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REVIEW OF MAINTENANCE REQUIREMENTS FOR AEROBIC TREATMENT UNITS AND GREYWATER TREATMENT SYSTEMS IN WA

A RUNDOWN OF AREAS THAT COULD BE IMPROVED AND SPECIFIC RECOMMENDATIONS OFFERED

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ABSTRACT

Aerobic Treatment Units (ATUs) and Greywater Treatment Systems (GTSs) are onsite wastewater treatment systems (OWTSs) designed to treat wastewater to secondary effluent quality standards. Consequently, the electrical, mechanical and chemical components of these OWTSs need to be regularly maintained to ensure their consistent and reliable operation to the required standards.

In Western Australia (WA), the Department of Health sets out the regulatory requirements for the maintenance of OWTSs, as well as when and how it is to occur. This paper reviews the maintenance requirements for ATUs and GTSs 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 that could be improved, and specific recommendations are discussed.

Keywords: Onsite wastewater treatment, regulatory requirements, aerobic treatment units, greywater treatment units.

INTRODUCTION

Aerobic Treatment Units (ATUs) and Greywater Treatment Systems (GTSs) are designed to treat wastewater to secondary effluent quality. However, these systems require consistent maintenance to ensure that they continue to produce treated effluent to the designated standard. This paper reviews the current ATU and GTS maintenance requirements for 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 OWTS regulation, including ATU and GTS maintenance requirements. Currently the key documents administered by the DOHWA relating to the maintenance of domestic ATU and GTS are:

- *Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations* 1974, hereafter referred to as the 'Health Regulations' (Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974 (WA)).
- *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) (DOHWA, 2009b).

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.

Table 1. Pathogenic organisms (Kable and Shann, 2014).	
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 (USEPA, 2002).	
Nitrogen	Excess nitrogen in surface water (eutrophication) can cause algal blooms that lead to dissolved oxygen-loss toxicity and unacceptable water quality.
Phosphorus	Excess phosphorus in surface water can also cause similar problems.

Table 3. Effluent treatment levels (Australian and New Zealand Standards, 2012).	
Primary	The separation of suspended material from wastewater in septic tanks, primary settling chambers or other structures, 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.
Disinfection	The method of treatment of wastewater that kills or inactivates microbial pathogens to a level satisfactory for the intended use. Its effectiveness is typically measured by the reduction in faecal indicator bacteria *E. coli.*

Onsite Wastewater Treatment Systems

OWTSs provide an effective method of decontaminating wastewater and disposing of treated effluent onsite. Total treatment systems that treat both blackwater (coming from toilets) and greywater (coming from showers, baths and washing machines), such as ATUs, are of particular use when reticulated sewerage is impractical and there is sufficient room to dispose of effluent onsite. Partial treatment systems treating only greywater, such as GTSs, are used mainly as a water conservation measure. In WA, GTSs 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 is available, including septic tanks and composting toilets, however only ATUs and GTSs are considered in this review.

Despite the usefulness of OWTSs, 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 (Committee on Environment and Regulation, 2012). Therefore, maintenance is important for ensuring optimal performance (Alexander, 2007) and, along with monitoring, assists in minimising the risks associated with the systems.

Human Health Risks

The greatest risk wastewater poses to human health comes from pathogenic organisms. The three main types of pathogenic organism, which are present in untreated wastewater, are described in Table 1. Pathogenic organisms can cause diseases by either direct or indirect contact (DOHWA, 2010a). 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, although they rarely pose a direct risk to human health. Some ATUs 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 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, 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.

Aerobic Treatment Units

An ATU is an electrically driven OWTS in which sewage is treated, either wholly or partially, by aerobic means. It is designed to treat wastewater, both blackwater and greywater, from all areas of the house (DOHWA, 2011a). All ATUs incorporate the following processes: primary sedimentation,

Table 4. Disposal options based on treatment level (DOHWA, 2001; DOHWA, 2010a).

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)	√	X	X	X	X	X
Secondary (ATU or GTS) – without disinfection	√	√	X	X	X	X
Secondary with disinfection, blackwater (ATU)	√	√	√	√	X	X
Secondary with disinfection, greywater (GTS)	√	√	√	√	√	√

√ - Allowed
X – Not allowed

Table 5. ATU treatment processes (DOHWA, 2001; DOHWA 2011a).

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 sedimentation	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 pathogen levels of clarified effluent. The most common method is chlorination, followed by ultraviolet (UV) radiation and, occasionally, ozonation.

biological treatment, secondary sedimentation and, usually, disinfection. Descriptions of the typical treatment processes are included in Table 5.

Since ATUs are electrically driven mechanical systems – and most of them have a disinfection system – they require regular servicing to ensure that they perform optimally (DOHWA, 2011a). 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 (DOHWA, 2011a).

Greywater Treatment Systems

A GTS is an electrically driven onsite wastewater treatment system designed to treat greywater only DOHWA (2010a). A GTS typically includes the following treatment processes: filtration or screening, biological treatment and disinfection. Descriptions of the typical treatment processes are included in Table 6.

Table 6. GTS treatment processes (Nubian Water Systems (2009); Wise Water Solutions (2014).

Filtration/ screening	Filters, or similar, trap suspended solids (SS), effectively removing them from 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 by ultraviolet (UV) radiation, followed by chlorination.

Since GTSs 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 sewerage system or another onsite treatment system, so maintenance of a GTS, while important, is not as critical as for an 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 to water unprocessed foods, such as vegetables that will be eaten raw (DOHWA, 2010a).

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, 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.

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 program
**ATUs with ozone disinfection have a maximum service interval of 6 months*

In WA the DOHWA is the regulatory authority through the *Product Approval Code*. In addition, to be considered for approval by the DOHWA, an ATU must have a nationally accredited Standards Mark certification in accordance with AS/NZS 1546.3:2008 (DOHWA, 2011b).

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 different designs 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 (ASPs), 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 Local Government – in WA by Environmental Health Officers (EHOs). 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 (DHCS); however, the management process is still independent of the product approval. In the ACT there are no specific maintenance requirements and, once installed, systems are not governed by any particular guidelines (DHCS, 1996; DHCS, 1996; ACT Health, 2007).

The guidelines and regulations provide a framework that assists EHOs 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 shown in Table 7.

Table 8 is a summary of the parties responsible for product and installation approval throughout Australia. A summary of the reviewed

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	Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974 Code of Practice for Product Approval of Onsite Wastewater Systems in Western Australia Code of Practice for the Design, Manufacture, Installation and Operation of Aerobic Treatment Units (ATUs) Draft Code of Practice for Onsite Sewage Management Code of Practice for the Reuse of Greywater in Western Australia 2010 Guidelines for Becoming an Authorised Service Agent for Domestic Aerobic Treatment Units
NT	Code of Practice for Small On-Site Sewage and Sullage Treatment Systems and the Disposal or Re-use of Sewage Effluent Administrative Procedures for the Approval and Installation of Small On-Site Sewage and Sullage Treatment Systems and the Disposal or Reuse of Sewage Effluent
SA	Public Health (Wastewater) Regulations 2013 On-Site Wastewater Systems Code
QLD	Queensland Plumbing and Wastewater Code Queensland Plumbing and Wastewater Code Guidelines. For councils, plumbers and developers Greywater Guidelines. For plumbers. Use of greywater for residential properties in Queensland sewered areas Greywater Guidelines. For councils. A guide to the use of greywater in Queensland
NSW	Domestic Greywater Treatment Systems Accreditation Guidelines. Part 4, Clause 43(1), Local Government (Approvals) Regulation Environmental & Health Protection Guidelines. On-Site Sewage Management for Single Households NSW Guidelines for Greywater Re-Use in Sewered, Single Household Residential Premises
ACT	Greywater Use. Guidelines for residential properties in Canberra
VIC	Applying for an EPA Certificate of Approval for an Onsite Wastewater Treatment System (Publication 935.1) Code of Practice Onsite Wastewater Management (Publication 891.3) Guidelines for Aerated On-site Wastewater Treatment Systems (Publication 760)
TAS	Plumbing Regulations 2014 Tasmanian Plumbing Code 2013

key guidelines relevant to the maintenance of ATUs and GTSs in Australia is given in Table 9.

Australia/New Zealand Standards

The Australia/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;
- AS/NZS 1546.3:2008 On-Site Domestic Wastewater Treatment Units Part 3: Aerated Treatment Systems.

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.

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 regard to their opinions and recommendations. Two computer-based surveys were developed, one aimed at Local Government EHOs, and the other aimed at manufacturers and service personnel. These groups were targeted as EHOs 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 EHOs and manufacturers for review. Once reviewed, the surveys were distributed to all EHOs, manufacturers and service personnel working in 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 EHOs, 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 per cent values provided in relation to EHOs, manufacturers and service personnel refer to survey participants only.

RESULTS AND DISCUSSION

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. ASPs accredited by the system manufacturer are required to use the manufacturers' service report template.

EHOs 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 ASPs.

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 (DOHWA, 2013).

RECOMMENDATION 1

Create two standard service report forms for use by ASPs, one for GTSs and one for ATUs. Example reports for ATUs and GTSs are provided in Appendix G and Appendix H respectively.

Maintenance Report Submission

Under the current system, ASPs 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 within 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" (DOHWA, 2014).

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 (DOHWA, 2013). These comments, coming from EHOs suggest that a number of EHOs work from the Codes and are unaware of the specific details of ASPs' 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.

RECOMMENDATION 2

Include the period within which maintenance reports must be submitted to the LG as part of the codes of practice.

Implementation Of Recommendation 2

1. Attach the typical ASP Conditions of Approval as an appendix to the relevant codes of practice (the Greywater Code and either the ATU Code or the Draft Code).
2. Include the periods in text as part of the section for maintenance reports:
   a) ATU Code; Part 2: Clause 8(c) Maintenance Reports;
   b) Greywater Code; Section 2.4.4 Maintenance Requirements;
   c) Draft Code; Section 8.8.1 Maintenance Reports by Authorised Service Providers.

Effluent Testing

Effluent testing is required under the product's Conditions of Approval to be carried out during each service visit (DOHWA, 2009a; DOHWA, 2010b).

The product Conditions of Approval require the pH, free residual chlorine and dissolved oxygen levels to be tested during each quarterly service. However, a sample of maintenance report sheets from 10 companies showed that six did not appear to include a dissolved oxygen test at all, and one additional company indicated that it undertook dissolved oxygen testing just 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 relevant parameters 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" (Alexander, 2007).

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. Biochemical Oxygen Demand (BOD); 2. Suspended Solids (SS); 3. *E. coli* bacteria; 4. Free Residual Chlorine (Manningham City Council, 2011).

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" (DOHWA, 2013).

According to the Lanfax Laboratories fee schedule, the cost of testing samples for the four quality criteria from the ATU Code could cost more than $250 (Lanfax Laboratories, 2014).

Ideally, effluent criteria would be checked periodically to ensure that systems are being correctly maintained and that they 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.

RECOMMENDATION 3
Ensure that the appropriate testing is completed during each service visit.

- pH;
- Dissolved oxygen;
- Clarity (turbidity);
- Free residual chlorine.

Irrigation Area

Irrigation areas are included in the Codes of Practice as part of the system and, hence, during regular service visits, ASPs 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 were failing and that the primary reason behind this was the maintenance and servicing of the disposal fields (DOHWA, 2013). 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.

Of EHOs, 67% indicated that they have not been made aware of any modifications to irrigation areas.

Half of manufacturers and service personnel indicated that they had, on occasion, reported a modification of the irrigation area to the Local Government. All manufacturers and service personnel indicated that evaluation of the irrigation area was included in their maintenance reports.

It has been reported that the most common cause for malfunction of ATUs is caused by incorrectly installed irrigation systems (DOHWA, 2012).

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 ASPs evaluate irrigation areas, the overall upkeep of the disposal system, particularly landscaping, should primarily be looked after by the owner/operator.

RECOMMENDATION 4
Introduce an education program for ATU and GTS owner/operators regarding the importance of maintaining irrigation areas correctly and how to go about it, while ensuring their own safety.

Implementation Of Recommendation 4

- Department of Health should create a guidance note specifically dealing with maintaining irrigation areas, including specific maintenance requirements to be completed by owner/operators.
- Work with LG EHOs to distribute information about irrigation areas to owner/operators.

Monitoring And Auditing

LGs keep the records and are in charge of monitoring, auditing and administering the installation and maintenance of ATUs and GTSs. Monitoring programs are intended to ensure that systems comply with the requirements of the guidelines.

EHOs indicated that 73% maintained a consolidated copy of ATU installation records and 60% did the same for servicing records.

For GTS records, EHOs indicated that 63% maintained a consolidated copy of installation records, but only 22% kept servicing records.

Where LGs do not have installation records, servicing cannot be effectively monitored or audited. 71% of EHO indicated that there was no monitoring or auditing program in place for ATU within their LG areas. All EHOs indicated that there was no monitoring or auditing program in place for GTSs within their LG areas; and the main reasons cited in the EHO survey responses for the lack of monitoring and auditing were the lack of time, resources and funding.

A stricter and more vigorous monitoring and auditing program should be implemented, according to 54% of EHOs.

Some EHOs who took part in the survey also commented that, although monitoring or auditing programs had previously been in place, the programs had to be dropped, thanks to the considerable 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 states.

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 LGs that can be used to monitor onsite systems. The program is designed to track information regarding installations, permits, site evaluations, inspections and complaints (USEPA, 2013).

Most states within Australia, apart from 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 (EPA, 2013b).

A monitoring and auditing program would be able to assist in ensuring that ATUs and GTSs 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.

RECOMMENDATION 5

Require Local Governments keep organised installation records.

RECOMMENDATION 6

Liaise with Local Governments to develop a plan for the implementation of a monitoring and auditing system, controlled by Local Governments and audited by the Department of Health.

RECOMMENDATION 7

Implement an online maintenance report submission system to decrease the resources required for data entry, so freeing up resources for monitoring, by Local Governments.

Implementation Of Recommendations 5, 6 & 7

- 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.
- Work with Local Governments so that they are able to understand and use the system set up by the Department of Health.
- Audit Local Governments to ensure they keep installation and service records up to date, and monitor systems.

Regulation Of Authorised Service Persons

Currently, ASPs in Western Australia must be accredited by either the system manufacturer or the DOHWA. To be accredited for a system type, by the DOHWA, candidates 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 manufacturer's service manuals; proof of a minimum of one year of relevant experience; and proof of completion of an approved training course.

- While there are ASPs operating in all regions within WA, many rural areas have a limited number who must travel long distances, making unplanned call-outs expensive and difficult. Of EHOs, 26% indicated that they have received complaints from owner/operators about the limited number of ASPs in their area. While this is a small proportion of EHOs, limited numbers of ASPs had been expected to be an issue only in rural areas.
- 67% EHOs believed that ASPs have sufficient training and expertise to perform their job, and 83% believed that, with training, licensed plumbers would be capable of carrying out the necessary servicing of systems.
- Among manufacturers and service personnel, 94% believed that, with training, licensed plumbers would be capable of carrying out the necessary servicing of systems.
- Of manufacturers and service personnel, 88% believed that licensed plumbers would be unable to carry out the servicing requirements without specialised training.
- Operation and maintenance manuals were provided by 44% of manufacturers.
- Specialised training or expertise is, according to 93% of manufacturers and service personnel, required to service some parts of systems; while 73% indicated that specialised tools are required to service some parts of systems.
- Since systems have mechanical pumps, electrics, enclosed spaces and potentially dangerous wastewater, all service personnel 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". During the DOHWA's ASP discussion in 2012, it was agreed that the minimum competency for ASPs should include attending an ATU course and having experience in the industry (DOHWA, 2012).
- 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 (MPGA, 2014).
- In 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 (SA Health, 2013). In Queensland, service persons must be accredited by the system manufacturer (DIP, 2008a; DIP, 2008b; DIP, 2013). In NSW and the ACT there is no licensing or accreditation system in place for service persons (NSW Health, 1998; NSW Health, 2005). In Victoria, service persons must be accredited in writing by the system manufacturer or distributor (EPA, 2002: EPA, 2013a). 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 (EPA, 2013c):

  - Requiring licensing;
  - Increasing the consistency of servicing requirements;
  - Requiring servicing and repair, not just servicing.
- Approved training courses for ATU in WA come 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 (DOHWA, 2013).

- 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).

RECOMMENDATION 8

Endorse all licensed plumbers who have completed a recognised Aerobic Treatment Unit Service Training Course. As this would remove the requirement for prior experience it would be beneficial to check that all recognised courses provide sufficiently rigorous training.

Implementation Of Recommendation 8

- This would fit with the current Health Regulations and Codes of Practice; however, it would require changing the Guidelines for Becoming an Authorised Service Agent for Domestic Aerobic Treatment Units (2009).
- Send out letters to all manufacturers informing them of the requirement for all new service persons, regardless of level of experience, to have undertaken an accredited training course.

RECOMMENDATION 9

Liaise with the providers of accredited training courses so that the Department of Health continues to be involved, to ensure that persons receiving certification are aware of the Western Australian regulatory requirements.

RECOMMENDATION 10

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 ATUs and GTSs.

Service Interval

According to the guidelines, each ATU must be serviced quarterly, while a GTS must be serviced at least annually. All systems must be serviced according to the manufacturer's recommendations, and the DOHWA product approval conditions.

- Of EHOs, 68% believed that the frequency of services currently required is reasonable and 63% indicated that they had not received any complaints about inadequate maintenance of systems in the last five years.
- Sixty-five per cent of EHOs indicated that they were unaware of any commonly raised issues from maintenance reports received, but 22% of EHOs indicated that they did not believe that the ATUs in their area were serviced adequately, while 43% indicated the same for GTS. Thirty-five per cent of EHOs indicated they had received complaints from owner/operators about the cost of servicing their systems.
- 82% of manufacturers and service personnel believed that the number of services currently required per year was reasonable and 65% recommended that systems be serviced quarterly.
- 22% of manufacturers and service personnel who install systems in other states and who participated in the survey, use a different maintenance schedule in those other states.
- Half of manufacturers and service personnel indicated that they had found the system servicing requirements to be a negative factor for customers.

AS/NZS 1546.3 recommends that systems be serviced every three months and those in WA are designed to be serviced every three months, so servicing them less frequently could have a negative impact on the operation of the system and the quality of the effluent.

- As well as being specified in the guidelines, the required service interval for each type is included in the Conditions of Approval. The Conditions of Approval for the Aquarius O-ATU specify only six-monthly servicing (DOHWA, 2014) rather than the requirement of the ATU Code. This is an example of changing technology within the industry.
- The current WA servicing schedule does not allow for variability. Most states, excluding the ACT and Queensland, require a quarterly service interval. 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."

RECOMMENDATION 11

Increase the flexibility of the guidelines for ATUs and GTSs by removing the specified service interval and, instead, have the interval based solely on the manufacturer's or designer's recommendations, enforced by the Department of Health product approval conditions.

Owner Self-Servicing

Owner/operators servicing their own systems was one method suggested to assist with issues caused by the limited number of ASPs available in remote regions. A small majority (57%) of EHOs indicated that having the owner/operator perform basic maintenance to extend the service interval would not be possible. Rather more (67%) of manufacturers and service personnel indicated that owner/operators would not be able to carry out any aspects of the servicing requirements. Most (81%) manufacturers and service personnel indicated that it would be unrealistic to attempt a self-maintenance option for owner/operators, even if training was provided.

Nubian Water Systems has set up a self-service option for the Nubian GT600 Greywater Treatment System. It provides 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 based on a self-service agreement and it reminds them if they have a service overdue (Nubian Water Systems, 2009).

Neither the DOHWA nor LGs would have the resources to authorise individual system owners. Submission of maintenance reports to the Local Government would still be necessary

Owners have no certification and if they undertake the servicing they could void the system warranty (DOHWA, 2012). 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 health risk.

Self-service would not be practical unless the operator is also the owner, with expertise. Self-service would be more suited to a GTS as the health risks involved are lower.

RECOMMENDATION 12

Require owners wanting to service their own systems to complete an accredited training course and follow the same reporting requirements as Authorised Service Persons.

RECOMMENDATION 13

Require manufacturers wanting to allow non-certified owners to service their own systems to demonstrate, to the Department of Health's 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.

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 (Committee on Environment and Regulation, 2012).

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 systems. Work on developing these guidelines began in 2007.

RECOMMENDATION 14

Increased contact between members of the National Onsite Regulators Forum (NORF) could be beneficial to the policy development of all Australian jurisdictions.

Additional Issues Identified

Code Compliance and Enforceability
Multiple stakeholders have raised concerns about 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 non-compliance that have previously been seen. They suggested 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" (DOHWA, 2013).

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 in the survey regarding the legal enforceability of the guidelines relating to ATU servicing.

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

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.

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. Recommendations 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, encourage more innovative system design and assist development of the *Code of Practice for Onsite Sewage Management*, which is currently in the draft stage.

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