in accordance with AS/NZS 1546.3:2008 [13].

Included as a part of the product approval are the Conditions of Approval. The DOHWA applied Conditions of Approval contain additional requirements that each product and manufacturer must adhere to in order to maintain their approval. These requirements are an extension of the requirements of the guidelines and follow a

general standard with slight variations taking into consideration the variations of design of the systems. They also allow for the designation of more specific details not relevant to all systems.

A similar system is used for Authorised Service Persons (ASP), in that all persons wanting to service systems must first be accredited by either the DOHWA or the system manufacturer. Once accredited service persons must also abide by the DOHWA issued Conditions of Approval.

Once the basic product approvals from the DOHWA are in place the management of individual domestic systems is controlled by the local government, in WA by Environmental Health Officers (EHO). The exceptions to this are in the Northern Territory (NT) and Australian Capital Territory (ACT). In the NT the management is the responsibility of the regional branches of the Department of Health and Community Services; however the management process is still independent of the product approval. While in the ACT there are no specific maintenance requirements and, once installed, systems are not governed by any particular guidelines [14]-[16].

The guidelines and regulations provide a framework that assists EHO in overseeing the management of domestic systems. Management includes approving the installation of systems, issuing permits to use systems and enforcing the maintenance requirements. A summary of the basic requirements set out in the guidelines for each state is included in **Table 7**. Also included, in **Table 8**, is a summary of the parties responsible for product and installation approval throughout Australia. A summary of the reviewed key guidelines relevant to the maintenance of ATU and GTS within Australia is included in **Table 9**.

**Table 7.** Guidelines summary.

	Maximum service interval (months)	Service persons approved by	Service reports submitted to
AS1547	NS	TP	RA
AS1546.3	3	NS	NS
WA	3 - 6*	M, RA	LG
NT	3	NA	NA
SA	3	M & TP	LG
QLD	CA	M	NA
NSW	3	NA	LG
ACT	NA	NA	NA
VIC	3 (CA)	M	LG
TAS	3 (CA)	TP & LP	LG (CA)

NA: Not Applicable. NS: Not Specified. CA: Specified in Conditions of Approval, May Vary. M: Manufacturer. RA: Regulatory Authority. LG: Local Government (or Local Council). LP: Must be a Licensed Plumber. TP: Undertaken an appropriate Training Programme. \*ATU with ozone disinfection have a maximum service interval of 6 months.

**Table 8.** National onsite domestic system approvals.

	Product approval	Installation approval (regulatory authority)	Maintenance management
WA	Department of Health	Local Government	Local Government
NT	Department of Health and Community Services	Department of Health and Community Services	Department of Health and Community Services
SA	Public Health and Clinical Systems (SA Health)	Local Government	Local Government
QLD	Department of Housing and Public Works	Local Government	Local Government
NSW	NSW Health	Local Government	Local Government
ACT	ACT Health Protection Services, and ACT Planning and Land Authority	Local Government	NA
VIC	Environmental Protection Authority	Local Government	Local Government
TAS	Department of Justice	Local Government	Local Government

**Table 9.** Key state guidelines.

	Key guideline documents
WA	<ul style="list-style-type: none"> <li>• Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974</li> <li>• Code of Practice for Product Approval of Onsite Wastewater Systems in Western Australia</li> <li>• Code of Practice for the Design, Manufacture, Installation and Operation of Aerobic Treatment Units (ATUs)</li> <li>• Draft Code of Practice for Onsite Sewage Management</li> <li>• Code of Practice for the Reuse of Greywater in Western Australia 2010</li> <li>• Guidelines for Becoming an Authorised Service Agent for Domestic Aerobic Treatment Units</li> </ul>
NT	<ul style="list-style-type: none"> <li>• Code of Practice for Small On-site Sewage and Sullage Treatment Systems and the Disposal or Re-use of Sewage Effluent</li> <li>• Administrative Procedures for the Approval and Installation of Small On-site Sewage and Sullage Treatment Systems and the Disposal or Reuse of Sewage Effluent</li> </ul>
SA	<ul style="list-style-type: none"> <li>• Public Health (Wastewater) Regulations 2013</li> <li>• On-site Wastewater Systems Code</li> </ul>
QLD	<ul style="list-style-type: none"> <li>• Queensland Plumbing and Wastewater Code</li> <li>• Queensland Plumbing and Wastewater Code guidelines. For councils, plumbers and developers</li> <li>• Greywater guidelines. For plumbers. Use of greywater for residential properties in Queensland sewered areas</li> <li>• Greywater guidelines. For councils. A guide to the use of greywater in Queensland</li> </ul>
NSW	<ul style="list-style-type: none"> <li>• Domestic greywater treatment systems accreditation guidelines. Part 4, Clause 43 (1), Local Government (Approvals) Regulation</li> <li>• Environmental &amp; Health Protection Guidelines. On-site Sewage Management for Single Households</li> <li>• NSW Guidelines for Greywater Re-use in Sewered, Single Household Residential Premises</li> </ul>
ACT	<ul style="list-style-type: none"> <li>• Greywater Use. Guidelines for residential properties in Canberra</li> </ul>
VIC	<ul style="list-style-type: none"> <li>• Applying for an EPA Certificate of Approval for an onsite wastewater treatment system (Publication 935.1)</li> <li>• Code of Practice Onsite Wastewater Management (Publication 891.3)</li> <li>• Guidelines for Aerated On-site Wastewater Treatment Systems (Publication 760)</li> </ul>
TAS	<ul style="list-style-type: none"> <li>• Plumbing Regulations 2014</li> <li>• Tasmanian Plumbing Code 2013</li> </ul>

### 1.1.5. Australia/New Zealand Standards

The Australian/New Zealand Standards, hereafter referred to as “the Standards”, for wastewater were prepared by the Joint Standards Australia/Standards New Zealand Committee WS-013 on On-site Domestic Wastewater Management to create effective and sustainable policy documents pertaining to the proper management of domestic wastewater. Standards relevant to the management of wastewater include:

- AS/NZS 1547:2012 On-site domestic wastewater management [8]
- AS/NZS 1546.3:2008 On-site domestic wastewater treatment units Part 3: Aerated treatment systems [17].

The Standards, however, do not consider the regulatory process, nor does their application remove the necessity of following guidelines set out by the relevant regulatory authorities. The Standards in themselves are not legally enforceable; their most significant impact comes from the way regulatory authorities use them, either to assist in the development of state guidelines and regulations, or by adopting them, in part or whole under their legislation. Where state guidelines conflict with the Standards, the state guidelines take precedence.

## 2. Methodology

The primary method used to gather information regarding the effectiveness of the current maintenance requirements was through surveys. Surveys were sent to those most heavily involved in the domestic wastewater treatment systems industry with regards to their opinions and recommendations. Two computer based surveys were developed, one aimed at local government EHO, and another aimed at manufacturers and service personnel. These groups were targeted as EHO are responsible for approvals and enforcement of the regulations, while manufacturers and service personnel are responsible for the design, sale, installation and maintenance of the systems. Both surveys were developed with a focus on the following broad topics:

- Current usage information

- Records available
- Commonly occurring issues
- Current maintenance procedures
- Current monitoring procedures
- Perceived suitability of current regulations/guidelines

Draft versions of these surveys were sent to members of the DOHWA Water Unit, and a handful of EHO and manufacturers for review. Once reviewed the surveys were distributed to all EHO, and manufacturers and service personnel working within WA, through an email providing an online link to the survey. This allowed practical information to be gathered and gave those most heavily involved in the industry the opportunity to express any dissatisfaction, opinions, or recommendations. A total of 40 responses to the surveys were received. Of these responses, 24 came from EHO, and 16 from manufacturers and service personnel.

The survey responses suggested that industry personnel were, generally, content with the current maintenance arrangements, however they also allowed several problem areas to be identified. In-depth discussion of these areas is included in the following sections, with reference given to specific survey results as necessary throughout. Unless otherwise noted all percent values provided in relation to EHO, and manufacturers and service personnel refer to survey participants only.

### 3. Results and Discussion

#### 3.1. Standardised Maintenance Report

Under the current system, anybody wishing to become an ASP must be accredited by either the DOHWA or the system manufacturer. As part of the application process to the DOHWA they must submit service report and maintenance agreement templates, for use during maintenance. ASP accredited by the system manufacturer are required to use the manufacturers' service report template.

- EHO who participated in the surveys indicated that, due to unique maintenance reports being used by each ASP, service reports showed a variation in the factors assessed. It is important that testing procedures are consistent between ASP.
- Submissions from the Draft Code consultation period recommended that a standardised maintenance report form for all systems be created to assist local governments to gather data regarding system installations [18].

#### 3.2. Maintenance Report Submission

Under the current system, ASP are required to prepare a maintenance report and provide copies to the owner/operator of the system and the LG that authorised the system for any maintenance occurring on the system. However, the current Codes do not include a period of time by which LG must receive service reports. Currently, this is included under each ASP's Conditions of Approval issued by the DOHWA. The typical conditions of approval indicate: that service reports must be provided to the LG within "14 days of maintenance, including quarterly services, being conducted, and that notification of maintenance contracts entered into, terminated or varied must be provided within 21 days of its occurrence" [19].

- Submissions from the Draft Code consultation period recommended that a time frame be included for the submission of service reports to the LG as many service personnel tended to submit them in bulk [18]. These comments, coming from EHO, suggest that a number of EHO work from the Codes and are unaware of the specific details of ASP's conditions of approval. This is important as where EHO are not aware of the guidelines they are unable to enforce them.
- As part of the preparation of the Draft Code consideration is being given to modifying the requirements for becoming an ASP. Depending on the modifications made, the use of conditions of approval to specify additional requirements may no longer be appropriate.

#### 3.3. Effluent Testing

Effluent testing is required under the product's conditions of approval to be carried out during each service visit [20] [21].

- The product conditions of approval require the pH, free residual chlorine, and dissolved oxygen levels to be tested during each three monthly service. However, from a sample of maintenance report sheets from 10

companies, six did not appear to include a dissolved oxygen test at all, and one additional company indicated that they undertook dissolved oxygen testing once per year.

- According to the ATU Code the purpose of maintenance is to ensure that the effluent continues to satisfy the required quality criteria, however not all of the criteria are tested.
- According to Alexander (2007), in Mount Gambier, South Australia, “there are many reported cases where on-site wastewater treatment systems can fail to treat effluent even though the system conforms to local standards and regulations” [4].
- Systems in Manningham, Victoria, are required to have the following tests conducted on an effluent sample by a National Association of Testing Authorities registered laboratory every 12 months: 1) Biological Oxygen Demand (BOD); 2) Suspended Solids (SS); 3) *E. Coli* Bacteria; 4) Free Residual Chlorine [22].
- Any effluent testing beyond the current requirements would require laboratory testing.
- Submissions from the Draft Code consultation period recommended that in environmentally sensitive areas the maintenance schedule “should include tests and checks to ensure that the nitrogen and phosphorus removal efficiency of the system is maintained” [18].
- According to the Lanfax Laboratories fee schedule the cost of testing samples for the four quality criterion from the ATU Code could cost in excess of \$250 [23].

Ideally, effluent criteria would be checked periodically to ensure that systems are being correctly maintained and continue to satisfy quality requirements, however the additional financial burden a requirement such as this would put on owner/operators would make it difficult to implement.

### 3.4. Irrigation Area

Irrigation areas are included in the Codes of Practice as a part of the system as a whole and, hence, during regular service visits ASP are required to evaluate the area. However proper upkeep includes landscaping and, for above ground, checking individual drip or spray heads, not just a general evaluation.

- Submissions from the Draft Code consultation period indicated that a large number of systems are failing and that the primary reason behind this was the maintenance and servicing of the disposal fields [18].
- The most common issues raised in service reports, as identified by the EHO who participated in the survey, were associated with the lack of maintenance or failure of the irrigation system.
- 67% of EHO indicated that they have not been made aware of any modifications to irrigation areas.
- 50% of manufacturers and service personnel indicated that they had, on occasion, reported a modification of the irrigation area to the local government.
- 100% of manufacturers and service personnel indicated that evaluation of the irrigation area was included in their maintenance report.
- It has been reported that the most common cause for malfunction of ATU is caused by incorrectly installed irrigation systems [24].
- Maintenance of the irrigation areas does not require specialised skills, however, since effluent is discharged to the area, care must be taken to minimise contact with contaminants.
- It is possible to get a good idea of whether or not the irrigation system is performing adequately from a brief evaluation during service visits, however a rigorous inspection of all lines and sprinkler heads is not practical.

While ASP evaluate irrigation areas, the overall upkeep of the irrigation system and area, particularly landscaping, should, primarily, be looked after by the owner/operator.

### 3.5. Monitoring and Auditing

LG keep the records and are in charge of monitoring, auditing and administering the installation and maintenance of ATU and GTS. Monitoring programs are designed to ensure that systems comply with the requirements of the guidelines.

- 73% of EHO indicated that they maintained a consolidated copy of ATU installation records.
- 63% of EHO indicated that they maintained a consolidated copy of GTS installation records.
- 60% of EHO indicated that they maintained a consolidated copy of ATU servicing records.
- 22% of EHO indicated that they maintained a consolidated copy of GTS servicing records.
- Where LG do not have installation records, servicing cannot be monitored or audited.
- 71% of EHO indicated that there was no monitoring or auditing program in place for ATU within their LG

- areas.
- 100% of EHO indicated that there was no monitoring or auditing program in place for GTS within their LG areas.
  - The main reasons cited in the EHO survey responses for the lack of monitoring and auditing were the lack of time, resources and funding.
  - 54% of EHO thought that a stricter and more vigorous monitoring and auditing program should be implemented.
  - Some EHO who took part in the survey also commented that, although monitoring or auditing programs had previously been in place, the programs have had to be dropped due to the large amounts of time required for data entry of maintenance reports. Electronic submission of reports could assist greatly.
  - Levels of monitoring, auditing and enforcement vary greatly throughout the state.
  - Any attempt to implement a more rigorous monitoring program would need a source of funding.
  - The United States Environment Protection Agency provides a Microsoft Access program, The Wastewater Information System Tool (TWIST), to local councils that can be used to monitor onsite systems. The program is designed to track information regarding installations, permits, site evaluations, inspections and complaints [25].
  - Most states within Australia, excluding Victoria and Queensland, do not have any particular monitoring programs in place.
  - In Victoria each Local Council is required to develop a Domestic Wastewater Management Plan (DWMP). Included in each DWMP is an assessment of the current wastewater situation and identification of strategies and actions to be taken, along with a breakdown of resources required for implementation [26].

A monitoring and auditing program would be able to assist in ensuring that ATU and GTS are operated and maintained appropriately, and do not pose a risk to human health. However, the resources and funding required to implement such a system are not currently available.

### 3.6. Regulation of Authorised Service Persons

Currently ASP must be accredited by either the system manufacturer or the DOHWA. To be accredited for a system type, by the DOHWA, persons are required to undergo an assessment interview with a representative and provide the following; a maintenance report form, a maintenance agreement form, evidence of Public and Product Liability cover, proof of access to spare parts, proof of access to the relevant manufacturers service manuals, proof of a minimum one year of relevant experience, and proof of completion of an approved training course.

- While there are ASP operating in all regions within WA, many rural areas have a limited number who must travel long distances, making unplanned callouts expensive and difficult.
- 26% of EHO indicated that they have received complaints from owner/operators regarding the limited number of ASP in their area. While this is a small proportion of EHO, limited numbers of ASP was only expected to be an issue in rural areas.
- 67% of EHO believed that ASP have sufficient training and expertise to perform their job.
- 83% of EHO believed that, with training; Licensed Plumbers would be capable of carrying out the necessary servicing of systems.
- 94% of manufacturers and service personnel believed that, with training, Licensed Plumbers would be capable of carrying out the necessary servicing of systems.
- 88% of manufacturers and service personnel believed that Licensed Plumbers would be unable to carry out the servicing requirements without specialised training.
- 44% of manufacturers and service personnel provide owner/operators with the Operation and Maintenance Manual.
- 93% of manufacturers and service personnel indicated that specialised training or expertise is required to service some aspects of systems.
- 73% of manufacturers and service personnel indicated that specialised tools are required to service some aspects of systems.
- Systems have mechanical pumps, electrics, enclosed spaces and contaminated, potentially dangerous, wastewater, so all service personnel should require some form of training.
- As stated by Whitehead *et al.* (1999), training programs offer an “important measure of quality assurance for

- the industry, local government and the general public” [27].
- During the DOHWA’s ASP discussion in 2012 it was agreed that the minimum competency for ASP’s should include attending an ATU course and having experience in the industry [24].
  - Currently plumbers are not required to carry Public Liability Insurance, however the possibility of introducing this as a requirement was recommended in the recent review of plumbing regulation in Western Australia [28].
  - The NT there is no licensing or accreditation system in place for service persons.
  - In South Australia servicing can only be undertaken by a service provider, defined in the On-site Wastewater Systems Code as; an agent, company, employee or any individual who has undertaken training as specified by the Department for Health and Aging [29].
  - In Queensland service persons must be accredited by the system manufacturer [30]-[32].
  - In NSW there is no licensing or accreditation system in place for service persons [33] [34].
  - In the ACT there is no licensing or accreditation system in place for service persons.
  - In Victoria service persons must be accredited, in writing, by the system manufacturer or distributor [35], [36].
  - In Tasmania service persons must be accredited by either the system manufacturer or the Local Government.
  - Suggestions for improving the training and performance of service technicians from the Victorian Re-approval Forum Workshop in 2013 included [37]:
    - Requiring licensing
    - Increasing the consistency of servicing requirements
    - Requiring servicing and repair, not just servicing.
  - Approved training courses for ATU in WA include courses from California, Queensland and New South Wales. All of these courses are nationally accredited in Australia; however they do not cover specific WA guidelines, which are also important for service personnel working in WA.
  - Submissions from the Draft Code consultation period recommended that there be a mechanism in the approval process to check the competencies of providers and that related licensing structures should be taken into consideration. They also indicated that there was growing evidence that more skilled persons are needed in the industry [18].
  - Institute of Technology (Polytechnic West) offers a short course for ATU service technicians with the following units accredited by Training.gov.au:
    - NWP208A-Perform basic wastewater tests
    - NWP346B-Monitor, operate and control wastewater treatment processes (ATU Service Technician Course).

### 3.7. Service Interval

According to the guidelines, all ATU must be serviced every three months, while GTS must be serviced at least every 12 months. All systems must be serviced according to the manufacturer’s recommendations, and the DOHWA product approval conditions.

- 68% of EHO believed that the number of services currently required per year is reasonable.
- 63% of EHO indicated that they had not received any complaints regarding inadequate maintenance of systems in the last five years.
- 65% of EHO indicated that they were unaware of any commonly raised issues from maintenance reports received.
- 22% of EHO indicated that they did not believe that the ATU in their area were serviced adequately, while 43% indicated the same for GTS.
- 35% of EHO indicated that have received complaints from owner/operators regarding the cost of servicing their systems.
- 82% of manufacturers and service personnel believed that the number of services currently required per year is reasonable.
- 65% of manufacturers and service personnel recommended that systems be serviced quarterly.
- 22% of manufacturers and service personnel who install systems in other states and participated in the survey use a different maintenance schedule in other states.
- 50% of manufacturers and service personnel indicated that they had found the system servicing requirements

to be a prohibitive factor for customers.

- AS/NZS 1546.3 recommends that systems be serviced every three months [17].
- Systems currently installed in WA are designed to be serviced every three months and servicing them less frequently could have a negative impact on the operation of the system, and the quality of the output effluent.
- As well as being specified in the guidelines, the required service interval for each specific system type is also included in each system's conditions of approval.
- The conditions of approval for the Aquarius O-ATU specify the systems as requiring only six monthly servicing [38], rather than the three monthly servicing required by the ATU Code. This is an example of changing technology within the industry.
- The current regimented servicing schedule does not allow for the variability in design across different systems.
- Most states within Australia, excluding the ACT and Queensland, have a required service interval of 3 months. The guidelines for the ACT and Queensland do not have a required service interval.
- The Greywater Code states that: "The GTS shall be operated and maintained in accordance with the manufacturer's recommendations, DOHWA product approval conditions, and the LG installation approval."
- The Draft Code does not contain a specific service interval; instead, it specifies that "Aerobic Treatment Units and other secondary treatment systems (including greywater treatment systems) must be serviced by an authorised service person as per the conditions of product approval issued by the Department of Health."

### 3.8. Owner Self-Servicing

Owner/operators servicing their own systems was one method suggested to assist with issues caused by the limited number of ASP's available in remote regions.

- 57% of EHO indicated that having owner/operator perform basic maintenance to extend the service interval would not be possible.
- 67% of manufacturers and service personnel indicated that owner/operators would not be able to carry out any aspects of the servicing requirements.
- 81% of manufacturers and service personnel indicated that it would be unfeasible to attempt to adopt a self-maintenance option for owner/operators, even if training was provided.
- Nubian has set up a self-service option for the Nubian GT600 Greywater Treatment System. They provide a package with training information and software to simplify the process. The service reports are required to be sent to Nubian as well as the local government. Nubian keeps a record of service reports for each customer on a self-service agreement and reminds them if they have a service overdue [11].
- Neither the DOHWA, nor LG's would have the resources to authorise individual system owners.
- Owners have no certification and if they undertake the servicing they could void the warranty of the system [24]. Based on the survey results, the option of owner/operator servicing is unlikely to be taken up by manufacturers.
- If owners did not service their systems correctly, they could end up posing a risk to human health.
- Submission of maintenance reports to the local government would still be necessary.
- Would not be practical unless the operator is also the owner. For example, it would not be practical in rental properties.
- More suited to GTS as the health risks involved are lower.

### 3.9. Interstate Communications

There is currently minimal contact between the regulators of each state, despite often dealing with similar issues.

- NSW continues to use guidelines published in 1998, however there was an inquiry undertaken, completed in 2012, by the Committee on Environment and Regulation to look into concerns regarding poor standards of installation, maintenance and monitoring of systems [3].
- Regulators from Queensland, the NT and the ACT are each in the process of adapting their guidelines to better deal with system maintenance. Specific methods being considered include introducing a set maintenance program and accredited maintenance training courses.
- South Australia implemented a new set of guidelines in 2013, including changes to the management of maintenance of systems. Work on developing these guidelines began in 2007.

**Table 10. Recommendations.**

Issue	Recommendation
Standardised Maintenance Report	Create a standardised maintenance report form for use by service agents for both GTS and ATU.
Maintenance Report Submission	Include in the COP the period within which maintenance reports must be submitted to the LG.
Effluent Testing	Ensure that appropriate testing is completed during each service visit for: <ul style="list-style-type: none"> <li>• pH</li> <li>• Dissolved Oxygen</li> <li>• Turbidity</li> <li>• Free Residual Chlorine</li> </ul>
Irrigation Area	Introduce an education program for ATU and GTS owner/operators regarding the importance of maintaining irrigation areas correctly. <ol style="list-style-type: none"> <li>1) Require LG keep organised installation records.</li> <li>2) Liaise with LG to develop a plan for the implementation of a monitoring and auditing system, controlled by LG and audited by DOHWA</li> <li>3) Implement an online maintenance report submission system to decrease the resources required for data entry, and therefore monitoring, by LG.</li> </ol>
Monitoring and Auditing	<p><b>Implementation of the recommendations:</b></p> <ul style="list-style-type: none"> <li>• Set up a proper, simple to use, software system allowing Local Governments to record and store installation information and servicing records. Preferably allowing maintenance reports to be directly submitted through the system to each Local Government.</li> <li>• Work with Local Governments so that they are able to understand and use the system set up by the Department of Health.</li> <li>• Audit Local Governments to ensure they keep installation and service records up to date, and monitor systems.</li> </ul>
Regulation of Authorised Service Persons	<ol style="list-style-type: none"> <li>1) Endorse all licensed plumbers who have completed a recognised ATU Service Training Course.</li> <li>2) Liaise with the providers of accredited training courses so that the DOHWA continues to be involved, to ensure that persons receiving certification are aware of the WA regulatory requirements.</li> <li>3) Liaise with Plumbers Licensing Board to discuss the possibility of including a wastewater technician sub-qualification under the Plumbers License, covering the installation, and servicing of ATU and GTS.</li> </ol>
Service Interval	Increase the flexibility of the guidelines for ATU and GTS by removing the specified service interval and, instead, have the interval based solely on the manufacturer's or designer's recommendations, enforced by the DOHWA product approval conditions.
Owner Self-Servicing	<ol style="list-style-type: none"> <li>1) Require self-servicing owners to complete an accredited course and follow the same reporting requirements as ASP.</li> <li>2) Require manufacturers wanting to allow non-certified owners to service their own systems to demonstrate, to the DOHWA satisfaction, that they have the ability to monitor and manage the situation from a distance, including the ability to provide assistance in case of failure.</li> </ol>
Interstate Communications	Increase contact between members of the National Onsite Regulators Forum as it could benefit to the policy development of all states within Australia.
Additional Issues Identified: <ul style="list-style-type: none"> <li>• Code Compliance and Enforceability</li> <li>• Complaints</li> <li>• Handover Procedures</li> </ul>	<ol style="list-style-type: none"> <li>1) Modified penalties via infringement notices are required to address the issue of poorly maintained systems.</li> <li>2) Establish an official process for the DOHWA to deal with complaints raised by EHO.</li> <li>3) LG to develop a system to manage information regarding the systems when the systems ownership changes to ensure that maintenance agreements are entered into by the new owner/operator and the system is still appropriate for the new loading conditions.</li> </ol>

### 3.10. Additional Issues Identified

#### 3.10.1. Code Compliance and Enforceability

Multiple sources have raised concerns regarding the legal enforceability of the ATU Code.

- Submissions from the Draft Code consultation period suggested that a “practical enforcement mechanism” was required to deal with the levels of noncompliance that have previously been seen. They continued on to

suggest that modified penalties via infringement notices were also required and that issues with the current process must be addressed otherwise “the current status quo of poorly maintained systems with ad hoc monitoring will continue” [18].

- Another submission from the Draft Code consultation period questioned what possible consequence local governments could enforce if an owner’s maintenance agreement contract was not renewed.
- Concerns were raised by participants of the survey regarding the legal enforceability of the guidelines relating to ATU servicing.

### 3.10.2. Complaints

There should be an official process in place for the DOHWA to deal with complaints raised by EHO.

### 3.10.3. Handover Procedures

Submissions from the Draft Code consultation period raised concerns regarding the current handover procedure when the owner/operator changes. No-one has official responsibility for communicating information regarding the systems and ensuring that maintenance agreements are entered into by the new owner/operator, or for ensuring that the system is still appropriate for the new loading conditions.

## 4. Conclusion and Recommendations

### 4.1. Conclusion

While the current guidelines for the maintenance of Aerobic Treatment Units and Greywater Treatment Systems work well in most situations there is room for improvement. This paper identified and discussed areas of the guidelines requiring improvements based, primarily, on concerns raised by those working in the industry.

### 4.2. Recommendations

The recommendations, summarised in **Table 10**, are provided with a view to rectifying weaknesses and increasing the flexibility of the guidelines. The implementation of the recommendations provided could address industry concerns and encourage more innovative system design and assist development of the Code of Practice for Onsite Sewage Management, which currently is in the draft stage.

## References

- [1] Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974 (WA).
- [2] DOHWA (2009) Guidelines for Becoming an Authorised Service Agent for Domestic Aerobic Treatment Units. Department of Health, Western Australia.
- [3] Committee on Environment and Reeregulation (2012) Inquiry into the Regulation of Domestic Wastewater. New South Wales. Parliament. Legislative Assembly. Committee on Environment and Regulation. Sydney, NSW.
- [4] Alexander, K.S. (2007) Social Implications of Management of On-Site Wastewater Treatment Systems for Groundwater Protection. CSIRO, South Australia.
- [5] DOHWA (2010) Code of Practice for the Reuse of Greywater in Western Australia. Department of Health, Western Australia.
- [6] Kable, J. and Shann, M. (2014) Moorabool Shire Council Domestic Wastewater Management Plan. NSW.
- [7] USEPA (2002) Onsite Wastewater Treatment Systems Manual. US Environmental Protection Agency.
- [8] Australian and New Zealand Standards (2012) AS/NZS 1547:2012. On-Site Domestic Wastewater Management. Standards Australia International Ltd.
- [9] DOHWA (2001) Code of Practice for the Design, Manufacture, Installation and Operation of Aerobic Treatment Units (ATUs). Department of Health, Western Australia.
- [10] DOHWA (2011) Aerobic Treatment Units. Western Australia: Department of Health.
- [11] Nubian Water Systems GT600 Technical Specification.
- [12] Wise Water Solutions. About Wise Water—Grey and Black Water Recycling. <http://www.wisewatersolutions.com.au/about>
- [13] DOHWA (2013) Code of Practice for Product Approval of Onsite Wastewater Systems. Department of Health, West-

ern Australia.

- [14] DHCS (1996) Code of Practice for Small On-Site Sewage and Sullage Treatment Systems and the Disposal or Reuse of Sewage Effluent. Department of Health and Community Services, Northern Territory.
- [15] DHCS (2006) Administrative Procedures for the Approval and Installation of Small On-Site Sewage and Sullage Treatment Systems and the Disposal or Reuse of Sewage Effluent. Department of Health and Community Services, Northern Territory.
- [16] ACT Health (2007) Greywater Use Guidelines for Residential Properties in Canberra. ACT Health, Australian Capital Territory.
- [17] Australian and New Zealand Standards (2008) On-Site Domestic Wastewater Treatment Units. Part 3: Aerated Wastewater Treatment Systems. Standards Australia. AS/NZS 1546.3:2008.
- [18] DOHWA (2013) Consultation Comments for the Draft Code of Practice for On-Site Sewage Management (October 2012). Department of Health, Western Australia.
- [19] DOHWA. Authorised Service Persons Conditions of Approval (Template). Department of Health, Western Australia.
- [20] DOHWA (2009) Aerobic Treatment Units Conditions of Approval (Template). Department of Health, Western Australia.
- [21] DOHWA (2010) Greywater Treatment System Conditions of Approval (Template). Department of Health, Western Australia.
- [22] Manningham City Council (2011) Domestic Wastewater Management Plan. Manningham City Council, Victoria.
- [23] Lanfax Laboratories (2014) Fee Schedule. <http://www.lanfaxlabs.com.au/fees.html>
- [24] DOHWA (2012) Authorised Service Persons Discussion Session. Meeting Minutes. Department of Health, Western Australia.
- [25] USEPA (2013) The Wastewater Information System Tool (TWIST). United States Environmental Protection Agency.
- [26] EPA (2013) Code of Practice Onsite Wastewater Management. Environmental Protection Authority, Victoria.
- [27] Whitehead, J.H., Geary, P., Linich, M. and Patterson, R. (1999) Responding to the Changing Training Needs of On-Site Wastewater Management Professionals. *Proceedings of Conference On-Site 99: Making On-Site Wastewater Systems Work*, University of New England, Armidale, Lanfax Laboratories. 13-15 July 1999, 309-313.
- [28] MPGA (2014) Review of Plumbing Regulation in Western Australia: Response by Master Plumbers and Gasfitters Association of WA. Master Plumbers and Gasfitters Association, Western Australia.
- [29] SA Health (2013) On-Site Wastewater Systems Code. Department for Health and Aging, South Australia.
- [30] DIP (2008) Greywater guidelines. For Councils. A Guide to the Use of Greywater in Queensland. Department of Infrastructure and Planning, Queensland.
- [31] DIP (2008) Queensland Plumbing and Wastewater Code Guidelines. For Councils, Plumbers, Builders and Developers. A Guideline to Assist in the Interpretation and Application of the Queensland Plumbing and Wastewater Code. Department of Infrastructure and Planning, Queensland.
- [32] DIP (2013) Queensland Plumbing and Wastewater Code. Department of Infrastructure and Planning, Queensland.
- [33] NSW Health (1998) Environment and Health Protection Guidelines. On-Site Sewage Management for Single Households. Department of Health, New South Wales.
- [34] NSW Health (2005) Domestic Greywater Treatment Systems Accreditation Guidelines. Department of Health, New South Wales.
- [35] EPA (2002) Guidelines for Aerated On-Site Wastewater Treatment Systems. Environmental Protection Authority, Victoria.
- [36] EPA (2013) Applying for an EPA Certificate of Approval for an Onsite Wastewater Treatment System. Environmental Protection Authority, Victoria.
- [37] EPA (2013) Reapproval Forum Workshop Questions and Feedback. Environmental Protection Authority, Victoria.
- [38] DOHWA (2014) Aquarius O-2 Aerobic Treatment Unit. Department of Health, Western Australia, Approval Number: F-AA-26362.