

Victorian Government

Alternative Urban Water Supplies Regulatory Review - Industrial Water Technical Report

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APPENDICES

A: Types of Industrial Water

1 Introduction

1.1 Background

In recent years the urban community in Victoria has had an increased focus on the use of alternative water supply systems to supplement or partially replace the reticulated supply. This is due to a number of complementary factors including prolonged drought conditions and associated water restrictions, improved awareness of the environmental value of our water resources, and the direct relationship between water usage and water rates.

The State Government has recognised the community interest and the need to use alternative water sources in addressing the water challenges caused by the increasing stress on Victoria's water supplies. As such there is a need to review the regulatory framework and associated guidance supporting the alternative water supplies in order to ensure protection of public health and environment.

Currently, the key water recycling regulatory and approval mechanisms for ensuring environmental and public health protection in Victoria vary depending on the source of the water and the characteristics of the recycling scheme.

Good management of water recycling activities is required to ensure that incidents are avoided and community confidence enhanced. Without an independent assessment and approval process, some sectors have limited confidence to invest or be involved in schemes. In addition to ensuring environment and health protection, effective regulatory oversight is needed to enable access to alternative water supplies.

1.2 Context for the Review

Under the Victorian Government White Paper: *Our Water Our Future*, the Environment Protection Authority Victoria (EPA) and the Department of Human Services (DHS) are required to undertake a review of the public health and environmental framework supporting alternative urban water supplies.

Section 5 of the White Paper *Smarter Water Use in Our Cities and Towns - Getting the Right Planning Framework and Regulation* states that the planning and regulatory framework will be aligned to support water conservation and to ensure that the use of recycled water and alternative supplies is consistent with environmental and public health protection requirements.

Action 5.42 states that EPA Victoria, in partnership with DHS, will review the public health and environmental framework supporting alternative urban water supplies. For each alternative water supply the review is required to consider:

- the level of regulatory oversight that is needed;
- the most efficient approaches for assessing and approving the use of individual alternative water supplies; and
- the necessary reporting and auditing requirements so that the community retains confidence in the safety of alternative supplies.

Action 5.43 states that EPA Victoria, in partnership with DHS, will build from the existing Guideline for Environmental Management: Use of Reclaimed Water (EPA; 2003) and establish a broad suite of guidance for alternative water supplies. The guidelines will establish water quality standards and appropriate management controls to expand the use of alternative supplies including the use of industrial water for industrial and urban recycling.

1.3 Objective of this Project

A key action arising out of the State government's White Paper *Our Water Our Future* was to review the public health and environmental regulatory framework supporting alternative urban supply sources.

The White Paper provides for the EPA and DHS to undertake the review. Hyder Consulting in association with Ecos Environmental Consulting and Water Futures was engaged to assist these agencies prepare the report. This technical report addresses Industrial Water.

The report incorporates:

- a) A review of current regulatory frameworks applicable to industrial water use.
- b) A health and environmental risk assessment framework and the development of preferred management controls.
- c) Development of recommendations for regulatory changes.

1.4 Terms of Reference

The terms of reference listed in three parts as presented below.

- a)
 - (i) Review the existing regulatory framework for industrial water:
 - in Victoria; and
 - nationally (including NSW and Queensland) and internationally (United Kingdom and California USA).
- b)
 - (i) Develop a recommended human health and environmental risk assessment approach for industrial water use (in consultation with the Working Group).
 - (ii) Identify management controls where necessary to minimise human health and environmental risks to acceptable levels.
- c)
 - (i) Identify legislative, regulatory and administrative changes required to implement the preferred management controls.
 - (ii) Report on outcomes, options and recommendations for regulatory changes.

For the purposes of this report, the term 'regulation' is not limited to formal, statutory provisions, but includes amongst other things, the provision of information, guidance and annual reporting of schemes. (Refer to Section 6.2 for further details on regulatory models).

The project scope addresses reuse of industrial water in urban and industrial schemes. It is however limited to water collected from within industrial sites located in urban areas. Urban areas are primarily defined as those areas provided with both reticulated drinking water and sewerage services.

1.5 Stakeholder Engagement

The day to day running of the project has been co-ordinated by the EPA and DHS management team. The management team reports to a steering committee with representatives from DSE, EPA and DHS.

A working group was established to bring together relevant technical and industry expertise to provide advice on the risk assessment and management options. Two workshops have been held involving input from the working group members on:

- risk assessment (Workshop 1); and
- identification of preferred management controls and SWOT analysis of the Victorian regulatory framework (Workshop 2).

The Working Group included representatives from the following organisations:

- Department of Sustainability and Environment;
- Department of Human Services;
- Environment Protection Authority;
- Qenos Pty Ltd;
- City West Water;
- Melbourne Water, and
- Fosters Australia - Abbotsford Brewery

It is to be noted that the views expressed by members of the working group may not necessarily represent the views of their organisations.

2 Alternative Water Sources and Uses

2.1 Key Definition

The definition of industrial water was agreed at the first workshop with the working group. It is:

Wastewater produced from processes at industrial or commercial premises. It includes all waterborne waste from these facilities except sewage.

2.2 Other Relevant Definitions

The following definitions apply to sources of water to, and in some cases specific types of industrial water generated at, an industrial facility.

Recycled Water:	Water that has been derived from sewage, greywater or stormwater systems and treated (where necessary) to a standard that is appropriate for its intended use.
Trade Waste:	Any waterborne waste (other than sewage) which is suitable, according to the criteria of an Authority, for discharge into the Authority's sewerage system; or any other matter which is declared by a by-law made under the Water Act to be trade waste.
Sewage:	Any waste containing human excreta or domestic wastewater. Sewage within a sewerage system may also contain a percentage of industrial waste commonly known as trade waste.
Stormwater:	Urban surface water runoff most commonly captured from rain events.
Rainwater:	Water collected directly from roof run-off.
Drinking Water:	Water that is intended, and of a quality that is suitable, for drinking. Within the water industry, water of this quality is also referred to as <i>potable water</i> .
Reticulated Drinking Water:	Drinking water supplied to a site by a water authority through a network of pipes.

Industrial Process:

An activity conducted at an industrial site directly associated with producing or handling of goods, for example, cooling, operation of boilers, pulping, washdown and cleaning. Also included for the purpose of this technical report are activities at commercial premises such as carwash and laundromats. Activities that are excluded for the purpose of this paper are agricultural, mining, forestry, fishing and other activities where reuse would lead to a discharge to the environment.

The following definitions apply to prescribed waste.

Prescribed waste:

A waste that is listed in Schedule 1 and any mixture containing a waste listed in Schedule 1 of the *Environment Protection (Prescribed Wastes) Regulations 1998*.

Prescribed industrial waste:

An industrial waste that arises from an industrial, commercial or trade activity or from a laboratory; or that is potentially harmful to human beings or equipment and arises from a hospital; and is listed in Part B of Schedule 1 of the *Environment Protection (Prescribed Wastes) Regulations 1998*.

2.3 Potential Uses

The potential uses of industrial water are shown in Table 2-1 overleaf.

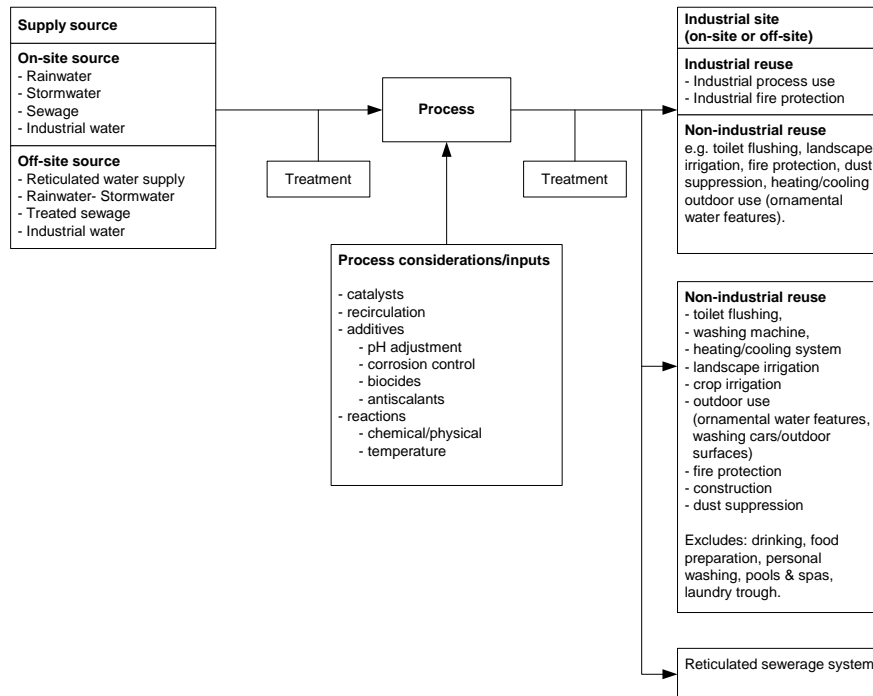
Table 2-1: Potential Uses of Industrial Water

Category	Uses
Non-industrial reuse	Drinking
	Food preparation
	personal washing
	laundry trough
	swimming pool/spa
	washing machine (with dedicated washing machine taps)
	outdoor use (for washing cars, outdoor surfaces, outdoor recreation and use in ornamental water features);
	toilet flushing
	heating/cooling systems
	landscape irrigation (surface and subsurface)
	crop irrigation (surface and subsurface)
	fire protection
	construction
	dust suppression
Industrial reuse	industrial processes (on-site)
	industrial processes (off-site)
	industrial fire protection

3 Context

Industrial facilities are both users and generators of wastewater as shown in the figure below. The quality and the quantity generated are dependent upon the supply source, the industrial process and level of treatment. The range of lifecycle scenarios for industrial water, from supply source to potential uses, is shown in Figure 3-1.

Figure 3-1: Industrial Process - Water Cycle Flow Diagram



The primary source of water to most Victorian industries in areas serviced by a reticulated sewerage system is potable mains water. In some cases this supply source is augmented by:

- groundwater;
- surface water from waterways;
- condensate from pressing, centrifuging, evaporating;
- recycled process water;
- rainwater/stormwater; and
- wastewater (including greywater & treated sewage).

Examples of industries that produce industrial water include chemical industries, abattoirs (slaughterhouse), food processing, automotive manufacturing, energy production, oil & gas refineries, and pulp and paper mills.

Industrial facilities vary in their function, scale, and complexity. Examples of process segments in which these waters may be generated include:

- raw material washing;
- fluming and transport;
- equipment washing;
- boiler and cooling tower blow down;
- condensate;
- reverse osmosis retentate;
- 'cold side' plate heat exchanger water;
- pump seal water;
- process filtrates, centrifugations and pressings;
- finished goods wash water;
- package cooling water; and
- effluent plant outfall.

Further details on each of these industrial process segments are provided in Appendix A.

The quality of water within these industry segments can vary dramatically depending upon a range of factors. These include:

- the source of the water;
- the number of times the water has been reused potentially increasing or decreasing the concentration levels of contaminants;
- the characteristics of the products and surfaces the water contacts;
- reactions that occur during process;
- additives such as biocides, antiscalants, pH adjusters; and
- temperature of the water.

Typical industrial process opportunities for using industrial water include:

- material washing;
- process rinsewater;
- crate and pallet washing;
- hardstand and vehicle washing;
- industrial fire protection;
- cooling; and
- boiler or cooling tower feed water supplement.

Industrial water, in many cases, can also be used on-site and off-site premises for non-industrial uses. Potential on-site and off-site non-industrial uses are shown in Figure 3-1. These include:

- washing machine (with dedicated washing machine taps);
- outdoor use (for washing cars, outdoor surfaces, outdoor recreation, and use in ornamental water features);
- toilet flushing;
- heating/cooling systems
- crop irrigation (surface and subsurface);
- landscape irrigation (surface and subsurface);
- dust suppression;
- construction; and
- fire protection.

Drinking, food preparation, personal washing, swimming pool/spa and laundry trough uses are not recommended where reticulated potable water is available.

4 Methodology

4.1 Overview

This section of the report describes the methodology applied to the identification of human health and environmental risks and the development of preferred management controls for industrial water reuse. The methodology addresses the following tasks:

- a)
 - (i) Review the existing regulatory framework for industrial water:
 - in Victoria; and
 - nationally (including NSW and Queensland) and internationally (United Kingdom and California USA).
 - (ii) Develop a recommended human health and environmental risk assessment approach for industrial water use (in consultation with the Working Group).
 - (iii) Identify management controls where necessary to minimise human health and environmental risks to acceptable levels.
- b)
 - (i) Identify legislative, regulatory and administrative changes required to implement the preferred management controls.
 - (ii) Report on outcomes, options and recommendations for regulatory changes.

4.2 Review of Regulatory Frameworks

4.2.1 Victoria

The existing Victorian regulatory framework for the reuse of industrial water has been reviewed and documented in Section 6.3. It includes an overview of relevant agency roles and responsibilities, a summary of the relevant legislation and guidelines, an overview of the approvals process, and a summary of the relevant management controls.

4.2.2 Other Jurisdictions

The Commonwealth, New South Wales, and Queensland regulatory frameworks as they apply to industrial water have been reviewed. (See Section 6.4). The United Kingdom and California regulatory frameworks as they apply to industrial water have been reviewed (See Section 6.5).

4.3 Risk Assessment and Management Controls

4.3.1 Risk Assessment

Sources of recycled water such as industrial water can contain a wide range of agents that pose risks to human health and the environment, including chemicals and pathogenic micro organisms.

Potential hazards and risks associated with industrial water reuse are described in Section 5. The recommended approach for assessing the potential risks and management controls for individual industrial water reuse schemes are described in Section 7.

4.3.2 Development of Management Controls

Management controls are interventions that are needed to reduce risk levels to those acceptable to the community. Management controls may be implemented through education, guidance and/or regulation including codes of practice, audits, system approvals, contracts and site permits.

Recommended controls for managing the public health and environmental risks associated with industrial water reuse are presented in Section 7.

4.4 Development of Recommendations

4.4.1 Identify Adequacy of Existing Victorian Framework

An analysis of the adequacy of the existing regulatory framework in Victoria has been undertaken to determine whether changes to the framework are required to provide for the recommended approach for assessing acceptability, on public health and environmental grounds, of industrial water reuse schemes. This assessment is presented in Section 8.

Section 9 identifies the key findings from the review of other regulatory frameworks that have been considered in the development of recommendations to address the deficiencies in the Victorian regulatory framework for managing the public health and environmental risks associated with industrial water reuse.

4.4.2 Report on Outcomes Including Recommendations

Following this analysis, recommendations on regulatory changes required to provide an enhanced public health and environmental framework for the reuse of industrial water have been developed. These are presented in Section 10.

5 Risk Management Framework

Sources of recycled water such as industrial water can contain a wide range of agents that pose risks to human health and the environment, including chemicals and pathogenic microorganisms.

Safe use of recycled water requires potential human health and environmental risks to be reduced to acceptable levels. This involves setting health based targets that are consistent with a level of risk that will be acceptable to the community and setting standards to minimise adverse environmental impacts.

5.1 Definitions

Effective risk management involves identifying all potential human health and environmental hazards and hazardous events, and assessing the level of risk. The distinction between hazard and risk needs to be understood, so that attention and resources can be directed according to the level of risk rather than just the existence of a hazard.

- A hazard is the capacity of an agent (e.g. biological, chemical, physical) to have adverse consequences to public health or the environment¹.
For example:
 - the bacterial pathogen *Escherichia coli* 0157 is a hazard to human health; and
 - sodium in irrigation water can be a hazard as it has the potential to cause plant toxicity.
- A hazardous event is an incident that can lead to an exposure of the hazard to humans or to the environment. For example:
 - Failure of controls at a recycled water treatment plant leading to *Escherichia coli* 0157 passing into the distribution system.
- Risk is the likelihood of the identified hazard causing harm to the exposed population or receiving environment. The level of risk is determined considering the likelihood (timeframe) and the consequences (impact). For example:
 - The likelihood of a sufficient number of organisms passing through the treatment system and causing illness to people exposed is a risk; and
 - The likelihood of an activity resulting in discharge of water with a high sodium concentration and causing plant toxicity is a risk.

¹ Modified from Department of Health and Ageing and enHealth Council, (2002), *Environmental Health Risk Assessment: Guidelines for assessing human health risks from environmental hazards*.

Other relevant definitions include:

- Inherent risk:** The probability that without intervention, an adverse outcome will occur in a person, group of people, plants, animals and/or the ecology of a specified area that is exposed to a particular dose or concentration of a hazardous agent.
- Residual risk:** The probability that following the implementation of risk management controls, an adverse outcome will occur in a person, group of people, plants, animals and/or the ecology of a specified area that is exposed to a particular dose or concentration of a hazardous agent.

5.2 Primary Information Needs

The 2005 draft *National Recycling Water Guidelines* (National Resource Management Ministerial Council and Environment Protection and Heritage Council) identify some of the main facts that need to be established in assessing risks for recycled water systems as:

- the source of the recycled water;
- information on hazards and the quality of the source water;
- preventative measures, including treatment processes already in place;
- quality of treated water;
- intended uses;
- preventative measures to be applied at the site of use or discharge of the recycled water; and
- the potential impacts being assessed (e.g.; impact on public health or receiving environments).

As the quality of industrial water can vary from industry to industry, proponents of industrial water reuse schemes need to establish what hazards are in the water so that they can determine the impact on human health or the environment.

5.3 Hazards

Industrial water can contain a wide array of hazards due to the presence of chemical (some of which may be reactive), microbiological, physical, and radiological constituents, including:

- Pathogenic organisms;
- Nutrients (nitrogen and phosphorus);
- Biodegradable organics (composed principally of proteins, carbohydrates and fats);
- Refractory organics which tend to resist conventional methods of wastewater treatment (e.g. phenols, agricultural pesticides);
- Dissolved inorganics (e.g. calcium, sodium);
- Metals (e.g. arsenic, barium, cadmium, chromium, lead, mercury and silver);

- Suspended solids; and
- Organic and inorganic compounds with toxicity.

Source: Metcalf and Eddy (2003) *Wastewater engineering: treatment and reuse*, McGraw-Hill.

Different uses of industrial water can provide pathways for hazardous constituents to be exposed to humans or to enter the environment. Hazards that pose a risk in industrial water are discussed in the following sections.

5.3.1 Microbiological Hazards

Water used in industrial processes can contain a wide range of agents that pose a risk to human health, including chemicals and pathogenic (disease causing) microorganisms. Microbiological hazards of concern are shown in Table 5-1.

Table 5-1: Potential Microbial Pathogens in Industrial Water

Pathogen type	Examples	Illness
Bacteria	Salmonella	Gastroenteritis, reactive arthritis
	Campylobacter	Gastroenteritis, Guillain-Barre syndrome
	Escherichia coli	Gastroenteritis, haemolytic uremia syndrome
	Shigella	Dysentery
	Yersinia	Gastroenteritis
	Vibrio cholerae	Cholera
	Atypical Mycobacteria	Respiratory illness (hypersensitivity pneumonitis)
	Legionella spp	Respiratory illness (pneumonia, Pontiac disorder)
	Staphylococcus aureus	Skin, eye, ear infection, septicemia
	Pseudomonas aeruginosa	Skin, eye, ear infection
	Helicobacter pylori	Peptic ulcer
Viruses	Enterovirus	Gastroenteritis, respiratory illness, nervous disorder, myocarditis
	Adenovirus	Gastroenteritis, respiratory illness, eye infection
	Rotavirus	Gastroenteritis
	Norovirus	Gastroenteritis
	Hepatitis A	Infectious hepatitis
	Calicivirus	Gastroenteritis
	Astrovirus	Gastroenteritis
	Coronavirus	Gastroenteritis
Protozoa	Cryptosporidium	Gastroenteritis
	Giardia	Gastroenteritis
	Naegleria fowleri	Amoebic meningitis
	Entamoeba histolytica	Amoebic dysentery
Helminths	Taenia	Tapeworm

Pathogen type	Examples	Illness
	Ascaris	Roundworm
	Trichuris	Whipworm

Source: Draft National Recycled Water Guidelines (National Resource Management Ministerial Council and Environment Protection and Heritage Council, 2005)

5.3.2 Chemical Hazards

The chemical hazards in industrial water can pose risks to the environment as well as humans. In assessing environmental risk, a variety of end points need to be considered, which can be grouped into the broad categories of air, land, water and biota. The resulting impact can vary depending on the constituent, its concentration, the pathway, length of exposure and the sensitivity of the environmental end point.

For example, in the case of industrial water being used to irrigate a municipal reserve containing a recreation oval and gardens with native plant species, the specific end points might be the:

- species of grass used on the oval;
- specific native species grown in the reserve;
- specific soil type in which the grass and plants are grown; and
- biota that occupy the soil and plant species in the reserve.

If the irrigation water could percolate to groundwater, or run off to surface water bodies nearby, these bodies of water would also be specific end points for the industrial water and hazard being assessed.

Examples of potential risks posed by the use of industrial water for irrigation are shown in Table 5-2.

Table 5-2: Potential Chemical Hazards in Industrial Water

Hazard	Environmental end point	Impact on Environment
Nitrogen	Soils	Nutrient imbalance in plants Pest and disease in plants
	Surface waters	Eutrophication of soils and effects on terrestrial biota
	Groundwater	Eutrophication Contamination
Phosphorus	Surface waters	Eutrophication of soils and toxic effects on phosphorus sensitive terrestrial biota (native plants)
	Surface waters	Eutrophication
Cadmium	Soils	Cadmium already in soil can be released to plants if chloride concentrations increase.
Chloride	Plants	Direct toxicity to plants when sprayed on foliage
	Soils	Plant toxicity via uptake through roots
	Surface water	Toxicity to aquatic biota
Sodium	Plants	Direct toxicity to plants when sprayed on foliage
	Soils	Plant toxicity via uptake through roots
	Soils	Soil structure decline due to sodicity

Source: Draft *National Recycled Water Guidelines* (National Resource Management Ministerial Council and Environment Protection and Heritage Council, 2005).

5.3.3 Other Hazards

Industrial water can contain physical and radiological hazards. Physical hazards include temperature and suspended solids. In an aquatic environment, suspended solids can lead to the development of sludge deposits and anaerobic conditions (e.g. use in ornamental water features).

The temperature of industrial water can be commonly higher than the local water supply. It is an important parameter with effects on chemical reactions, reaction rates, aquatic life and the suitability of water for the beneficial uses.

5.4 Risk Profile

The risk profile associated with industrial water is dependent on a number of factors including the quality of the source of water to the facility, the industrial process, the industrial water sources (i.e. boiler water, cooling water, manufacturing water, contaminated stormwater), and the level of on site water treatment.

The variability in industrial water quality, in combination with possible uses, provides a wide range of risks. As such, each industrial water reuse scheme needs to be assessed on a case-by-case basis. The recommended approach for assessing the public health and environmental risks associated with industrial water reuse is presented in Section 7.

5.5 Management Framework

The framework for management of industrial water quality and use should be based on preventive risk management systems, which can be applied to all combinations of water source and end use. The aim is to provide a measurable and ongoing assurance that performance requirements are met and that, as far as possible, faults are detected before supply, discharge or application of industrial water, so that corrective actions can be implemented.

Recommended controls for managing the public health and environmental risks associated with industrial water reuse are presented in Section 7.

6 Review of Regulatory Frameworks

6.1 Purpose

This section of the technical report presents the outcomes of the review of existing regulatory frameworks that are applicable to industrial water reuse.

The review considers the regulatory frameworks:

- in Victoria;
- nationally (including NSW and Queensland); and
- internationally (United Kingdom and California USA).

The purpose of the review is to provide direction for:

- the development of the recommended approach for assessing individual industrial water reuse schemes from a human health and environmental risk perspective (Section 7); and
- the development of recommendations to provide an enhanced public health and environmental regulatory framework for the reuse of industrial water (Section 10).

The review concludes with a summary of the key elements of the interstate and overseas regulatory frameworks that are of interest in informing the recommended approach and recommendations for an enhanced public health and environmental regulatory framework for industrial water reuse.

An analysis of the adequacy of the existing regulatory framework in Victoria has been undertaken to determine whether changes to the framework are required to provide for the recommended approach for assessing industrial water reuse. This assessment is presented in Section 8.

Section 9 identifies the key findings from the regulatory review of interstate and overseas frameworks that have been considered in the development of the recommendations to address the deficiencies in the Victorian regulatory framework for managing public health and environmental risks associated with industrial water reuse.

6.2 Regulatory Models

In the context of this review it is important to understand that there is a range of alternative measures that may be adopted to develop good controls to manage public health and environmental risks associated with the reuse of industrial water.

Management controls need to be viewed as part of a spectrum, with explicit regulation representing one end of this spectrum and self-regulation supported by education based guidance at the other extreme.

Where a risk analysis determines that the reuse of an industrial water is either of medium or high risk, explicit regulation may be necessary to either impose rules or principles to influence behaviour to protect public health and the environment.

The most explicit form of government regulation is legislation, either through Acts of Parliament – known as primary legislation – or through subordinate legislation, such as statutory rules. The passing of legislation establishes a legal requirement on affected parties to behave in a particular way.

Regulation is not limited to primary and subordinate legislation. There are other forms of regulation that have varying degrees of government involvement. Governments can play an important role in quasi-regulation, a form of regulation that attempts to influence business activity through the establishment of guidelines, industry codes of practice or similar advisory instruments. For example the EPA prepares guidance material such as the Guidelines for Environmental Management (GEM) series to provide technical details regarding implementation of statutory policy. Such guidance does not have a formal statutory effect unless it is referred to in a legislative document, the result of which is to provide the publication with the legal status given to it by that legislative document. They may also be used as a guide in statutory decision making processes in which case it is incumbent on the decision maker to identify the documents as one to which regard will be had.

Self-regulation, meanwhile, sits at the opposite end of the spectrum to explicit government regulation. Self-regulation is generally characterised by the development of voluntary codes of practice by an industry, with the industry solely responsible for enforcement, and where the government's role may be nonexistent, or limited to the provision of advisory information.

Policy approaches such as public information and education campaigns that do not involve the establishment of legislation can be described as non-regulatory and may be considered as the most appropriate approach to manage low risk uses of industrial water.

6.3 Victorian Regulatory Framework

6.3.1 Introduction

The existing regulatory framework for the reuse of industrial water in Victoria is described below under the following headings:

- Roles and responsibilities of agencies
- Acts and regulations
- State policies; and
- Codes, standards and guidelines.

6.3.2 Roles and Responsibilities of Agencies

The key Victoria agencies responsible for ensuring that industrial water meets appropriate human health and environmental standards for reuse are the Environment Protection Authority (EPA), the Department of Human Services (DHS), the Department of Sustainability and Environment (DSE), the Victorian Workcover Authority (VWA), local government, water authorities, Catchment Management Authorities (CMAs) and the Plumbing Industry Commission. Their roles and responsibilities that are relevant to industrial water reuse in urban areas are described below.

EPA Victoria

EPA administers the *Environment Protection Act 1970* and State environment protection policies including the *State environment protection policy - Waters of Victoria*. The Act provides the legal framework by which environmental objectives, goals and regulations are established throughout the State for industry, commerce and the general public. EPA is responsible for developing, implementing and enforcing environmental guidelines including those for the development of safe and sustainable water recycling schemes.

Department of Human Services

The Department of Human Service (DHS) administers the *Health Act 1958* and is responsible for the enhancement and protection of health and well being of all Victorians.

The Public Health Group within DHS is responsible for programs including disease control, food safety and environmental health. In this role the Public Health Group regulates drinking water safety, pest control, radiation safety, cemeteries and food safety.

In particular, DHS administers the regulatory framework to protect the public from legionnaire's disease under the provisions of the *Building Act 1993*.

Department of Sustainability and Environment

The Department of Sustainability and Environment is Victoria's lead government agency responsible for promoting and managing the sustainability of the natural and built environment.

The Department's primary functions include biodiversity conservation; efficient water management; public land stewardship across forests, coasts, alpine resorts, Crown land reserves and parks; the promotion of sustainable resource use and management practices among industries and the general community; and the promotion of sustainable urban and regional development.

DSE is responsible for the implementation of priorities outlined in *Our Water - Our Future*, including water recycling and river health initiatives.

The DSE oversees the administration of the *Water Act 1989*, the *Water Industry Act 1994*, the *Catchment and Land Protection Act 1994* and the *Planning and Environment Act 1987*. It also works with CMA's, water authorities and other agencies to assist in the development and implementation of regional priority programs and regional targets, and to develop a framework for monitoring and evaluating the implementation of regional strategies.

Local Government

Local councils are responsible for protecting the public health and environment within the municipal area and are responsible for permitting septic tanks systems.

Water Authorities

Water Authorities provide water supply and sewerage services and may have other roles such as waterway management, drainage or floodway management provisions.

The retail water authorities within the Melbourne metropolitan area (City West Water, Yarra Valley Water and South East Water) are “licensed” to carry out their tasks under the *Water Industry Act 1994*. These authorities are government owned corporations. Water authorities outside the Melbourne area operate under the *Water Act 1989*.

Catchment Management Authorities

Victoria has a strong integrated catchment management system established under the *Catchment and Land Protection Act 1994* (the CaLP Act). Under the CaLP Act, Victoria is divided into ten catchment regions and a Catchment Management Authority is established for each region.

Catchment Management Authorities apply a whole of catchment approach to ensuring the protection and restoration of land and water resources, the sustainable development of natural resource based industries and the conservation of our natural and cultural heritage. Many CMAs are also waterway management authorities with responsibilities including the issuing of permits for works on waterways under the *Water Act 1989*.

Victorian Workcover Authority

The Victorian WorkCover Authority (VWA) is the manager of Victoria's workplace safety system. WorkSafe Victoria, the VWA's occupational health and safety arm, takes the lead role in the promotion and enforcement of health and safety in Victorian workplaces.

Broadly, the responsibilities of the organisation are to:

- help prevent workplace injuries; and
- enforce Victoria's occupational health and safety laws.

The VWA's statutory obligations are spelt out in the *Occupational Health & Safety Act 2004*.

Plumbing Industry Commission

The Plumbing Industry Commission enforces standards and regulatory requirements for all regulated plumbing work including plumbing for reuse.

6.3.3 Acts

The main Victorian Acts of Parliament that apply to industrial water are:

- Water Act 1989;
- Water Industry Act 1994;
- Building Act 1993;
- Occupational Health and Safety Act 2004; and
- Environment Protection Act 1970.

The critical aspects of these Acts of Parliament, as well as regulations and key State Environment Protection Policies that are relevant to industrial water, are described below.

Water Act 1989 and Water Industry Act 1994

The *Water Act 1989 (Water Act)* governs Water Authorities outside Metropolitan Melbourne and the *Water Industry Act 1994 (Water Industry Act)* governs them within Metropolitan Melbourne. Pricing for all water authorities is regulated by the Essential Services Commission (ESC) under the *Water Industry Act*.

Both the *Water Act* (Part 9) and the *Water Industry Act* (Division 3 of Part 3) provide for sewerage services and the regulation of “trade waste”, a term defined in the *Water Act* (but which applies in both Acts) as “any water borne waste other than sewage which is suitable...for discharge into thesewage system or any other matter declared by a bylaw to be trade waste.”

The *Water Act* provides for the making of bylaws by water authorities on trade waste whereas the *Water Industry Act* provides for the making of regulations in relation to trade waste.

The matters which may be dealt with pursuant to regulations or bylaws are comparable. They include:

- regulating or prohibiting the discharge of any trade waste into the sewers of a licensee/water authority;
- prescribing the terms and conditions to be included in agreements for the receipt and disposal of trade waste by a licensee/water authority, including the grounds on which a licensee/water authority may disconnect the service;
- prescribing any waste as trade waste for the purposes of this Act; and
- prescribing the information to be provided to a licensee/water authority by any person whose trade waste the licensee/water authority agrees to receive.

Water from a variety of sources can be treated by a water authority or licensee under the *Water Industry Act 1994* and supplied as Drinking Water. In this context, the provisions of the *Safe Drinking Water Act 2004* apply. It is also possible for a “water supplier” to be another party if declared to be a “water supplier” by the Regulations. Such circumstances are beyond the scope of this review.

Industrial water not treated and used must be discharged or disposed of appropriately; that is, in accordance with the trade waste bylaws, any trade waste agreement and the relevant statutory provisions.

There does not appear to be any role for the involvement of a water authority/licensee in the on-site use of industrial water. Additionally there does not appear to be a need for the consent of a water authority for the sale by an industrial proprietor of industrial water (whether treated, partially treated or otherwise) to a third party.

The exception is likely to occur if that water is used in a way that sees it interact with water in a waterway, groundwater or other water under the control of the relevant water authority/licensee. Similarly, if the use scheme requires works that interact with or affect water in a waterway, requires the drilling of a bore etc, the provisions of the *Water Act/Water Industry Act* will apply.

During the production of this technical report, a range of views was expressed about the ownership and sale of industrial water. Although this issue is beyond the scope of the current study, it will be considered by the relevant stakeholders, to ensure that it does not act as a barrier to the reuse of industrial water.

Building Act 1993

The *Building Act* 1993 provides the head of power for the *Plumbing Regulations* 1998. Division 8 of the Act states that regulations may be made with respect to prescribing standards, prescribing what constitutes specialised plumbing work, specifying classes of plumbing work, the qualifications or experience needed to be eligible to be licensed or registered as well as other matters.

The Act was amended in 2004 to establish a regulatory framework to protect the public from legionnaire's disease. The amendment required the registration of cooling tower systems, the development and implementation of risk management plans (and their audit) and made provision for compliance certificates issued for certain plumbing work. Importantly, it also provides for the regular testing of cooling tower systems against minimum standards prescribed by regulation.

In this context any proposed reuse of industrial water must comply with this framework.

Occupational Health and Safety Act 2004

The *Occupational and Health and Safety Act* 2004 applies in all workplaces across Victoria. The objects of the OH&S Act 2004 are to:

- secure the health, safety and welfare of employees and other persons at work;
- eliminate, at the source, risks to the health, safety or welfare of employees and other persons at work;
- ensure that the health and safety of members of the public is not placed at risk by the conduct of undertakings by employers and self-employed persons; and
- provide for the involvement of employees, employers, and organisations representing those persons, in the formulation and implementation of health, safety and welfare standards.

The Act requires employers to provide, as far as practicable, a working environment that is safe and without risk to health. Employers are responsible for eliminating or reducing those risks to health or safety so far as is reasonably practicable. Under the Act employers are required to be proactive, take all reasonably practicable measures to ensure health and safety at workplaces, and to exchange information and ideas about risks to health and safety and measures that can be taken to eliminate or reduce those risks.

Health Act 1958

The *Health Act* 1958 is the principal Act that provides the legislative framework to protect public health, it provides for both the Department of Human Services and Local Governments to undertake activities to prevent diseases, prolong life and promote public health.

This Act does not specifically refer to industrial water reuse.

However, where an industrial water scheme creates a nuisance (a condition that is dangerous to health or offensive, in that water sourced, treated or extracted is noxious or injurious to personal comfort) the *Health Act* requires the condition to be investigated by local government. Where the council is satisfied of the existence of a nuisance it can issue a "Notice to Abate" the nuisance and/or take action against the person responsible for a statutory offence under the Act.

Environment Protection Act 1970

The *Environment Protection Act 1970* (EP Act) provides a legislative framework for the protection of the environment in Victoria. The EP Act includes a range of provisions that bear on the management of industrial water. These provisions are in both the Act and the statutory policies that underpin the Act. These include state environment protection policies and waste management policies.

Under the EP Act discharges to the environment must be managed so that they do not adversely affect the receiving environment (for example, land, surface water or groundwater). The EP Act provides the basis for the licensing of sewage treatment plants (STPs). STP treatment capacity and discharge requirements have a direct relationship to trade waste controls.

Sections 39, 41 and 45 of the EP Act make it an offence to pollute water, air and land respectively. It is also an offence to cause an "environmental hazard" which is defined as a "state of danger to human beings or the environment, or otherwise resulting from the location, storage or handling of any substance having ... otherwise dangerous characteristics."

6.3.4 Regulations

Aspects of the *Building (Legionella Risk Management) 2001*, *Building (Cooling Tower Systems Register) Regulations 2001*, *Environment Protection (Scheduled Premises and Exemptions) Regulations 1996*, the *Prescribed Waste Regulations 1998*, and the *Plumbing Regulations 1998* that are relevant to industrial water are described below.

Building (Legionella Risk Management) Regulations 2001,

These regulations specify the matters to be included in risk management plans prepared in accordance with Part 5B of the *Building Act 1993*.

Building (Cooling Tower Systems Register) Regulations 2001

The *Building (Cooling Tower Systems Register) Regulations 2001* prescribe information which must accompany an application to register, or to renew the registration of, a cooling tower system under the *Building Act 1993*; to prescribe registration and renewal fees; to prescribe information which must be provided where there is an addition to, or removal, decommissioning or relocation of, a cooling tower system; and to prescribe information which must be included in the register of cooling tower systems.

Environment Protection (Scheduled Premises and Exemptions) Regulations 1996

The *Environment Protection (Scheduled Premises and Exemptions) Regulations 1996* outline the premises and activities that are scheduled and therefore require works approval and/or licensing under the *Environment Protection Act 1970*. The Regulations also provide for exemptions from these works approval and licensing provisions for certain, otherwise scheduled, activities and premises.

An industrial or commercial facility may, by virtue of the activity carried out by it, already satisfy the definition of “scheduled premises” and require a licence in relation to its discharge. That licence would impose requirements on the proprietor in relation to the treatment and disposal of waste including wastewater generated on the premises. If the discharge is to the sewer the premises would not require a licence. Similarly, where the discharge is reused in accordance with the requirements of EPA, the premises would not require a licence (as it would be exempt in accordance with regulations)

It should be noted that a licence may not cover all aspects, i.e. On-site recycling. Not all industrial premises are scheduled. As such, licensing cannot always be used as the means for facilitating industrial water reuse.

Environment Protection (Prescribed Waste) Regulations 1998

The *Environment Protection (Prescribed Waste) Regulations 1998* establish a system of controls over the management of wastes that require careful management and close regulation because of their potential adverse affect on the environment, human health and amenity.

Prescribed waste is a waste that is listed in Schedule 1 and any mixture containing a waste listed in Schedule 1 of the *Environment Protection (Prescribed Waste) Regulations 1998*.

Under these regulations, prescribed industrial waste (solid and liquid) is defined as an industrial waste that arises from an industrial, commercial or trade activity or from a laboratory; or that is potentially harmful to human beings or equipment and arises from a hospital; and is listed in Part B of Schedule 1. Therefore wastewater generated from industrial processes can be classified as a prescribed industrial waste.

These regulations establish detailed requirements for the transport of prescribed waste, including a tracking system and a permit system for vehicles transporting prescribed waste. The movement of industrial water that contains prescribed industrial waste off-site (other than via sewer) must comply with these requirements.

Further, the *Industrial Waste Management Policy (Movement of Controlled Waste Between States and Territories) 2001*, and the *National Environmental Protection Council (Victoria) Act 1995*, ensure consistency with controls in relation to the cross-border movement of controlled hazardous wastes.

Prescribed waste regulations provide a regulatory mechanism to facilitate off-site reuse of industrial water. Under Part 5- Exemptions, these regulations allow for beneficial use of industrial waste.

Some of the matters to be considered by the Authority when granting an exemption:

- any applicable waste minimisation plans or waste management plans;
- any applicable State environment protection policy or industrial waste management policy;
- the potential for diversion of the type of waste to a higher value use;
- any recognised specifications or standards for the prescribed industrial waste used for, or the product or material resulting from, the reuse or recycling of the waste or the recovery of energy from the waste; and
- commonly or best available technologies, methods or processes for reuse or recycling of the waste or recovery of energy from the waste.

In accordance with the current regulations, opportunities for exemptions for reuse and recycling appear to be limited to waste receivers, waste reusers, waste recyclers or recoverers of energy where waste has been transported off-site.

The *Environment Protection (Prescribed Waste) Regulations 1998* do not address the situation of on-site use of industrial water. If a premises or activity is scheduled under the *Environment Protection (Scheduled Premises and Exemptions) Regulations 1996*, exemptions for reuse (from works approval and licensing) may be granted under Table B-Exemptions.

In situations where the on-site use is permitted, EPA Victoria (2003) *Guidelines for Environmental Management: Use of Reclaimed Water (Publication No. 464.2)* could be applied for on-site use activities; however, this guidance is limited with regard to industrial water.

In accordance with Victorian legislative requirements these regulations are due to be reviewed by 2008.

Plumbing Regulations 1998

The main objectives of the *Plumbing Regulations 1998* are to specify classes of plumbing work for the purposes of the *Building Act 1993*; to specify the qualifications and experience that are necessary for a person to be eligible to be registered or licensed to carry out plumbing work; and to prescribe standards in relation to each class of plumbing work.

For industrial facilities that generate industrial water the main classes of plumbing work are:

- draining work;
- mechanical services work including the installation, alteration or repair, in relation to a cooling tower, of any water pipe, valve, pump, automated dosing device or automated bleeding device or any other mechanical component that affects the cooling tower's water treatment, flow rate of water for cooling or waste water disposal;
- roofing (stormwater) work;
- water supply work including the installation, alteration or repair of any pipe, fitting, fixture, appliance or other item that is directly or indirectly involved in the supply of potable water and fire sprinkle system;

- backflow prevention work includes the inspection, maintenance, commissioning, testing, alteration or repair of a registered or testable backflow prevention device.

All of the above work must be undertaken by persons with appropriate qualifications and training to undertake the particular class of work. The licensing and registration requirements for each class of work are defined in the regulations.

6.3.5 State Policies

State Environment Protection Policies

The *Environment Protection Act 1970* provides for the formulation and adoption of State environment protection policies (SEPPs). SEPPs identify beneficial uses of the environment to be protected, environmental objectives appropriate to those uses, and plans and programs for the attainment of those objectives. The SEPPs provide ambient environmental quality objectives and attainment programs for achieving them. Compliance with the relevant policies must be attained for all activities that involve recycled water treatment and use.

The *SEPP (Waters of Victoria)* and its schedules provides a framework for State and local government agencies, businesses and communities to work together to protect and rehabilitate Victoria's surface water environments. It supports Victoria's catchment and coastal management processes and associated community decision making. The purpose of the SEPP is to help achieve sustainable surface waters by:

- setting the environmental values and beneficial uses of waters and the environmental quality to protect them; and
- within a 10-year timeframe setting goals for protection agencies, businesses and communities, and means by which they can be met.

In particular, the *SEPP (Waters of Victoria)* imposes standards and requirements for EPA in relation to the licensing of wastewater discharges to surface waters. It requires generators of wastewater to prioritise the avoidance of generation of wastewater and, where avoidance isn't possible, to reuse and recycle wastewater in accordance with the waste hierarchy.

Clause 31 states that wastewater may be discharged to surface waters to provide water for the environment only if EPA "is satisfied that the wastewater can be treated and managed to a level that will protect beneficial uses".

The *SEPP (Waters of Victoria)* also has a requirement for water businesses to implement programs that progressively reduce the size of sewage treatment plant discharge mixing zones. Increased reuse of industrial water and improvements in the quality of discharges to sewers will be critical to achieving this requirement.

Industrial Waste Management Policy (Prescribed Industrial Waste) 2000

The objectives of the *Industrial Waste Management Policy (Prescribed Industrial Waste) 2000*, the IWMP, are to protect human health, amenity and the environment from hazards that may be posed by prescribed industrial waste (PIW) and to minimise the generation of PIW, and to eliminate as soon as practical the disposal of PIW to landfill. The IWMP has an equal status to SEPPs under the EP Act.

The IWMP is the key piece of legislation that manages industrial waste and although it mainly addresses solid waste it provides a framework or model for managing industrial water. The IWMP establishes a framework for classifying particular types of PIW and regulating their management.

Key principles of the IWMP include adherence to the waste management hierarchy, eco-efficiency, and product stewardship. The IWMP allows the EPA to establish waste reduction targets for avoidance, reuse and recycling of and/or recovery of energy from PIW.

Schedule 2 of the IWMP describes the PIW decision framework. This is consistent with the waste management hierarchy and only allows for the discharge of liquid PIW to the sewer in accordance with a business's trade waste agreement if opportunities for reuse and recycling are not available.

The IWMP definitions of recycling and reuse of PIW appear to be limited to use as an input to the manufacturing of a product and hence do not specifically identify non-industrial reuses.

6.3.6 Codes, Standards and Guidelines

Safe Handling of Industrial Waste, A Practical Guide for Workplaces 2003

The advice in this *Safe Handling of Industrial Waste* guide, produced by the WorkSafe Victoria aims to simplify actions that employers can take to meet some of their legal requirements in providing a safe working environment. It has been developed for organisations that deal with waste at their own workplace and at sites undertaking downstream processes.

This document is applicable for both the OHS management of hazardous wastes, and is also relevant to those wastewaters classified by the EPA as prescribed wastes.

Environmental Guidelines for Industry

The EPA has a responsibility to ensure that the environment is protected both now and for future generations. To this end, EPA has produced environmental guidelines for specific industries.

These include the following publications:

- Publication 570: Environmental guidelines for the dairy processing industry;
- Publication 607: Environmental guidelines for the fired clay building products industry;
- Publication 621: Environmental guidelines for the textile dyeing and finishing industry;
- Publication 628: Environmental guidelines for the concrete batching industry;
- Publication 480: Environmental guidelines for major construction sites;
- Publication 508: Environmental guidelines for composting and other organic recycling facilities; and

- Publication 722: Environmental guidelines for reducing greenhouse gas emissions from landfills and wastewater treatment facilities.

These guidelines focus on best practice environment management; a means of managing an organisation or activity to achieve a high level of environmental performance which is sustainable, continuously improves and is consistent with business or economic objectives.

The BPEM publication series comprises guidelines and codes of practice for industry sectors or activities, which outline what is needed to achieve optimum environmental outcomes, consistent with the industry's economic viability.

These guidelines do not focus on regulatory compliance, but emphasise how efficient resource usage results in increased productivity as well as reduced environmental impact.

These guidelines refer to the *Industrial Waste Management Policy (Waste Minimisation) 1990* which requires premises which are subject to works approval to have waste management plans incorporating waste minimisation. Typical waste reduction measures quoted included:

- reducing use of water;
- reducing use of chemicals or substitution of mineral salts;
- recycling water and chemicals;
- recovery and reuse of product from first reuse;
- reuse/reprocessing of off-spec material; and
- recovering and reusing spilled raw materials and products.

Guidelines for Environmental Management: Use of Reclaimed Water (Publication No. 464.2) 2003

The overall objective of the *Guidelines for Environmental Management: Use of Reclaimed Water 2003* is to maximise the reuse of reclaimed water through minimising and managing risks associated with its use. These guidelines primarily relate to the reuse of treated effluent from sewage treatment plants. Section 6.6 outlines potential options for the reuse of reclaimed water from industry sectors and potential quality concerns for industrial reuse. Although this guideline applies to the use of industrial water, it does not provide specific water quality objectives in relation to industrial water use.

Compliance with this guideline forms the basis for exemption under the Environment Protection (Scheduled Premises and Exemptions) Regulations 1996. That is, an occupier of land that applies recycled water on that land would ordinarily require a works approval and licensing but compliance with the Guidelines exempts that occupier from that obligation. However, while the guideline define "reclaimed water" as "water that has been derived from sewerage systems or industry processes and treated to a standard that is appropriate for its intended use", section 1.2 of the guideline restrict the scope of the document to "the use of reclaimed water from sewerage treatment plants".

While the principles established by the guideline are applicable to industrial water, it is likely that the specific trigger points and much of the detail are not appropriate to industrial water. For example, Table 1 establishes classes of reclaimed water by reference to E.coli levels which are generally not relevant to industrial water.

6.4 Australian Regulatory Frameworks

A review of the Commonwealth, NSW, and Queensland legislation and guidelines that are relevant to the reuse of industrial water has been undertaken with the primary aim of identifying possible controls, either required through legislation or recommended through guidelines and codes that may be relevant to Victorian.

6.4.1 Commonwealth

Acts and Regulations

The Commonwealth is involved in water management in Australia through the *National Environmental Protection Council Act 1994*, and the *Environment Protection and Biodiversity Conservation Act 1999*. Constitutional responsibility for water rests with the States and Territories (Australian Academy of Technological Sciences and Engineering 2004). There are however, several international treaties such as the 1971 Ramsar Convention that provide cause for federal intervention for water related issues.

Codes, Standards and Guidelines

The National Water Quality Management Strategy

The *National Water Quality Management Strategy* (NWQMS) aims to develop national policies, principles and guidelines to facilitate further development and alignment of State and Territory guidelines by providing a series of national guidelines for water quality management. The NWQMS documents were prepared by ARMCANZ, ANZECC, and the NHMRC. The guidelines address the management of environmental risk.

The strategy provides guidance on water quality management for a range of uses including industry.

The NWQMS series of guideline documents include:

- Guidelines for Sewerage Systems - Effluent Management (1997);
- Guidelines for Sewerage Systems - Use of Reclaimed Water (1999);
- Guidelines for Sewerage Systems - Acceptance of Trade Waste (Industrial Waste) (1994);
- Australian Drinking Water Guidelines (2004); and

The *Guidelines for Sewerage Systems - Acceptance of Trade Waste (Industrial Waste)* (1994) is relevant to industrial water. This guideline advises on the potential effects of various contaminants discharged to sewer, and the approaches that water authorities can take in managing these impacts.

Draft National Guidelines for Water Recycling Managing Health and Environmental Risks, Natural Resource Management Ministerial Council, Environment Protection and Heritage Council, 2005.

These guidelines provide a generic risk-assessment framework for managing the health and environmental risks that is applicable to all types of water recycling. It also provides specific guidelines for the uses of recycled water initially identified as a priority. These uses are: large-scale treated sewage and grey water to be used for residential garden watering, car washing, toilet flushing and clothes washing, irrigation for urban recreational and open space; agriculture and horticulture, fire protection and fire fighting systems, industrial uses, including cooling water, grey water treated on-site for use for residential garden watering, car washing, toilet, flushing and clothes washing.

These guidelines do not deal specifically with industrial water use. However, the generic approach may be used to determine and manage the human health and environmental risks associated with water from any source.

Industry Guidelines

Various peak national industry associations and regulatory authorities provide guidance on water quality such as the Australian Quarantine and Inspection Service (AQIS), the Dairy Industry Authority of Australia (DIAA) and the Metal Trades and Industries Association (MTIA), amongst others.

In general, the export food and beverage, dairy, white and red meat industries have water quality control requirements which must be observed when considering the use of industrial water. This is predominantly a health risk management issue.

6.4.2 New South Wales

The key Acts and Regulations that control the reuse of industrial water in NSW are:

- Local Government Act 1993;
- Protection of the Environment Operations Act 1997;
- Public Health Act 1991;
- Sydney Water Act 1994; and
- Environment Planning and Assessment Regulation 2000.

Local Government Act 1993

Before a recycled water system can be installed and operated approval is required under Section 68 of the *Local Government Act* 1993. This section of the Act requires Council approval for any water supply, sewerage and stormwater drainage work.

The regulations of the Act reference the *NSW Code of Practice Plumbing and Drainage* 1999. This code provides the regulatory requirements for work carried out at a range of facilities including recycled water treatment systems.

Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations (POEO) Act 1997* states that it is an offence to pollute waters, or permit waters to be polluted. The occupier of a property is guilty of a pollution offence if any part of the pollution is caused by a failure to operate and maintain a recycled water system in a proper and efficient manner.

The Act also establishes a system of environment protection licences to minimise and control the impact of activities on the surrounding environment. Under the Act, the NSW EPA is the relevant authority for an activity whenever:

- the activity is listed on Schedule 1 of the POEO Act;
- a licence to control water pollution from the activity has been granted, or
- a public authority is carrying out the activity or is occupying the premises where the activity occurs.

Licences can deal with the impact of an activity on any environmental media in both the construction and operating phases. This means the potential impacts of an activity on air quality (including odour), water quality, noise pollution and/or the waste stream can all be dealt with in the one licence. The licence is ongoing, but will be reviewed at least once every three years. There is no longer a need to obtain separate EPA approvals and licences. A single licence can cover both the construction phase (scheduled development work) and the operation phase for a scheduled activity.

Public Health Act 1991

Under the Public Health Act 1991 the Minister for Health has powers to issue orders and direct public authorities to take action to prevent public health risks. NSW Health plays a key role in setting quality criteria for recycled water.

Sydney Water Act 1994

The *Sydney Water Act 1994* requires Sydney Water to:

- protect public health;
- protect the environment; and
- be a successful business.

Sydney Water has a licence granted under the Act to operate water, sewerage and some stormwater drainage systems in the Sydney, Illawarra and Blue Mountains areas.

It is an offence under Section 49 of the *Sydney Water Act 1994* to discharge any substance into a work owned by Sydney Water without the written agreement of Sydney Water. Sydney Water accepts trade wastewater into the sewer in line with these objectives, subject to the conditions of a written agreement.

Environment Planning and Assessment Regulation 2000

The *Environment Planning and Assessment Regulation 2000* is being revised to include a provision for recycled water.

Trade Waste Regulations

As in Victoria, industries that discharge trade wastewater must have a permit with the water authority authorising the discharge to sewer. Industrial customers must comply with standards which in metropolitan Sydney generally involve some of pretreatment. The permit to discharge trade wastewater must be issued prior to any installation of pre-treatment equipment and prior to any discharge of trade wastewater to the sewer.

Trade waste agreements between Sydney Water and its industrial and commercial customers may also specify such things as:

- the type of pre-treatment required;
- how often the system needs to be serviced;
- the substances that are allowed to be discharged; and
- the amount of wastewater to be discharged.

Sydney Water's trade waste policy focuses on working with customers to encourage waste minimisation at the source through minimising water use, increasing water reuse, and using best available technology and cleaner production methods.

Draft Management of Private Decentralised Recycled Water Systems Regulatory Framework 2006

The NSW Department of Energy, Utilities and Sustainability released the *Management of Private Decentralised Recycled Water Systems Regulatory Framework – Draft for Consultation* in March 2006. Recycled water is defined as water taken from a waste stream and treated to a level that is suitable for non-potable end uses.

Private decentralised recycled water systems are defined as schemes incorporating a single or small number of users. Potential water sources include industrial wastewater. End uses include multi-unit residential properties, urban irrigation and industrial applications

For these systems local government is the approval authority under Section 68 of the Local Government Act. Approval is required to install and operate. For approval to install the proponent is required to prepare a draft system management plan that includes system design, treatment system design, and risk assessment. Approval to operate is based upon treatment system validation, commissioning testing and finalisation of the system management plan. Annual auditing conducted by a third party auditor is required for ongoing operation.

Guidelines for Urban and Residential Use of Reclaimed Water 1993

The *Guidelines for Urban and Residential Use of Reclaimed Water* 1993 was produced by the NSW Recycled Water Coordination Committee. These guidelines were developed for the application of recycled water under the control of water authority for either single household systems or larger centralised dual reticulation systems.

Environmental Guidelines: Use of Effluent by Irrigation 2004

The *Environmental Guidelines: Use of Effluent by Irrigation 2004* prepared by the Department of Environment and Conservation provides a broad framework, principles and objectives that should be considered when establishing a system for the agricultural irrigation of recycled water. Although these guidelines focus on the use of recycled water for irrigation, the guidelines reference the *Protection of the Environment Operations Act 1997* as it relates to industrial water.

6.4.3 Queensland

This section of the report provides an overview of the existing regulatory framework in Queensland for industrial water use. The key acts and regulations that control the use of industrial water in Queensland are:

- Environmental Protection Act 1994;
- Environmental Protection Regulation 1998;
- Environmental Protection (Waste Management) Regulations 2000;
- Integrated Planning Act 1997;
- Water Act 2000;
- Health Act 1937;
- Local Government Act 1993;
- Sewerage and Water Supply Act 1949; and
- Environmental Protection (Water) Policy 1997

The *Legislative Environment Water Recycling Background Study*, prepared by the Queensland Environmental Law Association (QELA 2000) provides information on several of these acts and regulations.

Environment Protection Act 1994

The object of the *Environment Protection Act 1994* is to protect Queensland's environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends (ecologically sustainable development).

Under the Act activities can be prescribed as environmentally relevant activities (ERA) which require licensing. These activities are listed in Schedule 1 of the Environmental Protection Regulation 1998. While sewage treatment is an ERA, industrial water is not unless the industrial facility is an ERA.

The Act provides for environmental approvals for environmentally relevant activities which require developmental approval under the *Integrated Planning Act 1997* and those that do not.

The Minister may make environmental protection policies such as *Environment Protection Policy (Water)* 1997 to enhance or protect Queensland's environment.

Typically an EIS is required under the Act for projects that involve activities prescribed as environmentally relevant activities.

Environmental Protection (Waste Management) Regulation 2000

The *Environmental Protection (Waste Management) Regulation 2000* identifies trackable waste in Schedule 1. These include many liquid wastes sourced from industrial facilities.

These regulations establish detailed requirements for the transport of trackable waste, including a tracking system and a permit system for transporting vehicles. The movement of industrial water that contains prescribed industrial waste off-site (other than via a sewer) must comply with these requirements.

The administering authority may grant the application if it is satisfied the waste does not show any environmentally significant characteristics.

The regulations do not appear to provide a regulatory mechanism to facilitate industrial water use.

Integrated Planning Act 1997

The *Integrated Planning Act 1997* is the principal legislation in Queensland regulating development and the effects of development. The Act is of considerable relevance to the regulation of industrial water as recycled water may be used as part of an assessable development.

Water Act 2000

The *Water Act 2000* is administered by the Department of Natural Resources, Mines and Water. It governs the water supply and sewerage activities of local government in urban areas.

The *Water Act 2000* makes provision for sewerage services and the regulation of “trade waste” under Chapter 3 Part 5 of the Act. It states that a local government that is a sewerage service provider may approve a trade waste discharge into its sewerage infrastructure.

Approval can only be given if local government is satisfied that:

- the discharge will not harm the sewerage system or the health and safety of anyone working on the sewerage system; and
- the sewage treatment plant to treat the waste is capable of treating the waste to an acceptable standard; and
- if the local government has an environmental plan about trade waste management, as defined under the *Environmental Protection (Water Policy) 1997*, the proposed discharge into the sewerage is consistent with the plan.

Under the trade waste section of the Act local government, as the water utility, must consider the effect of the proposed discharge on any existing or potential reuse of waste water or sludge. It is however unclear as to whether it has the power to consider on-site use of industrial water.

Additionally there does not appear to be a need for the consent of a local government for the sale by an industrial proprietor of industrial water (whether treated, partially treated or otherwise) to a third party.

Health Act 1937

The *Health Act 1937* provides the legislative framework to protect public health. It makes provision for local government to undertake activities to prevent diseases, prolong life and promote public health. This includes serving notices requiring the owner or occupier to take action within a specified time frame, and undertaking works as necessary.

Local government has the power to institute proceedings when a nuisance arises by the pollution of any watercourse, stream or canal within or passing through its area, or passing along the boundaries whether such pollution arises within or without the area of such first mentioned local government and may take such steps as are deemed necessary to abate such nuisance, and may recover the expenses incurred in so doing from the local government or person by whose act or omission such nuisance has been occasioned.

This Act does not specifically refer to industrial water use. However, where an industrial water scheme creates a nuisance the Act requires the condition to be investigated by local government.

Environment Protection Policy (Water) 1997

The *Environment Protection Policy (Water) 1997* requires that an administering authority consider a four-step waste hierarchy about an activity that may affect water. The most preferred option is (1) prevention, followed by (2) treatment and recycling; (3) treatment and disposal to land, sewer or surface water; and (4) treatment and disposal to groundwater.

Section 16 of the policy requires Councils to consider the water quality objectives for waters affected by wastewater recycling and the maintenance of acceptable health risks when making an environmental management decision about an activity involving waste water recycling.

Local Government Act 1993

The *Local Government Act 1993* enables local governments to make local laws to control the public health and environmental risks associated with the use of recycled water and thereby address identified areas of scientific concern. The *Local Government Act 1993* also allows for the Minister to make a model local law dealing with recycled water for adoption by local government.

At present there are no model local laws dealing with recycled water. However, in considering the effectiveness of promoting model local laws as a regulatory tool it should be noted that it is not mandatory for local governments to adopt model local laws and as such there is potential for inconsistency in regulatory regimes between local government areas.

Building Act 1975

Plumbing and drainage related to industrial facilities is regulated through the *Building Act 1975*.

Workplace Health and Safety Act 1995

The *Workplace Health and Safety Act 1995* is relevant to industrial water use to the extent that it seeks to protect human health. The *Workplace Health and Safety Act 1995* is, however, specifically concerned with the possible health impacts of recycled water in the workplace. Obligations are imposed on employers and those in control of a workplace to minimise the risk of injury or illness from any plant or substance. An industry code of practice, ministerial notice or regulation is provided for as a means of managing exposure to, or protection against, such a risk.

Queensland Water Supply Recycling Strategy

The *Queensland Water Recycling Strategy (QWRS)* provides an overarching framework for sustainable water recycling. Its aim is to encourage and support the use of water recycling (including industrial water use) that is safe, environmentally sustainable and cost effective.

The QWRS addresses industrial water as well as municipal effluent, agricultural effluent, greywater in unsewered and sewerred areas, blackwater in unsewered areas, urban stormwater; and rainwater.

The strategy advises that industry can recycle its own wastewater (on-site recycling) or use recycled water from sewage treatment plants or other industries (off-site recycling). It does not appear to consider other potential uses of industrial water.

The QWRS allows for industries to develop their own guidelines for recycling water. The Queensland Government will encourage the development of such industry guidelines and may provide input into them.

6.5 Overseas Regulatory Frameworks

A review of the United Kingdom (UK) and Californian USA legislation and guidelines that are relevant to industrial water use has been undertaken with the primary aim of identifying possible controls that may be relevant to Victoria.

6.5.1 United Kingdom

The UK is divided into three separate countries (England, Scotland and Wales) and a province (Northern Ireland). Legislation is often drafted so that it is applicable on only one or two of these areas – usually England and Wales (together), Scotland (independently and Northern Ireland (independently).

The respective responsibilities for regulation of water pricing, environmental health and drinking water in these United Kingdom jurisdictions are presented in Table 6-1.

Table 6-1: Key Responsibilities for Water Use in the UK

Parameter	England and Wales	Scotland	Ireland
Economic	OFWAT and the Consumer Council for Water	Water Industry Commission for Scotland	Northern Ireland Water Service
Environmental	Environment Agency	Scottish Environment Protection Agency	Northern Ireland Environment and Heritage Service
Drinking Water Quality	(Independent) Drinking Water Inspectorate or Local Authority	Scottish Executive	Northern Ireland Water Service

The following UK legislation has a bearing upon how water is used and reused in industrial and urban applications across the UK. Each Act is a separate piece of legislation which may add to and overwrite previous acts. A later piece of legislation will make specific reference to sections of earlier ones which it overwrites.

The Water Act 1945, 1973, and 1989

The *Water Act 1945* brought together previous diverse legislation, introduced a waterworks code of practice and the amalgamation of the many water companies and water boards. The *Water Act 1970* formed the water authorities (arranged according to river catchments) which were then privatised under the *Water Act 1989*. The authorities are responsible for water conservation, controlling water pollution and the supply of water and sewerage services amongst other things

The Control of Pollution Act (COPA) 1974

This legislation made the water authorities responsible for issuing consent limits for off-site effluent discharge.

The Environmental Protection Act 1990

The *Environmental Protection Act 1990* introduced Integrated Pollution Control (IPC). IPC addresses the management of discharges to air, land and water in an integrated manner.

Part I of the Act and the Industrial Pollution Control (Northern Ireland) Order 1997 established a UK wide pollution control system for industry under which any person carrying out a prescribed process must obtain an authorisation from the environmental regulator. The holders of authorisations must comply with conditions set by the environmental regulator.

Water Resources Act 1991

This Act governs discharges to surface water for those processes and sites which are not prescribed under the *Environmental Protection Act 1990*.

Private Water Supply Regulations 1991

Local authority environmental health officers have a duty under the *Private Water Supplies Regulations* 1991 to monitor private supplies, most commonly borehole supplies in the industrial context. They are concerned with the quality of water supplied from private supplies in England and Wales for drinking, washing or cooking or for food production purposes. Similar regulations apply in Scotland and Northern Ireland.

Notification of Cooling Tower and Evaporative Condenser Regulations 1992

These regulations state that cooling tower and evaporative condenser installations must be notified to the local authority or the Health and Safety Executive (HSE) for risk assessment in accordance with the HSE Approved Code of Practice to prevent or control legionellosis (including legionnaires' disease) (L8).

The Environment Act 1995

The *Environment Act* 1995 allocates responsibility to the Environment Agency for Her Majesty's Inspectorate of Pollution, the National Rivers Authority and the waste disposal authorities.

Groundwater Regulations 1998

These regulations implement the European Union Groundwater Directive, and identify two groups of substances, List I and List II. The authorisation system, under these regulations makes it the duty of the Environment Agency to control disposals and tipping, such as to prevent List I substances from entering groundwater, and to reduce the pollution of groundwater by List II substances.

The Water Supply (Water Fittings) Regulations 1999

This legislation specifies technologies, procedures and methodologies which must be adhered to when a user is connected to a town mains water supply. The primary objective is to protect that supply from contamination. It specifies end user requirements for installing or modifying a facility.

The Water Supply (Water Quality) Regulations 2000

Administered by the Drinking Water Inspectorate and implemented by the local water authorities the *Water Supply (Water Quality) Regulations* 2000 governs the control and monitoring of drinking water throughout England and Wales.

The regulations define 'wholesomeness' in water supplied to 'premises in which food is produced' and for domestic purposes.

This definition specifies levels of micro-organisms and substances 'which could constitute a potential danger to human health' and gives the detail on how to sample and check for these, where to do it and the permitted levels.

Pollution Prevention and Control (England and Wales) Regulations 2000, (Scotland 2000), (Northern Ireland 2003)

The *Pollution Prevention and Control (PPC) Regulations* build on and are replacing the Integrated Pollution and Control (IPC) regime mentioned above. PPC requires that any person operating an installation (as defined in the regulations) must obtain a permit from the environmental regulator and comply with the conditions in that permit.

PPC Part A addresses energy efficiency, waste minimisation, vibration and noise as well as air, land, and water.

The regulations require an effective system of management to be implemented to ensure that all appropriate pollution prevention and control measures are taken. Special emphasis is placed on the application of Best Available Techniques (BAT) to reduce the environmental impact of the process. These BAT are regularly updated and revised as developments occur hence they provide a useful database for any site considering new plant installations which are designed to minimise their environmental impact.

This BAT approach includes 'benchmarking' for knowledge (i.e. sites have to show knowledge of the amounts of water similar sites may use), provision of water mass balances, efficient water use etc.

The regulators are issuing permits at present and the operators are addressing the conditions and improvements which these permits specify

Because of the regional differences the *IPPC - A Practical Guide* has been developed to provide an overview of the respective IPPC regulatory regimes.

The Cryptosporidium (New Water and Sewerage Authorities) Direction 2000

The Cryptosporidium (New Water and Sewerage Authorities) Direction 2000 is applicable to Scotland only and revised in 2003 to take into account regional amalgamations.

Where Cryptosporidium is a particular risk (areas where faecal contamination from herd animals may contaminate run off water) this direction specifies actions to be taken by water authorities on completion of a risk assessment.

6.5.2 California

In California, industrial uses account for approximately five percent of the recycled water use. For many industries, cooling water for commercial air conditioning systems comprises the largest use of recycled water. Power plants (including geothermal energy) and refineries also use substantial amounts of recycled water for cooling water purposes.

Regulations

Regulation of water recycling is vested by State law in the State Water Resources Control Board (SWRCB) and the Department of Health Services (DHS).

California law consists of 29 codes of regulation covering various subject areas which have been formally adopted by state agencies. The California DHS, which is responsible for regulating recycled water uses including for industry, has established water quality standards and treatment reliability criteria for recycled water under Title 22 of the code.

Permits are issued to water recycling projects by one of the nine Regional Water Quality Control Boards (RWQCB) that are part of the SWRCB.

Permits

Permits to use recycled water include water quality and public health criteria established by DHS under Title 22 of the code. The RWQCBs enforce these permits.

To protect public drinking water supplies, DHS also has regulations to prevent cross connections between recycled water systems and potable water systems. Local health departments and DHS have enforcement authority to administer the cross connection prevention regulations.

The Water Recycling Act 2005

The *Water Recycling Act 2005* clarifies the state's authority to protect human health through permitting of recycled water projects, creates incentives and removes barriers to permitted uses, and directs the SWRCB to adopt a statewide permitting system for water recycling.

6.6 Summary of Other Regulatory Frameworks

The key elements of the national, NSW, Queensland and overseas regulatory frameworks that are of interest in informing the recommended approach (Section 7) and recommendations for an enhanced public health and environmental regulatory framework for the industrial water use (Section 10) are presented below.

The review of other frameworks has not identified any regulations within these jurisdictions that preclude industrial water use from a public health or environmental risk perspective.

6.6.1 National

The NWQMS 1994 *Guidelines for Sewerage Systems - Acceptance of Trade Waste (Industrial Waste)* provide information on the potential effects of various industrial water contaminants discharged to sewer.

The 2005 *Draft National Guidelines for Water Recycling Managing Health and Environmental Risks* provide a generic risk-assessment framework for managing the health and environmental risks that is applicable to all types of water recycling. While the guidelines do not deal specifically with recycling of water from industrial sources the generic risk-assessment framework may be applied to industrial water.

The Australian Quarantine and Inspection Service provides guidance on water quality control requirements which must be observed when considering the use of industrial water in export food and beverage, dairy, white and red meat industries.

6.6.2 New South Wales

The *Protection of the Environment Operations Act 1997* licensing requirements for scheduled premises generally reflect the Victorian *EP Act 1970* requirements. Licences can deal with the impact of an activity on any environmental media in both the construction and operating phases.

Under the *Public Health Act* 1991 NSW Health plays a key role in setting quality criteria for recycled water.

The *Environment Planning and Assessment Regulation* 2000 is currently being revised to include a provision for recycled water. It is not clear as to whether the provision will include industrial water specific regulations.

It is noteworthy that Sydney Water's trade waste policy includes a focus on increasing water reuse by industry through the use of best available technology and cleaner production methods.

The *Guidelines for Urban and Residential Use of Reclaimed Water* 1993 are not directly relevant to industrial water as they apply to the use of recycled water under the control of a water authority for either single household systems or larger centralised dual reticulation systems.

The *Environmental Guidelines, Use of Effluent by Irrigation* 2003 provides a broad framework, principles and objectives for the agricultural irrigation of recycled water (including industrial water).

6.6.3 Queensland

The *Environment Protection Act* 1994 licensing requirements for scheduled premises generally reflects the Victorian *Environment Protection Act* 1970 requirements. Under the Act activities can be prescribed as environmentally relevant activities (ERA) which require licensing. The use of industrial water is not a prescribed activity unless the industrial facility is an ERA.

The *Environmental Protection (Waste Management) Regulation* 2000 identifies trackable waste in Schedule 1. These include many liquid wastes sourced from industrial facilities. The movement of industrial water that contains prescribed industrial waste off-site (other than via a sewer) must comply with these requirements.

Under the *Integrated Planning Act* 1997 industrial water, as recycled water, may be a trigger for consideration as an assessable development.

Under the trade waste section of the *Water Act* 2000 local government, as the water utility, must consider the effect of the proposed discharge to sewer on any existing or potential reuse of waste water or sludge. It is however unclear as to whether it has the power to consider on-site use of industrial water.

The *Water Act* 2000 does not appear to require local government consent for the sale of industrial water (whether treated, partially treated or otherwise) by an industrial proprietor to a third party.

As in Victoria and NSW the *Health Act* 1937 does not specifically refer to industrial water use. However, where an industrial water scheme creates a nuisance the Health Act requires the condition to be investigated by local government.

The *Environment Protection Policy (Water)* 1997 requires Councils to consider the water quality objectives for waters affected by wastewater recycling and the maintenance of acceptable health risks when making an environmental management decision about an activity involving wastewater recycling. These requirements apply to industrial water.

The *Local Government Act 1993* enables local governments to make local laws to control the public health and environmental risks associated with the use of all types of recycled water.

The *Queensland Water Recycling Strategy* provides an overarching framework for sustainable water recycling. The strategy advises that industry can use their own industrial water or industrial water from other premises. The strategy allows for industries to develop their own guidelines for recycling water.

6.6.4 United Kingdom

Within the United Kingdom there is no 'all encompassing' regulatory framework and no specific reference to industrial water use. Potential suppliers and users of industrial water must assess whether the water is fit for purpose and comply with relevant legislation such as the *Water Supply (Water Quality) Regulations 2000*.

Cryptosporidium, drinking water quality and Legionella in cooling towers are legislated by specific acts of parliament and often vary according to the perceived (or real) risk pertinent to a country or the province.

The *Pollution Prevention and Control Regulations (IPPC)* have established a workable process to ensure industry owners/occupiers are responsible for their environmental footprint. The regulations are moving towards an integrated approach to the use of alternative water supplies. The regulations apply the same principles across the UK with administration occurring locally. IPPC has brought industry into close contact with agencies that have skills to help them to minimise their environmental impact.

6.6.5 California

The Californian *Water Recycling Act 2005* clarifies the state's authority to protect human health through permitting of recycled water projects, creates incentives and removes barriers to permitted uses, and directs the SWRCB to adopt a statewide permitting system for water recycling. Water recycling appears to allow for the inclusion of the use of industrial water.

Regulation of water recycling is vested by State law in the State Water Resources Control Board (SWRCB) and the Department of Health Services (DHS). In California water quality standards and treatment reliability criteria for recycled water have been established.

Regional Water Quality Control Boards, that are part of the SWRCB, issue and enforce permits for all water recycling projects.

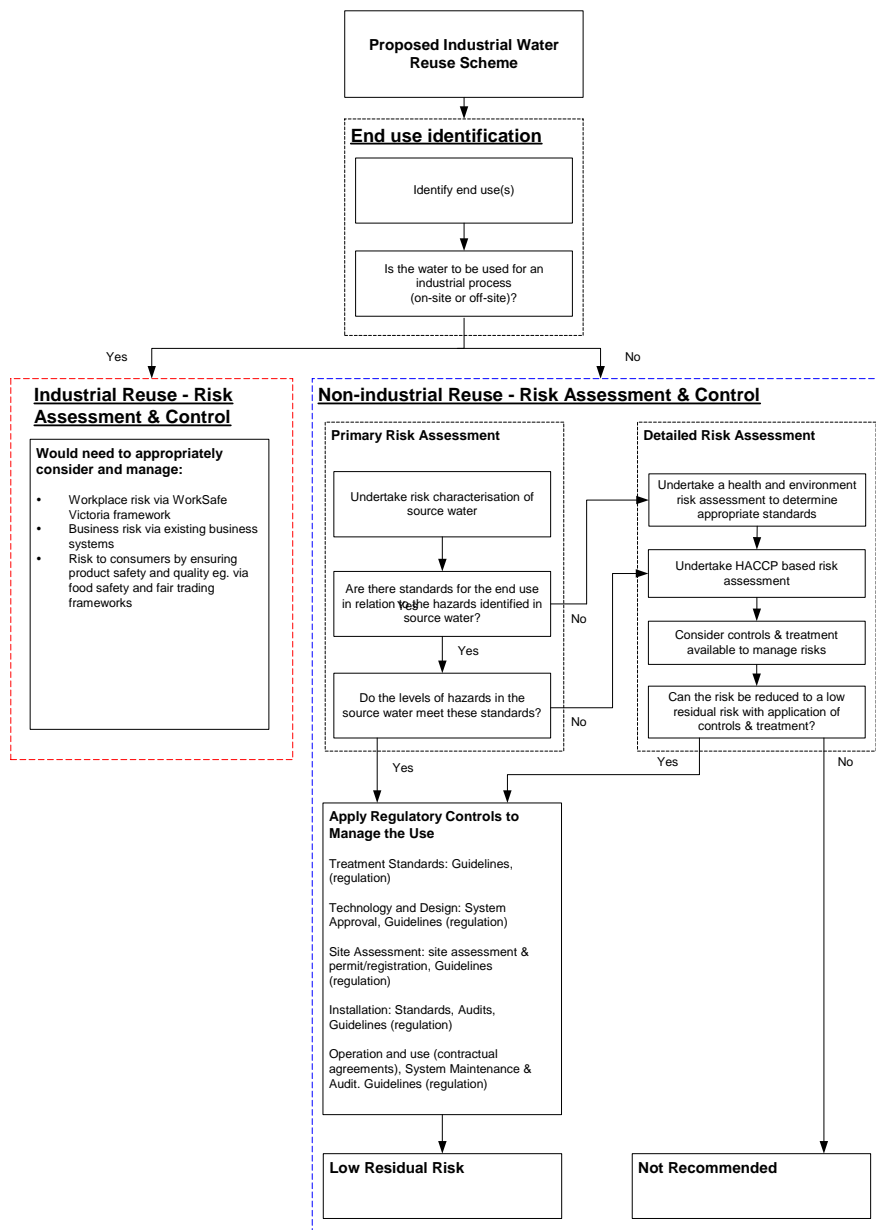
DHS regulates to prevent cross connections between recycled water and potable water systems. Local health departments and DHS administer these regulations.

7 Recommended Approach

As identified in Section 5, the hazards in industrial water vary depending on a range of inputs, and for this reason a generic risk assessment is not deemed to be practical. It is therefore recommended that a case-by-case assessment be undertaken for each proposal to reuse industrial water.

The recommended approach to manage human health and environmental risk in relation to industrial water reuse schemes is shown in Figure 7-1.

Figure 7-1: The process for assessing industrial water reuse schemes



The recommended steps for assessing individual industrial water reuse schemes are:

End-use Identification Phase

End-use identification is needed to determine the nature of human health and environmental exposures.

If the end use is exclusively for an industrial process (either on the site where the industrial water is sourced or off-site at another industrial premises) the **Industrial Reuse - Risk Assessment and Control Phase** applies.

If the end use is a non-industrial use (either on the site where the industrial water is sourced or off-site) the **Non-industrial Reuse - Risk Assessment and Control Phase** applies.

Industrial Reuse - Risk Assessment and Control Phase

Where the end use is exclusively for an industrial process (either on the site where the industrial water was sourced or off-site at another industrial premises), the proposed framework will not seek to regulate the reuse. It is proposed that the risks involved need to be appropriately considered and managed via the controls available under the relevant frameworks as indicated:

Workplace Risk: If the water is used for an industrial process, primary exposure is to employees and visitors to the workplace, and therefore, the reuse presents a workplace risk. This risk is proposed to be managed by WorkSafe Victoria's current occupational health and safety framework;

Business Risk: The suitability of the water for the industrial process is a business risk and should be managed via existing business risk management systems; and

Risks to Consumers: Specific regulatory frameworks control risks to consumers in relation to product safety and quality, for example, food safety is regulated by the *Food Act* 1984, and the *Fair Trading Act* 1999 provides a framework for the safety of goods that are intended to be used, or are of a kind ordinarily used for personal, household or domestic purposes.

It is important to note any inadvertent spills, leaks, etc. (including any used water) will be captured by the provisions of the *Environment Protection Act* 1970, as is the off-site transport of industrial water under the regulatory requirements for the transport of industrial waste.

Non-industrial Reuse – Risk Assessment and Control Phase

Non-industrial Reuse - Risk Assessment

The proposed framework for non-industrial reuse includes two stages of Risk Assessment, 'primary' and 'detailed', depending on the existence of recognized standards for hazards in the source water considered and the risks posed by the hazards identified.

The **primary risk assessment** requires a risk characterisation of the source industrial water. This involves the identification of hazards present in the source water and the risks posed by these hazards to human health and the environment when reused.

The primary risk assessment would need to establish whether applicable standards exist for the end use in relation to the industrial water hazards. These may include state, national or international standards. Where applicable end use standards exist, the proponents of the scheme would need to establish if the industrial water meets these standards.

For cases where existing standards are met, it is recommended that the reuse scheme comply with regulatory controls as specified in the **Non-industrial Reuse – Control** below.

If end use standards are not present, the standards are not applicable, or the industrial water does not meet the end use standard, it is recommended that a **detailed risk assessment** be undertaken to determine whether risks can be reduced to a low residual level.

Where standards are not available for water use a risk assessment is needed to determine appropriate health and environmental standards. Guidance needs to be developed to provide the methodology to determine standards for industrial water reuse. However, the draft *National Guidelines for Water Recycling Managing Health and Environmental Risks* provides a model for such guidance.

The Hazard Analysis and Critical Control Point (HACCP) approach used in the *Guidelines for Environmental Management: Dual Pipe Water Recycling Schemes: Health and Environmental Risk Management* (EPA 2005), is recommended. HACCP is an industry-recognised preventive risk management system that identifies, evaluates and controls hazards associated with the production of safe food or water.

HACCP focuses on preventing substandard water being delivered for use, by ensuring that treatment steps, controls, monitoring and verification that are essential for achieving the required water quality objectives are in place.

Where it is determined that residual risks can be reduced to a low level, it is recommended that the scheme comply with regulatory controls described under **Non-industrial Reuse - Control** below.

Where residual risks cannot be reduced to a low level, it is recommended that the scheme does not proceed.

Non-industrial Reuse - Control

The level of regulatory rigour to manage industrial water reuse is to be proportionate to the risk involved. The regulatory framework recommended requires industrial water reuse scheme proponents to comply with:

- treatment standards and treatment system design;
- site assessment and permit/registration;
- installation; and
- system operation and use.

A note on the framework

It is recommended that the regulatory framework include and be supported by guidance to be incorporated in the existing EPA reclaimed water guidance series, including:

- guidance and advice on safeguards for businesses wishing to sell their industrial water to third parties.
- general guidance (but not regulatory requirements) on risk management where industrial water is used for industrial purposes.

8 Adequacy of the Existing Victorian Framework

Victoria doesn't have an integrated legislative/policy/guidance framework that recognises and facilitates industrial water use. The following points outline:

- the extent to which the current regulatory framework addresses industrial water use; and
 - the gaps in the framework from the perspective of underpinning the recommended approach for regulating industrial water use within Victoria (as identified in Section 7).
1. *Environment Protection (Prescribed Waste) Regulations 1998* provide a framework for the use of industrial water through the Exemptions (Part 5) for off-site use of industrial water.
 2. *Environment Protection (Prescribed Waste) Regulations 1998* do not address the situation of on-site use of industrial water. Currently, on-site use of industrial water can be carried out without a regulatory control, apart from when a specific activity is scheduled under the *Environment Protection (Scheduled Premises and Exemptions) Regulations 1996*. If a premises or activity is scheduled under these regulations, exemptions for use (from works approval and licensing) may be granted under Table B-Exemptions of these regulations.
 3. Currently, there is no provision to regulate on-site use of industrial water on non-scheduled premises (not including Occupational Health and Safety legislation). Not all premises that have the potential to produce industrial water are scheduled under the *Environment Protection (Scheduled Premises and Exemptions) Regulations 1996*.
 4. The framework provided via the *Environment Protection (Prescribed Waste) Regulations 1998* needs to be further developed to facilitate safe and sustainable use of industrial water. It needs to include appropriate clauses to ensure that any industrial water use (either off-site or on-site) is carried out in accordance with the guidelines to be developed.
 5. The government policy applicable to waste management, *Waste Management Policy (Prescribed Industrial Waste) 2000*, does not specifically address water based industrial waste as it primarily seeks to facilitate solid waste reduction and diversion of wastes from landfill. Based upon the definition of recycling and reuse, the policy does not specify non-industrial use.
 6. The *Guidelines for Environmental Management: Use of Reclaimed Water (464.2)* apply to industrial water (Section 6.6); however, these guidelines do not provide specific water quality objectives for industrial water, and therefore, are limited with respect to the use of industrial water.
 7. There is a need to clarify where relevant in the regulations/guidance definitions such as "industry waste", "trade waste", "prescribed industrial waste" and "industrial water" particularly for external users of the system.
 8. It is necessary to clarify the requirements for managing industrial water reuse systems, including the need for appropriate contractual agreements.

9 Implications from Other Frameworks

The purpose of this section is to identify where the other regulatory frameworks reviewed address the gaps in the Victorian regulatory framework from the perspective of underpinning the recommended approach for regulating industrial water use within Victoria. These gaps are identified in Section 8. The implications of other regulatory frameworks for the Victorian regulatory gaps are presented in Table 9-1.

Table 9-1: Regulatory Approach by Other Jurisdictions – for Gaps in Victorian Framework.

Gap in Victorian Regulatory Framework	Approach in Other Jurisdictions
There is not an integrated legislative/policy/guidance framework that recognises and facilitates industrial water use.	There are no specific all encompassing regulations or guidelines and in any of the other regulatory frameworks reviewed. However the Queensland Water Recycling Strategy and the draft National Guidelines provide overarching guidance for alternative water supplies including industrial water using a risk based approach. The Queensland strategy encourages industry to develop their own guidelines.
The Environment Protection (Prescribed Waste) Regulations 1998 do not address the situation of on-site use of industrial water. Currently, on-site use of industrial water can be carried out without a regulatory control, apart from when a specific activity is scheduled under the Environment Protection (Scheduled Premises and Exemptions) Regulations 1996.	NSW and Queensland have similar regulations for the management of prescribed wastes. In both cases these regulations do not cover on-site use.
There is no provision to regulate on-site use of industrial water on non-scheduled premises (not including Occupational Health and Safety legislation). Not all premises that have the potential to produce industrial water are scheduled under the Environment Protection (Scheduled Premises and Exemptions) Regulations 1996.	Both Queensland and NSW have similar legislation to identify scheduled premises and to licence these premises. The Queensland Local Government Act 1993 enables local government to make laws to control public health and environmental risks associated with the use of recycled water. Such laws could control on-site use if required.
The Environment Protection (Prescribed Waste) Regulations 1998 do not include appropriate clauses to ensure that any industrial water use (either off-site or on-site) is carried out in accordance with industrial water use guidelines.	There are no industrial water specific guidelines within the other jurisdictions reviewed.
The Waste Management Policy (Prescribed Industrial Waste) 2000 does not specifically address water based industrial waste as it primarily seeks to facilitate solid waste reduction and diversion of wastes from landfill. Based upon the definition of recycling and reuse, the policy does not specify non-industrial use.	Sydney Water's trade waste policy includes a focus on increasing water reuse by industry through the use of best available technology and cleaner production methods.
The <i>Guidelines for Environmental Management: Use of Reclaimed Water (Publication No. 464.2)</i> does not provide specific water quality objectives for industrial water.	NSW and Queensland have similar guidelines for the use of recycled /reclaimed water. These guidelines do not include specific water quality objectives for industrial water uses.
There is a need to clarify where relevant in the regulations/guidance the definitions such as "industry waste", "trade waste", "prescribed industrial waste" and "industrial water".	Other jurisdictions utilise similar definitions.
It is necessary to clarify the requirements for managing industrial water reuse systems, including the need for appropriate contractual agreements.	Commercial aspects for the sale of industrial water were not considered in detail in the review of other regulatory frameworks. The Queensland Water Act 2000 does not appear to require local government consent for the sale of industrial water.

Furthermore there are no regulations within these jurisdictions that preclude industrial water use.

10 Recommendations

The following specific and general recommendations are intended to provide an enhanced public health and environmental regulatory framework for the use of industrial water. They recommendations are consistent with the recommended approach (Section 7), address the regulatory gaps as identified in Section 8, and build upon the learnings from other jurisdictions (Section 9).

10.1.1 Industrial Water Specific

1. The reuse of industrial water for industrial processes (e.g. cooling, material washing, etc.) will not be regulated. Where the reuse of industrial water is exclusively for an industrial process (on-site or off-site),
 - the workplace risks must be assessed and managed in accordance with WorkSafe Victoria's current occupational health and safety framework;
 - the suitability of the water for the industrial process is a business risk and should be managed via existing business systems;
 - risks to consumers in relation to the product safety and quality are to be managed by the existing frameworks for ensuring food safety and product quality; and
 - for any inadvertent spills, leaks, etc. the provisions of the Environment Protection Act 1970 would apply.

If the industrial water is transported off-site, regulatory requirements that apply to the transport of industrial waste would apply.

2. Ensure that head of power legislation is provided to manage environmental and health risks in relation to the non-industrial reuse of industrial water (on-site or off-site), which:
 - allows for roles and responsibilities to be clearly identified and assigned;
 - ensures proposed industrial water use schemes undergo an appropriate assessment process, including primary assessment and where necessary, detailed risk assessment; and
 - allows for controls to be imposed based on a regulatory framework which balances the level of rigour with the level of risk.
3. During the review of the *Environment Protection (Prescribed Waste) Regulations* 1998, consider:
 - provision for industrial water use to be undertaken in accordance with guidance to be developed; and
 - the definition of industrial water.

4. Develop industrial water reuse guidance that provide guidance on managing environmental and health risks for common non-industrial uses that address:
 - roles and responsibilities, including contractual arrangements;
 - the process for evaluating industrial water reuse proposals;
 - environmental and health risk assessment methodologies;
 - methodologies and process for managing environmental and health risk;
 - management of the industrial water reuse system;
 - compliance with industrial and trade waste policies and objectives;
 - communication, awareness and training;
 - incidents and emergencies;
 - documentation and reporting; and
 - auditing, review and improvement.
5. When the regulations are reviewed, amend where necessary the *Industrial Waste Management Policy (Prescribed Waste) 2000* and existing guidance to ensure consistency with the proposed changes to the Environment Protection (Prescribed Waste) Regulations 1998 referred to in Recommendation 3.
6. Review all relevant regulations to allow for on-site reuse at industrial premises for non-industrial uses where appropriate as determined by a risk-based approach as set out in guidance referred to in Point 4.
7. Clarify where relevant in the regulations/guidance definitions such as “industry waste”, “trade waste”, “prescribed industrial waste” and “industrial water”.
8. Large-scale adoption of industrial water reuse can have potential impacts (either negative or positive) on the functioning of sewerage systems and sewage treatment plants. Although outside the scope of this project, such impacts need to be assessed and considered when promoting industrial water reuse, and maintaining and constructing sewerage infrastructure and sewage treatment plants.

10.1.2 General

The following general recommendations relate to industrial water as well as all other alternative urban water source (e.g.; rainwater, stormwater, greywater and sewage) frameworks.

1. Ensure integration between the regulatory frameworks of each alternative water sources where possible.
2. Ensure participation in, and where appropriate consistency with, national initiatives.
3. Ensure that the regulatory framework provides for the trial and adoption of new and innovative technologies.

4. Develop evaluative mechanisms to determine the impact of alternative water source uptake on the complete water cycle, including consideration of relevant management plans at the local, regional and State level.
5. Develop a mechanism to allow for data collection of alternative water source usage to assist with assessment of water cycle impacts.
6. Determine the most appropriate institutional and administrative arrangements given the adoption of the proposed regulatory framework.
7. Ensure that the regulatory framework takes account the resourcing capacity and capability of the agencies responsible for administering the framework.
8. Develop a unified system to inform new owners and occupiers (resulting from change of ownership or tenancy) of existing alternative water systems and the maintenance requirements.
9. Develop guidance expressing a hierarchy for the best and lowest risk users of alternative water sources for a range of common scenarios.
10. Establish mechanisms to provide for the assessment of long term impacts on the environment from alternative water source usage.
11. Develop and implement a communication strategy to promote the guidance and regulatory framework for all alternative water sources.

11 References

Victorian Acts, Regulations and Policies

Building Act 1993
Catchment and Land Protection Act 1994
Environment Protection Act 1970
Health Act 1958
National Environmental Protection Council (Victoria) Act 1995
Occupational Health and Safety Act 2004
Planning and Environment Act 1987
Safe Drinking Water Act 2004
Water Act 1989
Water Industry Act 1994
Building (Legionella Risk Management) Regulations 2001.
Building (Cooling Tower Systems Register) Regulations 2001.
Environment Protection (Prescribed Wastes) Regulations 1998.
Environment Protection (Scheduled Premises and Exemptions) Regulations 1996
Plumbing Regulations 1998
State Environment Protection Policy (Waters of Victoria) 2003
Industrial Waste Management Policy (Waste Minimisation) 1990
Industrial Waste Management Policy (Prescribed Industrial Waste) 2000
Industrial Waste Management Policy (Movement of Controlled Waste between States and Territories) 2001

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EPA Victoria (2000) Environmental Guidelines for Industry - Dairy Effluent (Publication No. 570)
EPA Victoria (2000) Environmental Guidelines for Industry - Brick Kiln Waste (Publication No. 607)
EPA Victoria (2000) Environmental Guidelines for Industry - Textile Effluent (Publication No. 621)
EPA Victoria (2003) Guidelines for Environmental Management: Use of Reclaimed Water (Publication No. 464.2)
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Government of Victoria (2004) White Paper: Our Water - Our Future.
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- Guidelines for Sewerage Systems - Acceptance of Trade Waste (Industrial Waste) (1994)
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- Australian Drinking Water Guidelines (2004).

Natural Resource Management Ministerial Council, and Environment Protection and Heritage Council (2005) Draft National Guidelines for Water Recycling Managing Health and Environmental Risks

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Protection of the Environment Operations (POEO) Act 1997

Public Health Act 1991

Sydney Water Act 1994

Environment Planning and Assessment Regulation 2000

NSW Guidance Documents

Department of Energy, Utilities and Sustainability (2006) Management of Private Decentralised Recycled Water Systems – Draft Regulatory Framework

Department of Environment and Conservation (2003) Environmental Guidelines, Use of Effluent by Irrigation

Recycled Water Coordination Committee (1993) Guidelines for Urban and Residential Use of Reclaimed Water

Queensland Acts, Regulations, Policies and Guidelines

Environmental Protection Act 1994

Environmental Protection Regulation 1998

Environmental Protection (Waste Management) Regulations 2000

Health Act 1937

Integrated Planning Act 1997

Local Government Act 1993
Water Act 2000
Sewerage and Water Supply Act 1949
Environmental Protection (Water) Policy 1997

Queensland Guidance Documents

Queensland Environmental Law Association (2000) Legislative Environment Water Recycling Background Study
Government of Queensland (2005) Queensland Water Recycling Strategy

UK Legislation

Control of Pollution Act 1974
Environmental Protection Act 1990
Environment Act 1995
Water Act 1945, 1973 and 1989
Water Industry Act 1991
Water Resources Act 1991
Groundwater Regulations 1998
Pollution Prevention and Control (England and Wales) Regulations 2000
Pollution Prevention and Control (Scotland) Regulations 2000
Pollution Prevention and Control (Northern Ireland) Regulations 2003
Private Water Supply Regulations 1991
Water Supply (Water Fittings) Regulations 1999
Water Supply (Water Quality) Regulations 2000
The Cryptosporidium (New Water and Sewerage Authorities) Direction 2000

Californian Acts, Regulations, Policies and Guidelines

Water Recycling Act 2005

General References

Metcalf & Eddy, Inc. (2003) Wastewater Engineering: Treatment and Reuse, McGraw-Hill Science Engineering.

12 Glossary

beneficial use	A use of the environment or any element or segment of the environment which is conducive to public benefit, welfare, safety, health or aesthetic enjoyment and which requires protection from the effects of waste discharges, emissions or deposits or of the emission of noise.
dual pipe water recycling scheme	An urban water recycling scheme where recycled water is provided to householders for certain uses via a reticulation system that is separate from the drinking water supply.
effluent	Treated or untreated liquid waste flowing from agricultural and industrial processes or from sewage treatment plants.
groundwater	Any water contained in or occurring in a geological structure or formation or an artificial landfill.
industry	An industry is generally any grouping of businesses that share a common method of generating profit, and includes sectors such as commercial, manufacturing, processing, petroleum, power generation, tourism, mining and agriculture.
industrial process	An activity conducted at an industrial site directly associated with producing or handling of goods, for example, cooling, operation of boilers, pulping, washdown and cleaning. Also included for the purpose of this paper are activities at commercial premises such as carwash and laundromats. Activities that are excluded for the purpose of this paper are agricultural, mining, forestry, fishing and other activities where reuse would lead to a discharge to the environment
industrial purposes	Use of water in industrial processes and industrial fire protection.
industrial water	Wastewater produced from processes at industrial or commercial premises. It includes all waterborne waste from these facilities except sewage.
irrigation	The watering of crops, pasture, golf courses, parks, gardens and open spaces, which may involve using either surface or subsurface application techniques.
inherent risk	The probability that without intervention, an adverse outcome will occur in a person, group of people, plants, animals and/or the ecology of a specified area that is exposed to a particular dose or concentration of a hazardous agent.
potable	(Water) of a quality suitable for drinking, cooking and bathing and.
prescribed waste	A waste that is listed in Schedule 1 and any mixture containing a waste listed in Schedule 1 of the Environment Protection (Prescribed Wastes) Regulations 1998.
prescribed industrial	An industrial waste that arises from an industrial, commercial or

waste	trade activity or from a laboratory; or that is potentially harmful to human beings or equipment and arises from a hospital; and is listed in Part B of Schedule 1 of the Environment Protection (Prescribed Wastes) Regulations 1998.
rainwater	Water collected directly from roof run-off.
recycled water	Water generated from sewage, greywater or stormwater systems and treated (where necessary) to a standard that is appropriate for its intended use.
reticulated drinking water	Drinking water supplied to a site by a water authority through a network of pipes.
reclaimed water	Water that has been derived from sewerage systems and industry processes and treated to a standard that is appropriate for its intended use.
residual risk	The probability that following the implementation of risk management controls, an adverse outcome will occur in a person, group of people, plants, animals and/or the ecology of a specified area that is exposed to a particular dose or concentration of a hazardous agent.
sewage	Any waste containing human excreta or domestic wastewater. Sewage within a sewerage system may also contain a percentage of industrial waste commonly known as trade waste.
sewerage system	The sewerage system comprises the pipes and plant needed to transport and treat sewage.
trade waste	Any waterborne waste (other than sewage) which is suitable, according to the criteria of an Authority, for discharge into the Authority's sewerage system; or any other matter which is declared by a by-law made under the Water Act to be trade waste.
treated effluent	Aqueous waste flowing from agriculture and industry processes, or sewage treatment plants, that has been subjected to one or more of screening, sedimentation, biological and chemical processes to improve its quality.
treatment	A process that is meant to alter the wastewater biological, pathogen, nutrient or other potentially harmful components to a defined level. There can be a number of different processes each giving rise to a different standard of output water quality. These can involve varying processes including simple screening, separation of grey and black-water, anaerobic and/or aerobic action. Treatment systems must be such as to meet the proposed wastewater management program.
wastewater	The used water of community, industry, or agriculture, containing dissolved and suspended matter.
water quality	The chemical, physical, biological and radiological condition of water.

13 Acronyms

ANZECC	Australian and New Zealand Environment and Conservation Council
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
DHS	Department of Human Services
DSE	Department of Sustainability and Environment
EPA	Environment Protection Authority
HACCP	Hazard Analysis and Critical Control Point
NHMRC	National Health and Medical Research Council
NWQMS	National Water Quality Management Strategy
SWOT	Strengths, Weaknesses, Opportunities and Threats

Appendix A

Types of Industrial Water

Appendix A

Types of Industrial Process Waters

Raw material washing

Raw material washing will vary in contaminant load, both between types of product washed and also over time for one material. There are opportunities for saving when incoming materials are intrinsically clean. Counter current rinsing where fresh water is fed into the final rinse tank and flows from there into the next tank upstream ensures that clean water encounters the cleaner raw material and this makes efficient use of its washing ability.

Fluming and transport

Water chutes and flumes, lubricated conveyors and belts, Archimedes screw conveyors and flighted elevators; all use water which is usually returned to a sump or tank. The level of bleed off from this container controls the usage and the effectiveness of the transport method. This area is often seen as a point of use for recycled water after a suitable risk assessment.

Equipment washing

This falls into the general categories of open plant cleaning, washing floors walls and ceilings and clean in place (CIP). The cleaning sequence is typically rinse gross debris, clean with detergent, rinse detergent and soils to drain, apply disinfectant (if necessary), and post rinse with water.

Pre-rinse waters may be sourced from a previous cleaning cycle post rinse (as is often achieved automatically in CIP systems) Detergent solutions tend to be recycled where possible due to their high intrinsic value.

Water is most effectively saved by optimising cleaning systems (both manual and automatic) rather than by reusing the rinses.

Boiler and cooling tower blow down

Water with high solutes and containing proprietary treatments in many cases is not an attractive source for use. Most facility operators reduce blow down by increasing the cycles of concentration.

Condensate

All steam users should have an effective condensate recovery system.

Reverse Osmosis retentate

Water with an increased solute level will not be appropriate for all applications but can be returned to the main site supply tank, if it is not a large proportion, or stored for lower grade applications.

'Cold side' plate heat exchanger water

The temperature increase for this water may be only a few degrees so a recycling system, with temperature governed bleed off, may be used. Alternatively an off-site water source, e.g. a local river, can be used on a 'once through' basis, subject to site risk assessment and local authority approval.

Pump seal water

From centrifugal pumps and vacuum pumps this water flows continuously, and often to the floor, the volumes involved can be significant (up to 4 m³ / day) and the polluting load is only a temperature rise of a few degrees Celsius. Proprietary systems are available for retro fitting which reuse the water up to a specific temperature point (usually in the pump manufacturers specification) when they empty to drain and refill with fresh water; alternatively refrigerated closed loops may be used.

Process filtrates, centrifugations and pressings

These flows may contain reclaimable suspensions or solutes depending on the application, if so they should be further processed to reclaim these if it is economical to do so. Such a reclaim will lead to purer water and a reuse opportunity.

The economics of this process will vary if the reclaimed material (e.g. starch) is sold.

Finished goods wash water

The feasibility of reuse here will depend upon the nature of the wash water; for example the wash may simply remove dust particles, where there is an opportunity, or it may remove traces of chemicals used in a finishing process, where there may not be.

Package cooling water

Package cooling water includes water from can warmers and cooling sprays from a tunnel pasteuriser. The level of solutes and suspended solids are the key factors for reuse.

Effluent plant outfall

The degree of effluent treatment will decide whether there is an opportunity for reuse. A low grade use may be viable where the water has been treated to a standard which allows direct discharge to a water course.