



CLASS A WASTEWATER RECYCLING

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Background

Recycling of waters that have been traditionally wasted is a critical element of effective water supply management to ease pressure on existing water resources

Several states have developed water resource strategies featuring large increases in recycling

In South Australia these are being headlined by strategies such as Water Proofing Adelaide and a number of initiatives in other parts of the State

Although not specified in existing strategies, proposals for Class A schemes are often raised

Why Class A Schemes ?

- 💧 **Because it is the highest quality and users want “Class A” (although recycling is based on the premise of using water that is “fit for purpose”).**
- 💧 **Schemes using “Class A plus” have also been suggested**
- 💧 **However Class A:**
 - **is difficult to achieve,**
 - **has a high capital cost**
 - **has high operating costs and requires trained operators**
 - **has high monitoring costs (testing and auditing)**
 - **presents a high risk to users in the event of failure**

National Guidelines for Water Recycling

- ◆ **New National Guidelines for Water Recycling are being drafted. It is anticipated that these will form the basis of new State Guidelines**
- ◆ **Phase 1 deals with:**
 - **Large scale-treated sewage and grey water** for residential (non-potable), urban recreational and open space irrigation and agricultural and industrial use
 - **On-site grey water** for residential (non-potable)
- ◆ **Phase 2 deals with potable reuse, ASR and stormwater recycling**



Contents of Guidelines

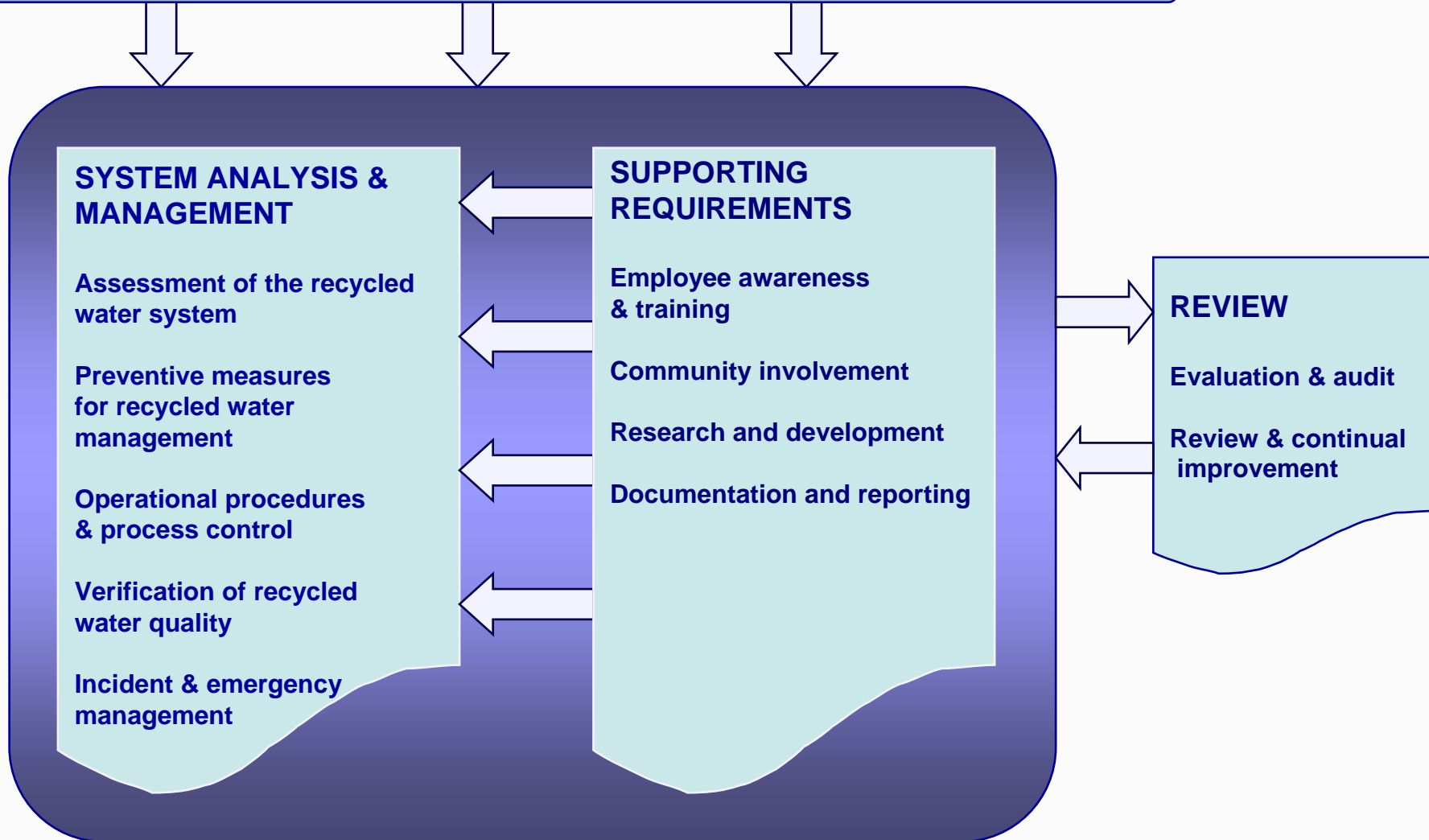
- 1. General principles**
 - 2. Framework for management of recycled water quality and use**
 - 3. Managing health risks**
 - 4. Managing environmental risks**
 - 5. Monitoring**
 - 6. Consultation and communication**
 - 7. Appendices incorporating case studies and detailed information on environmental risks**
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Management Framework

- ◆ **Based on risk management principles and adapted from the model included in the 2006 ADWG. Generic and applies to all sources of water including stormwater, grey water and sewage**
- ◆ **Aim is to ensure (as much as possible) that recycled water is safe before use**
- ◆ **Reduces reliance on recycled water testing (too little, too late)**
- ◆ **A coordinated approach from source to point of use**

Risk Management Framework

COMMITMENT TO RESPONSIBLE USE AND MANAGEMENT OF RECYCLED WATER



What does the framework provide ?

- ◆ A system for design and ongoing management of recycled water schemes
- ◆ Identification of major risks and implementation of **appropriate** control measures for intended uses
- ◆ Focus on operational monitoring systems designed to detect faults in control measures **before use** of recycled water
- ◆ Recycled water monitoring to ensure that the management system is effective
- ◆ Regular reporting and incident protocol
- ◆ A system that can be audited

Is this new ?

No

- ◆ **Several schemes have implemented risk management systems (Mawson Lakes, Virginia Pipeline, Eastern and Western Treatment Plants, Gold Coast etc)**
- ◆ **Well designed schemes currently incorporate elements from the Framework**

Managing health risks-principles

- 1. Safety is paramount**
- 2. No other public health measure has had a greater impact in reducing disease and extending life than separation of drinking water supplies and the public from wastewaters**
- 3. Diarrhoeal diseases including typhoid caused by poor sanitation used to be more prevalent in Australia. Internationally 1.6M people die each year from diarrhoeal disease**
- 4. For most uses microbial quality represents by the greatest risk**

Health aspects of new guidelines

- ◆ **Definition of tolerable risk (the goal posts)**
- ◆ **Targets for bacteria, protozoa and viruses (and how to calculate these)**
- ◆ **Discussion of preventive measures (treatment and on-site controls) and their impact**
- ◆ **Look-up tables of typical schemes and safe uses**

Performance targets

Performance target = reduction in hazard concentrations present in sewage to achieve tolerable risk

| Activity | Exposure Litres per year | Log reduction required | | |
|------------------|--------------------------------|------------------------|-----------|----------------------|
| | | Crypto | Rotavirus | <i>Campylobacter</i> |
| Residential use | 0.66 | 4.9 | 6.0 | 5.0 |
| Commercial crops | 0.49 | 4.8 | 5.9 | 4.9 |
| Urban irrigation | 0.05 | 3.7 | 4.8 | 3.8 |

Residential use = outdoor use, toilet flushing and laundry

Commercial crops include spray irrigation of salad vegetables

Achieving compliance

- ◆ **Performance targets can be met by reducing concentrations of hazards in recycled water or by controlling exposure**
- ◆ **Concentrations of microbial hazards are reduced by treatment (focus in “Class A” schemes)**
- ◆ **Exposure can be controlled on-site eg**
 - **by selective use (irrigation of salad vegetables vs almond trees)**
 - **via methods of application (drip vs spray irrigation).**

Treatment

| | Log reductions | | |
|--------------------------|----------------|------------|-----------|
| | Bacteria | Viruses | Protozoa |
| Primary treatment | 0 - 0.5 | 0 - 0.1 | 0 - 1.0 |
| Secondary treatment | 1.0 - 3.0 | 0 - 2.0 | 0.5 - 1.5 |
| Dual media + coagulation | 0 - 1.0 | 0.5 - 3.0 | 0.5 - 3.0 |
| Lagoon storage | 1.0 - 5.0 | 1.0 - 4.0 | 1.0 - 4.0 |
| Chlorination | 2.0 - 6.0 | 1.0 - 3.0 | 0 - 1.5 |
| UV light | 2.0 - > 4.0 | 1.0 - >3.0 | > 3.0 |

On-site Preventive Measures

Preventive measure

Exposure reduction

Cooking or processing

5-6 log

Drip irrigation

2 log

Subsurface irrigation

4 log

Withholding periods

0.5 log per day

Spray drift control

1 log

No public access when irrigating

2 log

Subsurface landscape

5-6 log

Buffer zones

1 log

Preventive measures for specific uses

| Use | Log reduct ⁿ (virus) | Treatment | | On-site | |
|-------------------|---------------------------------|---|-----|--|-------------|
| | | | Log | | Log |
| Dual reticulation | 6 | 2 ^o , coag, filtration disinfection | 6 | | |
| Salad crops | 6 | 2 ^o , coag, filtration disinfection | 6 | 1.5-2 days to market | 1 |
| Urban irrigation | 5 | 2 ^o , coag, filtration disinfection | 6 | | |
| Urban irrigation | 5 | 2 ^o , disinfection | 1-3 | No access Buffer zones Spray drift control | 2 1 1 |

Typical uses for existing treatments

| Treatment | Use | On site control | Water quality |
|--|---|--|--|
| 2 ^o , coagulation filtration disinfection | Dual reticulation Urban irrigation Salad crops | General (signage etc) | Turbidity < 2 NTU Chlorine Ct >60 <i>E.coli</i> <1/100mL (Dual) <i>E.coli</i> <10/100mL (Urban) BOD < 20mg/L |
| 2 ^o , disinfection | Urban irrigation (parks, ovals, golf courses etc) | No access Buffer zones Spray drift control | Chlorine Ct >15 <i>E.coli</i> <100/100mL BOD < 20mg/L |
| 1 ^o , 60d lagoons 2 ^o , 30d lagoons | Urban irrigation | No access Buffer zones Spray drift control | <i>E.coli</i> <1000/100mL BOD(sol) < 20mg/L |
| 2 ^o | Landscape irrigation | Microspray, drip irrigation | <i>E.coli</i> <1000/100mL BOD < 20mg/L |
| 1 ^o , lagoons | Tree lots, turf | Drip irrigation, Spray - no access | <i>E.coli</i> <10000/100mL BOD < 20mg/L |

Implications for "Class A" schemes

- ◆ **"Class A" not included in the draft guidelines. Log reductions required for old "Class A" uses varies from 4.5-6 for viruses**
- ◆ **Schemes including residential use (Mawson Lakes) unrestricted food crop irrigation (Virginia Pipeline) or toilet flushing (Adelaide Airport) need to demonstrate that performance targets will be met on an ongoing basis**
- ◆ **Existing schemes will not require treatment upgrades but all schemes will need a formal risk management plan**

Requirements for "Class A" schemes

Residential use

- ◆ **Prior to installation demonstrate capability for at least 6 log reduction of viruses, 5 log reduction of bacteria and protozoa (published data and test results)**
- ◆ **Performance achieved continuously (on line monitoring of filtration and disinfection with 24 hour monitored alarms)**
- ◆ **Demonstrate correct installation with backflow protection (audit to demonstrate zero cross-connections)**
- ◆ **Annual audits of all aspects including treatment, monitoring, in-house cross-connection inspections *etc***
- ◆ **Ongoing community education (change of ownership *etc*)**

Requirements for "Class A" schemes

Unrestricted (salad) crop irrigation

- ◆ Prior to installation demonstrate capability for at least 5 log reduction of viruses, 4-5 log reduction of bacteria and protozoa (published data and test results)**
- ◆ Performance achieved continuously (on line monitoring of filtration and disinfection with 24 hour monitored alarms)**
- ◆ Demonstrate correct installation with backflow protection to dams/groundwater and mainswater**
- ◆ Annual audits of all aspects including treatment and monitoring**
- ◆ Ongoing community education**

Summary

- ◆ **“Class A” is required for dual reticulation and unrestricted irrigation of salad crops**
- ◆ **“Class A” is not required for the vast majority of uses including irrigation of golf courses, sports grounds, parks and gardens, grapevines, fruit trees, any crop that is processed, pasture *etc.***
- ◆ **In most cases effluent from conventional wastewater treatment plants can be used with little additional treatment for non “Class A” purposes**
- ◆ **Department of Health provides advice on approval requirements in the design phase**

Beyond the Black Stump

