DRAFT

POLICY AND PRINCIPLES

Protection of Waters from Pollution in Western Australia

WATER RESOURCE PROTECTION SERIES

WATER AND RIVERS COMMISSION WRP 27

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Water supply production bore in Jandakot, Western Australia
Photographer: Mr A Tomlinson

Cover picture: Mouth of the Canning River, Western Australia - February 1983
Photographer: Mr Chris O'Neil

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This report was released by the Water and Rivers Commission for public comment in July 1997

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Acknowledgments

This document has been prepared by the Pollution Prevention and Management Section within the Policy and Planning Division of the Water and Rivers Commission.

The author gratefully acknowledges the comments of the staff of the Commission on the Policy Discussion Paper issued in June 1996 and this draft policy. The author would like to thank Mr K Taylor, former Acting Director of Policy and Planning Division, for his specific comments on the scope of this draft Policy and Principles paper.

My special thanks to Mr P Ryan, Program Manager of Pollution Prevention Section, for providing technical advice and assistance in the overseeing and reviewing of the document. The author also wishes to thank Dr A Baker of the Department of Environmental Protection for his staff's comments on the Discussion Paper and draft Policy and Principles paper.

Finally, I would like to thank Mr T McAuliffe, Director of Policy and Planning Division, for supporting the release of this policy document.

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Reference details

The recommended reference for this publication is:

Water and Rivers Commission 1996
Policy and Principles
Protection of Waters from Pollution in Western Australia

ISBN 0-7309-7271-2
ISSN 1326-7442
Text printed on recycled stock
Onyx 100% recycled 100gsm
July 1997

Foreword

Water is one of our most important resources and is a vital part of our way of life economically, socially and environmentally. In Western Australia, water resources are a major source of water supply for drinking, stock, irrigation, industry and domestic gardens. Nearly 40% of Perth's public drinking water supply comes from groundwater, with the balance from surface water catchments. In the Perth metropolitan region alone, there are more than 121,000 shallow private bores used for domestic purposes other than drinking. As surface waters and groundwaters are linked hydraulically, we must maintain their quality if we are to protect and sustain these resources.

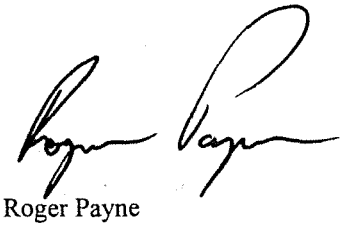
The Commission considers that these resources are undervalued and, as our population grows, it is likely that we will need to draw increasingly on them for water supplies. It is therefore important that water resources are used in a manner such that their beneficial uses are maintained, both for ourselves and future generations. Pollution can significantly affect the quality of the resource and therefore its beneficial uses.

This draft policy is designed to set the framework for protection of water resources from pollution in Western Australia. The Water and Rivers Commission has responsibility vested in it through the *Water and Rivers Commission Act 1995* for the conservation, management and use of water resources. The Commission will adopt this policy as an integral part of its water resources management strategy.

It is proposed that Western Australia's groundwater and surface waters be protected by the use of land use planning and legislative control measures to minimise the threat of pollution. The implementation of land use controls may be achieved through local and State government planning processes. Protection of water resources may also be achieved by establishment of an Environmental Protection Policy (EPP) under the *Environmental Protection Act 1986.*

Development of this document has involved consultation with personnel from the Commission, Department of Environmental Protection, Office of Water Regulation and the Water Corporation. The draft policy, to a large extent, is based on the information gathered and practices developed by the Commission whilst it was responsible, under delegation, for the administration of the pollution licensing and auditing function under the *Environmental Protection Act 1986.*

The Commission intends to give high priority to promoting this policy for groundwater and surface water protection. It will enable the Commission to use its existing statutory powers in a consistent and uniform manner, and will guide the Commission's response to statutory and non-statutory referrals it receives in relation to water and land use management.



Roger Payne
Chief Executive
Water and Rivers Commission

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Background to policy

1.0 Introduction

1.1 Need for water quality protection

High quality water is essential for the maintenance of the social, environmental and economic values of the State.

Water resources are coming under increasing demand as the needs of the community, industry and agriculture grow. These activities increase the risk of water pollution.

Water pollution has the potential to limit economic growth through adverse effects on drinking water supply, the environment, and activities such as fishing, recreation and tourism.

The major causes of groundwater and surface water contamination are human activities such as urbanisation, industrialisation and agriculture, which may result in chemical substances and microorganisms entering water bodies. Typical activities that may cause contamination of water resources are presented in Appendix A. Groundwater may be contaminated by material leaching through the soil through a localised discharge point (point source) or over a wide area (diffuse source). Similarly, surface water may be affected by groundwater base flows that discharge into a surface catchment.

Protection of the quality of our water resources should be based on meeting defined objectives to ensure that there is a consistent approach to management and decision making and that the decision-making process is neither arbitrary nor capricious. To be useful, these objectives should relate to the uses to which the resource is expected to be put.

The National Water Quality Management Strategy developed by the Australian and New Zealand Environment and Conservation Council and Australian Water Resources Council (ANZECC, and AWRC, 1992a) as a cooperative Federal/State program provides a national approach to water quality management and protection.

The national water quality policy objective is

"to achieve sustainable use of the nation's water resources by protecting and enhancing their quality while maintaining economic and social development".

The Water and Rivers Commission is the statutory agency responsible for the management of the State's water resources. The Commission is aware of growing community concern about deterioration of water quality of some of the State's water resources and the need to protect water quality.

This document presents the policy principles that will apply in the assessment of industrial, commercial and urban activities to ensure that best practices are used in the management of wastes. The document also discusses the principles of water quality protection that the Commission will apply in the assessment of point and diffuse sources of pollution.

1.2 Terminology

Definition of terms used in this document are included in the glossary. However, it is important that some terms are clearly defined at the outset so as to avoid any misunderstanding by people from different disciplines who will read and use this policy document.

The term "beneficial use" is adopted throughout the text. Water resources are valued by the community for many uses. There are numerous ways of categorising beneficial uses and values. For the purpose of this policy document, water resources are considered to support a variety of uses derived from social, cultural , ecological and economic values. These include:

- drinking water
- ecosystem protection
- recreation and aesthetics
- agricultural water and
- industrial water supplies

The beneficial use to which a water resource is designated includes the existing and potential future uses. The designation provides guidance for the management and protection of the quality and quantity of the resource.

1.3 Water pollution legislation

(a) Environmental Protection Act 1986

The *Environmental Protection Act 1986* is the principal Act dealing with the prevention of pollution in Western Australia.

The Environmental Protection (EP) Act empowers the Environmental Protection Authority (EPA) and the Department of Environmental Protection (DEP) to control water pollution from industry and commerce. This it does with advice from other regulatory authorities.

The EP Act provides for the protection of natural resources by the establishment of State environmental protection policies (Part III), implementation of the environmental impact assessment process (Part IV), and the control of pollution (Part V and VI). The EP Act also empowers the DEP to impose pollution abatement notices (PANs), control activities that pollute water resources and apply penalties for breaches of the Act.

(b) Water and Rivers Commission Act 1995

Under the Water and Rivers Commission Act, the Commission has responsibility for the "conservation, protection and management of the State's (land-based) water resource".

The Water and Rivers Commission Act has vested in it the following Acts and by-laws:

- *Country Areas Water Supply Act 1947*
- *Metropolitan Water Authority Act 1982*
- *Metropolitan Water Supply, Sewerage, and Drainage Act 1909*
- *Rights in Water and Irrigation Act 1914*
- *Waterways Conservation Act 1976*

The protection of Public Drinking Water Supply Areas (PDWSAs) against the effects of pollution is managed under the *Country Areas Water Supply Act 1947* and the *Metropolitan Water Supply, Sewerage and Drainage Act 1909* which allow for the writing of by-laws to protect water quality in catchment areas, water reserves and Underground Water Pollution Control Areas (UWPCAs). Both these Acts are administered under the *Water and Rivers Commission Act 1995*.

Within UWPCAs, the Commission administers by-laws to control land use. Controlling land use helps to prevent activities that could cause groundwater pollution.

The Commission uses the following three levels of water quality protection within all PDWSAs. The PDWSAs are divided into three priority classifications for their present and future public water supply catchments, namely Priority 1 (P1), Priority 2 (P2) and Priority 3 (P3) source protection areas.

Priority 1 (P1) source protection areas are defined to ensure there is ***no degradation*** of the water resource. They cover land generally owned by the State where protection of water quality for public drinking water is the most important beneficial use and ***most development is not permitted***.

Priority 2 (P2) source protection areas are defined to ensure there is ***no increased risk of pollution*** to the water resource. Provision of public water supply is a high priority in these areas. Restricted development may occur under specific conditions.

Priority 3 (P3) source protection areas are defined ***to minimise risk of pollution*** to the water resource. They are areas where substantial water resources of economic or strategic importance exist, but where there has been significant development. The objective is to manage land use rather than restrict development.

The Commission is seeking delegated powers under the provisions of Part V and VI and pursuant to section 20 (1) of the EP Act 1986. These powers include:

- powers of an inspector (section 88)
- issue of pollution abatement notices (section 65)

- issue of directions (section 73)
- prosecutions with Ministerial consent (section 114)

(c) Waterways Conservation Act 1976

Under the provisions of the *Waterways Conservation Act 1976*, the Commission has a conservation function, and associated powers, in respect of waterways and adjoining land in declared management areas under the Act.

(d) Health Act 1911

The *Health Act 1911* contains provisions designed to prevent water pollution in relation to drains which form an integral part of the State's natural system of rivers and wetlands.

(e) Pollution of Waters by Oil and Noxious Substances Act 1987

The Act contains provisions for the management of pollution by oily and noxious discharges from vessels to State waters.

This applies to nearshore marine and tidal waters.

2.0 Preparation of the document

In June 1996, the Pollution Prevention and Management Section of the Policy and Planning Division released a Policy Discussion Paper titled "Groundwater Quality Protection Outside Public Drinking Water Source Areas" which set out a proposed scope, structure and content for a policy.

The discussion paper was circulated for comment within the Department of Environmental Protection, Water Corporation, Department of Resources Development, Department of Minerals and Energy and Western Australian Municipal Association for a period of one month, and the submissions were taken into account in the preparation of this draft policy and principles document.

This document has been prepared on the basis of these comments and discusses the policy and principles that will apply to the protection of surface and groundwaters from potential point and diffuse sources of pollution.

This draft policy is now released to key stakeholders for comment.

3.0 National Water Quality Management (NWQM) Strategy

This document is based on the Draft National Water Quality Management Strategy proposed by the Australian and New Zealand Environment and Conservation Council and Australian Water Resources Council (ANZECC, and AWRC, 1992b) for the protection of water quality. The Strategy is part of the national program for ecologically sustainable development, and aims to achieve a nationally consistent approach to water quality management.

The document has been structured to be consistent with the Draft State Policy established by the Federal Department of Environment and Land Management, Hobart (1996) and the Environment Protection Authority Draft Policy (1994), which are based on the NWQM Strategy.

4.0 An overview of the policy document

The purpose of the policy is to set out an operational framework for the protection of water quality from pollution based on the sustainable development principles adopted by the Commission and consistent with the NWQM Strategy. The policy will apply to all surface waters (ie lakes, rivers, streams and estuarine waters) and groundwater in Western Australia. The major parts of the policy are set out below.

4.1 Preliminary

Part I of the policy contains definitions of key terms in the policy.

4.2 Policy objective and principles

Part II contains the objective of the policy and the principles on which the policy is based.

The overall objective of the policy is "to protect water resource quality to maintain existing and potential environmental, social and economic values throughout Western Australia, by the prevention of water pollution".

To protect water resources the Commission will adopt the following strategies:

- beneficial use planning
- land use planning
- environmental protection legislation

These protection strategies are made up from a detailed set of policies, plans and actions which together aim to achieve certain objectives.

The purpose of strategy development is to develop ways in which the government and the community can adopt a co-ordinated and comprehensive approach to the protection and management of a State's water resources.

(a) Beneficial use planning

Beneficial use planning is a process used in groundwater management.

Traditionally, groundwater management was based on managing issues related to utilisation of the resource and the aim was to maximise the net benefits to users of groundwater. This approach to planning for development of the resource should be adapted to incorporate the objective of protecting the resource from a range of contaminants so that the beneficiaries of planning are a broader community of interests.

Groundwater legislation generally covers controls on groundwater extraction rates, the gathering of hydrogeological information, and monitoring of critical over-draw situations.

Groundwater policies and regulations have traditionally been developed within a planning framework. This planning approach aims to integrate the many issues involved with resource management and provides an efficient plan for development of the resource by users.

The protection process includes the following steps:

- *regional allocation planning* - allocate the water resources of a region according to their current and potential long term values to the community,
- *use and protection planning* - plan effective protection and sustainable use of the water resources in accordance with their allocated uses,
- *use and protection management* - manage water resource use and protection in accordance with the sustainable use and protection plans.

The planning process for water quality management is complex and involved, and aims to:

- integrate land and water planning
- assess the economic, social and environmental tradeoffs
- maximise stakeholder involvement in both the planning and management phases
- establish effective and efficient management strategies
- discuss the private and public costs associated with each option

Use of salinity (expressed as total dissolved solids, TDS) water quality data where beneficial use not identified

The Commission recognises that it is not always possible for water resources to have clearly identified beneficial uses.

Where water is present in sufficient quantity to be useful to humans or ecosystems, the Commission will assign potential usage options. The Commission will do this by using a primary water quality indicator such as total dissolved salts. The underlying principle is that once a water resource is contaminated with salts it is technically difficult and requires considerable energy to remove the salt. Desalination of water resources is costly and is rarely used as a means of purification of water quality. Hence salinity is a strong determinant of usage potential.

The policy divides the water resource environment into five segments (ranges 1-5). These ranges are based on levels of the water quality indicator *total dissolved solids* (TDS), or salinity, and are identified in Table 1 of the policy document. Any water resource can normally be assigned to a segment based on its TDS level.

The water quality resource segment approach, applied on a site specific basis, is more effective than approaches which involve the definition of hydrological regions. Detailed information on water resource quality in many areas of Western Australia is not available, however the approach adopted in the policy document requires that the TDS of the water resource be known at a site in order to determine which beneficial uses are to be protected, and which water quality objectives apply.

Total dissolved solids was chosen as the most appropriate water quality indicator to define segments, as it can be easily measured and is the most common determinant of uses of water. The level of TDS directly affects the taste of water, can be toxic to plants and animals and can adversely affect industrial equipment.

The range for each segment was based on the *Australian Water Quality Guidelines for Fresh and Marine Waters* (ANZECC, and AWRC, 1992b), which identifies maximum TDS levels for particular beneficial uses.

The policy does not establish the administrative system for setting water quality objectives through a community-based consultative process, as it is envisaged that this will be part of the Integrated Catchment Management (ICM) process.

Once a potential set of beneficial uses has been determined for each of the ranges 1 to 5, it will generally be necessary to check other water quality indicators, eg nutrients, heavy metals and other toxicants, before confirming the beneficial use of the water resource.

(b) Land use planning

Land use planning provides a tool for managing and minimising risks of pollution to water resources.

Human activities can pose a pollution risk to water resources, if they are not appropriately managed. Some land uses, especially industrial development, can pose a significant risk to water resources. The risk of pollution may be minimised by selecting sites which are compatible to the activity. This may, in the long term, provide a cost benefit to the operator by minimising the cost of remedial action of a contaminated site as a result of poor planning.

Land use controls are likely to be more widely used to protect water resources that support significant social, cultural, environmental and economic values. Land use planning is a critical factor in implementing effective water resource management strategies at a regional level.

Protection of water resources may be achieved by:

- land zoning
- land reservation

Land zoning provides a basis for defining acceptable activities that can be carried out on the land.

Appropriate zoning can ensure that landholder expectations are compatible with the level of protection required for the water resource. While serving this purpose, there also needs to be a balance between groundwater protection objectives and wider community expectations and considerations for land use.

Reservation of land indicates to owners that the Crown intends to acquire the land at some time for public purpose. The Metropolitan Region Scheme (MRS) provides mechanisms such as the proposed addition of a new zone to the MRS to protect Jandakot Mound. The Parks and Recreation Reservation adjacent to the Swan-Canning System provides a mechanism for protecting that river system. All proposed development within this area must be approved by the Minister for the Environment.

Land use planning controls are a powerful instrument for ensuring activities such as mining and quarrying, land clearing and waste disposal are adequately managed. For example, quarrying activities can impact on the quality of groundwater by changing the aquifer characteristics by reducing recharge and the availability of the water resource.

The implementation of land use controls may be achieved through existing local and State government planning processes. The Western Australian Planning Commission has authority under the *Town Planning and Development Act 1928* and the *Planning Legislation Amendment Act 1996* for implementing land use controls.

Local government authority town planning schemes also afford protection of water resources by including water resource protection mechanisms in the schemes.

(c) Environmental protection legislation

Protection of water resources is also achieved by the establishment of an Environmental Protection Policy (EPP) under the EP Act 1986.

Examples include the Gnangara Mound EPP and the Peel-Harvey Estuary EPP.

4.3 Application of the policy

Part III discusses the application of the policy.

4.4 Water quality objectives

Part IV discusses the framework for setting water quality objectives necessary for the protection of water resources.

In determining water quality objectives, the Commission adopts three general policies of protection:

- non-degradation
- limited degradation
- differential protection

Non-degradation

Non-degradation policies require maintenance of the quality of the water resource at no worse than existing levels. For example, Priority 1 source protection areas within the Public Drinking Water Supply Areas (PDWSAs) are defined to ensure that there is no degradation of the water resource.

This level of protection will also apply to rivers, streams, wetlands, ecosystems and other water resources that support ecological, social and cultural values.

Limited degradation

The intent of limited degradation policies is to preserve water resource quality above certain specified standards. The policies are developed recognising the need to sustain beneficial uses.

Differential protection

Differential protection policies allow development of protection objectives after consideration of a number of factors such as existing and potential uses of water resources, zoning, land uses and community expectations.

Differential protection policies allow for combinations of non-degradation and limited degradation policies as appropriate to the site. The differential protection approach allows for setting differing levels of protection based on differing vulnerability of water resources to contamination.

The water quality objectives to be achieved, maintained and enhanced are based on the parameters, standards and criteria set out in:

(a) *Australian Drinking Water Guidelines 1996* National Health and Medical Research Council and Agriculture and Resource Management Council of Australia and New Zealand; and

(b) *Draft Australian Water Quality Guidelines for Fresh and Marine Waters 1992*, ANZECC

4.5 Achieving the water quality protection objectives

Part V of the policy outlines the principles that should apply for the management of point sources and diffuse sources of pollution.

The section discusses the processes by which water quality objectives will be achieved and maintained, recognising that this should involve a mix of regulatory, educational and market-based (economic) approaches.

For example, regulatory measures may work by setting limits on the quantity and nature of effluent that an individual or industry may produce to ensure that disposal of the waste does not pose a threat to the quality of water resources.

Market-based measures can be used to influence decisions on production methods and waste management. The adoption of a 'polluter-pays' approach, for example, can ensure that the cost of managing the waste is included in the costs of production.

Industry and developers therefore need to recognise that there are economic benefits in reducing water use and waste disposal. The process of assessing this is presently called 'water auditing' which involves:

- undertaking measurements of stream water quantity and quality
- assessing the cost-effective options for efficiency improvement.

This process can be used to minimise the risk of water pollution. Waste management can be approached through one or more of the following means which are listed in order of environmental desirability:

- waste avoidance
- waste minimisation/reduction
- recycling/reclamation
- waste re-use
- waste treatment to minimise the threat of polluting materials
- waste disposal

Point sources of pollution

The policy establishes that point sources of pollution should be managed by setting discharge limits in permits or licences, taking account of their potential impact on ambient water quality objectives. The use of "mixing and attenuation zones" as a natural final stage of treatment to achieve ambient water quality objectives is also discussed.

The policy establishes principles for the discharge of effluents to surface and groundwaters.

Diffuse sources of pollution

It is difficult to manage diffuse source pollution in the manner used for point source pollution.

Contamination from existing sources of this type is not covered by the licensing system and regulatory requirements under the *Environmental Protection Act 1986*. This situation is unlikely to change and therefore alternative strategies such as better urban design and improved farming and drainage practices in the context of an Integrated Catchment Management Plan are seen to be the direction for the future.

It has been recognised for some years that effective planning and management of whole catchments is needed if sustainable resource use and protection of waterways is to be achieved.

4.6 Implementation, evaluation and impact

4.6.1 Implementation

(a) *Monitoring*

Part VI establishes that monitoring is a critical part of the water quality management system, and identifies some principles and responsibilities in carrying out monitoring programs.

(b) *Development of "best practice" guidelines*

To meet the policy objectives, strategies to minimise the impact of a number of specific industrial activities on the quality of water resources are being developed.

Guidelines are being developed on land use and industrial activities which are likely to cause pollution of groundwater and surface waters from point and diffuse source discharges. The guidelines are intended to describe best practice environmental management for specific industries such as mining and mineral processing, wastewater treatment plants, the petroleum and agricultural industries.

The Commission will develop or have input into the development of these guidelines in consultation with key stakeholders.

The Commission recognises the role of other agencies in the development of 'best practice guidelines' and 'codes of practices' and will develop, assist in the development of and implement these guidelines in a 'whole of government' approach.

4.6.2 Review of policy

It is proposed that the policy will be reviewed five years from the date of publication, or as needed.
It will be possible to readily evaluate the effectiveness of the policy in terms of its acceptance and implementation, such as the application of guidelines describing best practice environmental management. However, evaluating the effectiveness of the policy in terms of maintaining or improving water quality will be a much more difficult and long term task.

4.6.3 Impact of the policy

To implement the policy, resources will be required to develop strategies and guidelines for the management of specific industrial and commercial activities that pose a threat to the quality of water resources. These guidelines will provide consultants, pollution licensing agencies and industry with information that will be useful when preparing submissions for statutory approval and for decision making.

The policy will require industry, developers and consultants to establish and adopt best management practices, where appropriate, to ensure that water resource quality is not degraded to a level where the beneficial uses are affected. This includes activities such as agricultural, mining, horticultural and urban land use.

The policy will require local government authorities to place more emphasis on preventing diffuse sources of pollution through the existing system of development approvals with advice from the Water and Rivers Commission and consistent with its water resource policies. The policy also envisages greater attention being paid to preventing diffuse pollution from stormwater runoff.

Implementing best practice environmental management may involve an increase in costs in some instances. However, the concept of best practice involves minimising environmental costs whilst still achieving the social and economic objectives of the activity.

Summary of policy statements

Issue		Policy Statement	
4.0	**Application of the policy**	4.1	The policy shall be observed throughout the State of Western Australia and shall apply to all terrestrial water resources for which beneficial uses described in Part IV Table 1 are applicable.
		4.2	The policy shall apply to industries (whether or not a 'prescribed premises' under the *Environmental Protection Act 1986*), organisations, individuals and all levels of government, public and private land owners and consultants or agents.
5.1	**Water quality indicators**	5.1.1	The Commission will use a range of water quality indicators to assess any change in water quality and quantity that may affect the beneficial uses of the water resource.
5.2	**Water quality objectives**	5.2.1	The Commission will set water quality objectives to ensure that the resource is capable of supporting its beneficial uses.
5.3	**Water quality guidelines criteria**	5.3.1	The *Australian Drinking Water Guidelines* (NH and MRC, 1996) will be used in assessing water quality suitable for public drinking water supplies delivered to the consumer, unless otherwise specified by the Director of Public Health.
		5.3.2	The *Australian Water Quality Guidelines for Fresh and Marine Waters* (ANZECC 1992) shall be adopted to protect existing and potential beneficial uses.
		5.3.3	In setting water quality objectives, the Commission may not use national guideline values directly to protect designated beneficial uses.
		5.3.4	The water quality indicators in Table 1 shall apply to all surface waters and groundwater with existing and potential beneficial uses, except where:
		•	the background water quality of another water quality indicator, other than TDS, is higher than its objective for the protection of beneficial uses, in which case the background level shall be managed with the objective of preventing further degradation of the water resource quality and enhancing the water quality;

Issue	Policy Statement
	• the water resource is within a polluted groundwater or surface water zone; • in cases, where a regulatory authority sets a level of water quality protection, and the proponent believes that the level is not achievable due to the higher background levels in the area, then the onus will be on that applicant or appellant to satisfy the Commission that the protection level does not apply to the area or premises under study. The Commission will then decide whether a new level of protection is appropriate.
	5.3.5 Where site specific information is not available or there are no water quality guidelines for a specific indicator, the Commission will aim to develop guidelines to protect beneficial uses using best available data.
6.0 Protected beneficial uses	6.1 The Commission will use a TDS water quality indicator range to assess the beneficial uses that would apply to a water resource. 6.2 Water quality will be protected on the basis of its designated beneficial use as identified through the planning process and/or the determined salinity (asTDS) range given in Table 2. 6.3 The Commission may determine that a beneficial use does not apply to a water resource where: • there is insufficient groundwater or stream flow to sustain the beneficial use • a polluted water zone has been declared • the Commission considers that the water quality is affected by the presence of a contaminant (eg chromium, benzene etc) and has the potential to pose a threat or be detrimental to the beneficial use under consideration. 6.4 Where a water resource has a unique conservation or scientific value, or high value for an existing or future allocated use which may conflict with other usage, the Commission will recognise this and endeavour to afford special protection. 6.5 Where the quality of a water resource has been identified to support more than one beneficial use, the water quality objective will be determined on the basis of the most sensitive value or use, unless otherwise directed by the relevant Minister in consultation with those directly affected.

Issue	Policy Statement
	6.6 Where natural ecosystems are known to operate within a salinity range in which fauna and flora have evolved, human activities should not adversely affect the natural seasonal range in water quality. 6.7 The Commission's objective for maintenance of aquatic ecosystems is to protect and enhance water quality, recognising that the flow and quality may vary over a wide band between wet and dry seasons, particularly where stream flow is ephemeral.
7.1 Avoiding discharge	7.1.1 The Commission will restrict activities in declared areas highly vulnerable to contamination and which support significant beneficial uses (eg drinking water supply and sensitive ecosystems). 7.1.2 Wastes should be directed to sewerage systems with appropriate treatment capacity, unless the regulatory authority is satisfied that connection to sewerage system: • is not practicable; or • may threaten the performance of the sewerage system; or • would not result in a lower net environmental risk than a separate means of treatment and disposal of the pollutant. 7.1.3 Methods to recover, contain, and re use wastes should be adopted, when opportunities for minimisation and recycling have been fully explored.
7.2 Limiting discharge to surface waters	7.2.1 Waste discharges should be reduced and managed in accordance with the following hierarchy of waste management, arranged in order of desirability: • waste avoidance • waste minimisation/reduction • recycling/reclamation • waste re-use • waste treatment to minimise the threat of polluting materials and • waste disposal. 7.2.2 The Commission will recommend permissible levels and/or loads of wastes which may be present in discharges to surface waters from point sources of pollution in accordance with this policy, and implement these limits through industry-based guidelines, permits, authorisations or a legal framework as appropriate.

Issue		Policy Statement	
7.3	**Setting of discharge limits**	7.3.1	The Commission will determine and recommend to the licensing agency, discharge limits for industrial activities where it considers that existing limits are not applied in accordance with the provisions of this policy.
7.4	**Role of technology**	7.4.1	The Commission recognises the capabilities and limits of technology in the treatment and disposal of wastes and will ensure that discharge limits for specific industrial and commercial activities are set to protect beneficial uses of the resource using the best available technology, where economically viable.
		7.4.2	Where waste minimisation, or changes in the waste stream, through improved technology have indicated a relative cost benefit to an industry when compared to the cost of treating waste streams to meet the needs of water resources, the industry will be encouraged to use this technology.
		7.4.3	Where a water resource has a significant beneficial use and is under threat from pollution, or where degradation has already occurred, then, where possible, the best available technology shall be used to minimise the threats.
7.5	**Mixing zones**	7.5.1	The concept of mixing zones when releasing contaminants to the environment is only supported to the extent that local beneficial uses are not lost, established beneficial usage is sustainable, and the receiving water body disperses the contaminant load without adverse impact; mixing zones are generally not applicable to lakes, wetlands, narrow streams or tidal estuaries.
7.6	**Direct waste discharge to groundwater**	7.6.1	Direct discharge of wastewater to aquifers using deep bore injection, mineshaft, well, infiltration basin or other similar structure will not be permitted, unless the proponent can demonstrate that the discharge will be of equivalent quality to that of the receiving aquifer.
		7.6.2	Direct discharge of wastes to aquifers may be acceptable for the purpose of: • aquifer recharge for improved beneficial use • saline drainage and groundwater disposal • backfilling of mineshafts with tailings where the applicant satisfies the Commission that the objective of this policy can be met and there is no adverse impact on the beneficial use of the resource.

Issue		Policy Statement	
7.7	**Disposal of wastes by land application (indirect discharge to groundwater)**	7.7.1	No single activity may use up the capacity of the receiving environment to attenuate contaminants to meet the water quality objectives required to protect existing and future beneficial uses. Conservative assessments require that provision be made for the impacts of other future developments within the catchment.
		7.7.2	The allowable discharge load of a contaminant which may be attributable to a single activity will be based on a percentage of the total load that may be sustained in that area.
		7.7.3	Where it is considered acceptable to permit release of some contaminants to the environment, the quantity of contaminants (load) which may be released into a water body is directly related to the area of land under the ownership or legal control of the activity operator.
7.8	**Attenuation zones**	7.8.1	The Commission may accept an attenuation zone in relation to a direct or indirect discharge of wastes where it considers that the zone would provide an assured, practical, affordable and long term means of protecting the water resource.
		7.8.2	Attenuation zones will not be allowed for activities which may be detrimental to an existing and future beneficial use. For example, attenuation zones may not be applicable in aquifers with high permeability and/or low attenuation properties, including coarse silica sands, karst rock and fractured rock aquifers.
7.9	**Rehabilitation or remediation**	7.9.1	The Commission will require clean-up of contaminated **soil** where it is considered that the contaminated soil poses a threat to water quality and may potentially affect the beneficial use of the resource.
		7.9.2	The Commission will require clean-up of contaminated **water** where it is considered that the contaminated water poses a threat to human health and the beneficial use of the resource.
		7.9.3	The responsibility for investigation costs and clean-up rests with the owner of the property on which the pollution occurred or with the person so identified in the licensing permit. The responsibility will transfer with transfer of the property or permit.

Issue		Policy Statement	
8.2	**Control of stormwater runoff**	8.2.1	Any stormwater runoff from a development site that has the potential for off-site contamination of water resources should be contained on-site unless appropriate safeguards to reduce the transport of pollutants off-site are installed.
		8.2.2	The use of stormwater drains for the disposal of untreated process water from industrial activity is not acceptable.
		8.2.3	The Commission will require the use of best management practices in the design of stormwater drainage systems to ensure that stormwater runoff does not adversely affect the quality of water resources.
8.3	**Nutrient and irrigation management plans (NIMP)**	8.3.1	The Commission will require the preparation of nutrient and irrigation management plans for activities involving large scale fertiliser use for broad scale agriculture in sensitive designated areas.
9.1	**Accidental chemical spillages**	9.1.1	The Commission will, in conjunction with other agencies, develop strategies and management plans to deal with accidental spillages which may pose a threat to the quality of water resources.
9.2	**Overflows from sewerage systems**	9.2.1	No untreated sewage is to be discharged in such a manner as to enter any water resource.
9.3	**Septic tanks**	9.3.1	The Commission recognises that private septic tanks will continue to operate in rural and small townships in the absence of reticulated sewerage and therefore considers it necessary to prescribe measures for the protection of water quality.
9.4	**Water allocation**	9.4.1	When issuing or reviewing water allocation and other licences or permits which allow water abstraction or diversion, the Commission will consider the potential effects of the abstraction or diversion of water and land use on the quality and beneficial uses of the water resource.
9.5	**Dewatering**	9.5.1	When assessing proposals for the disposal of dewater, the Commission will consider the following: • proposed location for the disposal of dewater • quantity and quality of the dewater • duration of discharge • potential impacts to water resources

Issue		Policy Statement	
9.6	**Dredging**	9.6.1	Any proposal for dredging in estuarine systems will require assessment by the Commission.
10.1	**Responsibility for monitoring**	10.1.1	The operators of activities which give rise to significant point sources of pollutants shall monitor their effluent for pollutants, to ensure compliance with water quality conditions set in permits and licences issued by statutory authorities.
		10.1.2	Activities that have the potential to pollute water resources by diffuse source discharges, directly or indirectly, shall be managed by conditions which require the operator of that activity to contribute to the ambient monitoring of the receiving waters. This should include baseline monitoring which should form part of the licence requirements. The level of monitoring should be proportional to the level of risk posed to water resources.
		10.1.3	The Commission requires proponents, developers and industry to carry out a 'water audit' for activities which are sensitive to water resource allocation and/or pose a threat to water resource quality.
10.2	**Quality control and coordination**	10.2.1	Monitoring programs should be designed to include Quality Assurance/Quality Control (QA/QC) procedures throughout the sampling and analysis program to ensure that high quality data is reported.
12.1	**Works approvals, licences and statutory referrals**	12.1.1	The Commission will provide advice on the following projects and statutory referrals submitted from local and State government agencies, industry and developers in accordance with the policy and principles. **Ministry for Planning and local government authorities** • planning and development proposals **Environmental Protection Act** Part IV Formal Environmental Assessments • consultative environmental review (CER), public environmental review (PER) and environmental review and management program (ERMP) Part IV Informal review and advice Part V Pollution • works approvals • licences

Issue	Policy Statement
	• **State projects** statutory referrals from the Department of Commerce and Trade and Department of Resources Development **Others** • other proposals referred under the following Acts: *Petroleum Act 1967* *Strata Title Act 1985* *Fisheries Resource Management Act 1994* *Soil and Land Conservation Act 1945* *Mining Act 1978* *Main Roads Act 1930* 12.1.2 The Commission will assess proposals which may have the potential to impact on water resources particularly in UWPCAs, and issue permits under the Metropolitan Water Supply, Sewerage and Drainage Act and by-laws.
12.2 Hydrological assessment	12.2.1 The Commission will require a hydrological and hydrogeological assessment to be carried out where it considers or suspects that a water resource may be at risk, or where contamination has occurred and a detailed assessment of the potential impact is necessary to determine the required action to be taken.

Policy and principles

Part I Preliminary

1.0 Glossary of terms

In this policy and principles document, unless inconsistent with the context or subject matter,

"aquifer" means a geological formation or group of formations able to receive, store and transmit significant quantities of water

"authority" means:

(a) a department or other agency of government of the State or of the Commonwealth; or

(b) an authority of the State or of the Commonwealth established for a public purpose; or

(c) a local government authority

"attenuation" means the reduction of contaminants in a suspension or solution passing through a filtering medium such as soil

"attenuation zone" means soil or water zone that receives and assimilates the contaminant that has been discharged to it

"background level" means the level of an indicator (parameter) in water which represents a condition similar to its natural state without the impact of human activities

"base flow" means the flow in a stream after direct storm runoff has ceased; the base flow is maintained by groundwater flow to the stream

"beneficial use" means an environmental value or 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 pollution sources

"bore" means a specific type of well accessing groundwater, generally a small diameter well

"Commission" means the Water and Rivers Commission established by section 4 of the *Water and Rivers Commission Act 1995*.

"contamination" means addition of matter which causes a change in water quality and produces an observable or detectable change in its characteristics

"confined aquifer" means an aquifer which is confined at its upper boundary by a layer of low permeability rock

"dewater"	means the act of lowering of the groundwater table by pumping or drainage
"diffuse source contamination"	means contamination which enters receiving waters via a dispersed method of entry
"environment"	means livings things, their physical, biological and social surrounding and interactions between all of these
"estuary"	means the tidal part of a river system and is the region where fresh water and sea water mix, at some time of the year, and includes coastal lagoons which are continuous with it
"groundwater"	means water that occurs in pore spaces and fractures in rocks beneath the ground surface
"hydrogeology"	means the geological science associated with the occurrence, distribution, movement and quality of groundwater
"karst"	means formations of limestone or dolomite characterised by structures such as underground drainage systems, caves, and sinkholes
"land"	means land, tenements and hereditaments and any interest therein, and also houses, buildings, and other works and structures
"low yielding aquifer"	means an aquifer which will not yield sufficient waters due to its extent or porosity to provide for economic beneficial uses, however such aquifers may still have an effect on beneficial uses
"pollution"	means the state of contamination for which the water quality has deteriorated to a point where the ability of the water to support or maintain the existing or potential identified beneficial uses is diminished
"premises"	means residential, industrial or other premises of any kind whatsoever and includes land, water and equipment
"prescribed premises"	means premises prescribed for the purposes of Part V of the *Environmental Protection Act 1986*
"receiving waters"	means the waters receiving a discharge of wastewater, runoff or pollutants
"reclaimed water"	means water recovered for beneficial use having been treated to the equivalent quality as its original or pristine condition
"recycled water"	means water returned for beneficial use after minimal or no treatment
"rehabilitate"	means restore to a condition equivalent to that which applied prior to development of the site or as agreed with regulatory authorities

"reused water"	means water returned for beneficial use after appropriate treatment to the quality required for that purpose
"State waters"	means the territorial seas adjacent to the State and waters within the limits of the State
"stormwater"	means water which flows over the surface of the land following rain
"surface waters"	means all waters on the land surface, including both fresh and saline waters, eg impoundments, lakes, wetlands, rivers, streams and estuaries
"terrestrial water resources"	means land-based water resources
"water quality indicator"	means a chemical compound, or characteristic of water which can be measured and used as a measure of quality
"water quality objectives"	means the levels of pollutants that may be tolerated without affecting the health of humans and the environment
"water table"	means the surface of a body of unconfined groundwater at which the pressure is equal to that of the atmosphere

Part II Policy objective and principles

2.0 Objective

The objective of the policy is to protect water resource quality to maintain existing and potential environmental, social and economic values throughout Western Australia, by the prevention of water pollution.

3.0 Principles

The policy objectives are based on the following five principles (defined in italics).

Principle 1

Land use planning policies and procedures play a significant role in the effective protection of water quality.

Proper land use planning plays an important role in preventing deterioration of water quality from development activities.

Improper land use practices can pose a significant threat to water resources. An appropriate natural resource planning process at State and regional levels is a key element in achieving sustainable water quality management.

This process should integrate land and water planning, identify management options and costs, and involve stakeholders and the community in relevant phases of the process.

Principle 2

An integrated approach to the protection of groundwater and surface waters is fundamental to the overall protection of water resource quality.

Surface waters and groundwaters are closely integrated in the water cycle eg. there are significant groundwater sources that discharge to surface waters (ie streams, rivers and wetlands). Conversely, many aquifers are recharged by surface water flow.

Protection of water quality from pollution sources should be on the basis of an integrated approach to groundwater and surface water management.

Principle 3

Groundwater and surface waters are often undervalued resources and these natural resources need to be protected for the long-term well-being of the community.

Determination of beneficial uses of the water resource in association with the community is necessary for the protection of water resources.

The use of water resources for public water supply, agriculture, industry and ecosystem maintenance is of vital importance for the community and the Commission believes should be adequately protected.

Identification of these uses is important in the establishment of appropriate water quality objectives for the protection of the water resource.

Principle 4

The industry/owner responsible for any pollution of water resources should be liable for the cost of cleaning up the pollution.

The concept of polluter pays has been applied by environmental agencies and incorporated in environmental regulation for some time.

The 'polluter pays principle' is a concept where the costs of preventing or abating pollution are borne by those who cause the pollution of the water resource. Those who carry out activities regulated by government must be held responsible by government for the consequences of those activities.

The application of this principle to existing or past activities that have caused pollution of the resource or degradation of the beneficial uses of the resource needs careful consideration.

In Western Australia there is presently no existing legislative or defined administrative process for clean-up of contaminated sites.

Principle 5

The protection of water resources should be based on educational, regulatory and market-based approaches, integrating economic and environmental goals in policies and activities.

In the past, regulatory measures have been used to control pollution. The approach to water quality management or pollution control has relied on established limits on the quality and quantity of effluent an user industry may discharge to the environment.

A regulatory approach together with market-based measures can influence decisions on the type of technology used in the production of material and in waste management. The adoption of the polluter pays concept, for example, can ensure that the cost of managing the waste products is included in the costs of production.

The Commission considers that education is a vital tool in achieving protection of water resources. The community needs information on the effects of contaminants upon water resources, and the risks posed by poor environmental management practice.

A well-educated community is expected to cooperate with government to minimise poor environment performance. One aim of the Commission is to ensure that the community and developers do not pursue economic gains at the expense of deteriorating water resource quality.

Such a trade-off is both unsustainable and inequitable in that only a small percentage of the community makes an economic gain, whilst the majority of the community members suffers a loss of environmental amenity which was formerly available. The cost of redressing this imbalance may not be affordable to future generations.

Part III Boundaries of water resources affected by the policy

4.0 Application of the policy

4.1 The policy shall be observed throughout the State of Western Australia and shall apply to all terrestrial water resources for which beneficial uses described in Part IV Table 1 are applicable.

This policy applies to all premises in the State of Western Australia at which waste or polluting matter is generated, stored, reprocessed, treated or disposed of. This includes industrial waste which may be discharged to the land by direct or indirect means that may pose a threat to water resources.

The Commission will actively promote the policy of water quality protection and encourage a cooperative approach involving industry, local and State government agencies and the community to achieve the objectives of this policy.

4.2 The policy shall apply to industries (whether or not a 'prescribed premises' under the Environmental Protection Act 1986), organisations, individuals and all levels of government, public and private land owners and consultants or agents.

All government agencies, public and private land owners, industries and consultants or agent shall observe and implement this policy in as far as it applies to their powers, responsibilities and functions in relation to the management of activities that have the potential to pollute water resources.

Part IV Water quality protection policy objectives

5.0 Developing water quality goals to meet community needs

5.1 Water quality indicators

5.1.1 *The Commission will use a range of water quality indicators to assess any change in water quality and quantity that may affect the beneficial uses of the water resource.*

The Commission will adopt key water quality indicators which will include physico-chemical (eg pH, salinity), chemical (nutrients and biochemical oxygen demand), microbiological (eg algae, bacteria, pathogens), biological and radiological (gross alpha and beta radioactivity) indicators. These indicators will be used in the assessment of water quality to ensure the protection of the range of beneficial uses.

5.2 Water quality objectives

5.2.1 The Commission will set water quality objectives to ensure that the resource is capable of supporting its beneficial uses.

Water quality objectives for a specific water resource are the levels of water quality indicators which should be met in order to protect the resource for its beneficial use.

The specific water quality indicators required to achieve the protection of beneficial uses are listed in Table 1.

5.3 Water quality guideline criteria

5.3.1 The Australian Drinking Water Guidelines (NH&MRC, 1996) will be used in assessing water quality suitable for public drinking water supplies delivered to the consumer, unless otherwise specified by the Director of Public Health.

5.3.2 The Australian Water Quality Guidelines for Fresh and Marine Waters (ANZECC & AWRC,1992) shall be adopted to protect existing and potential beneficial uses.

The water quality guideline criteria are estimates, based on the best scientific data available across Australia, of the levels of indicators which should be achieved to protect a beneficial use.

These guidelines provide a nationally accepted series of water quality criteria that have already been used to guide environmental management throughout Australia. The adoption of national water quality criteria results in interstate consistency which benefits the community and industry.

Adoption of the ANZECC water quality guidelines will ensure that the identified beneficial uses of the resources eg stock water supply, are sustained.

5.3.3 In setting water quality objectives, the Commission may not use national guideline value directly to protect designated beneficial uses.

If the guideline values are used directly, there is a potential for them to be used as "target" levels for contamination. This has the potential to cause contamination of the resource to levels just below or at the guideline levels recommended for the protection of beneficial uses. While this may mean that a resource still satisfies the criteria for its designated beneficial use, contamination of the resource may not be publicly acceptable.

There is also the strong risk that any review of the national guideline values may result in the development of more stringent criteria. The resource that has been contaminated up to the 'old' criteria will now technically be considered polluted and not suitable for its designated use.

The Commission recognises that, when establishing water quality objectives, there is a difference between the criteria recommended for the protection of

beneficial uses and water resource protection objectives. The Commission believes that to effectively protect the resource, 'preventive action limits' (PALs) need to be set. The PAL levels may be set at an appropriate level between the background resource quality level and the levels recommended to sustain the beneficial use of the resource.

A rational choice of PAL will be made depending on the following factors:

- type of contaminant and the nature of risk it poses to water resources
- difference between background levels of the resource and the criteria set to protect beneficial uses
- a value judgement based on the range and type of beneficial uses supported

The use of PALs as water quality objectives will:

- serve as an early indicator of the increase in contamination
- provide a buffer against the design criteria being exceeded accidentally.
- provide a buffer against future review of water quality criteria
- minimise enforcement action by the regulatory agency
- trigger action for investigation and use of measures to reduce contaminant release

5.3.4 The water quality indicators in Table 1 shall apply to all surface water and groundwater with existing and potential beneficial uses, except where:

- *the background water quality of another water quality indicator, other than TDS, is higher than its objective for the protection of beneficial uses, in which case the background level shall be managed with the objective of preventing further degradation of the water resource quality and enhancing the water quality;*
- *the water resource is within a polluted groundwater or surface water zone;*
- *in cases, where a regulatory authority sets a level of water quality protection, and the proponent believes that the level is not achievable due to the higher background levels in the area, then the onus will be on that applicant or appellant to satisfy the Commission that the protection level does not apply to the area or premises under study. The Commission will then decide whether a new level of protection is appropriate.*

5.3.5 Where site specific information is not available or there are no water quality guidelines for a specific indicator, the Commission will aim to develop guidelines to protect beneficial uses using best available data.

6.0 Protected beneficial uses

6.1 *The Commission will use a TDS water quality indicator range to assess the beneficial uses that would apply to a water resource.*

For the purpose of this policy, water resource salinity is divided into five ranges (R1 to R5) using the water quality indicator total dissolved solids (TDS), as shown in Table 2.

TDS was chosen as the most appropriate water quality indicator to protect beneficial uses, as it can be easily measured and is the most common determinant of potential uses of groundwater and surface waters.

The level of TDS affects the taste of water, can be toxic to plants and animals, and can adversely affect plant machinery. Generally the lower the TDS of the water resource, the greater the number of beneficial uses that can be made of the water.

6.2 *Water quality will be protected on the basis of its designated beneficial use as identified through the planning process and/or the determined salinity (as TDS) range given in Table 2.*

Where beneficial uses have been identified to support ecological, social and commercial values of the water resource, water resources will be protected in accordance with the water quality guidelines given in Table 2. All these values require protection from pollution.

6.3 *The Commission may determine that a beneficial use does not apply to a water resource where:*

- *there is insufficient groundwater or stream flow to sustain the beneficial use*
- *a polluted water zone has been declared*
- *the Commission considers that the water quality is affected by the presence of a contaminant (eg chromium, benzene etc) and has the potential to pose a threat or be detrimental to the beneficial use under consideration.*

Water pollution can restrict the use of the resource. In situations where there is a health risk in relation to the use of the water resource, the Commission will inform affected parties after seeking advice from the Health Department of Western Australia.

In areas (referred to as 'polluted water zone') where water resource quality is affected by, or is under threat of pollution from a contaminated site in the vicinity of the resource, the Commission will provide advice on the zone that is affected and the reason for the unsuitability of the resource for that particular beneficial use.

6.4 Where a water resource has a unique conservation or scientific value, or high value for an existing or future allocated use which may conflict with other usage, the Commission will recognise this and endeavour to afford special protection.

6.5 Where the quality of a water resource has been identified to support more than one beneficial use, the water quality objective will be determined on the basis of the most sensitive value or use, unless otherwise directed by the relevant Minister in consultation with those directly affected.

6.6 Where natural ecosystems are known to operate within a salinity range in which fauna and flora have evolved, human activities should not adversely affect the natural seasonal range in water quality.

6.7 The Commission's objective for maintenance of aquatic ecosystems is to protect and enhance water quality, recognising that the flow and quality may vary over a wide band between wet and dry seasons, particularly where stream flow is ephemeral.

Table 1 Water quality indicators to protect beneficial uses

Beneficial use	Range	Objective
Potable water-desirable	R1	The water quality indicator shall not exceed NH&MRC water quality guidelines (1996).
Potable water-acceptable	R1, R2	The water quality indicator shall not exceed NH&MRC water quality guidelines (1996).
Irrigation (agriculture)	R1, R2, R3	Surface water and groundwater shall not be affected so that the water quality indicator exceeds levels specified in ANZECC guidelines, Table 5.1
Irrigation (domestic garden use)	R1, R2, R3	Surface water and groundwater shall not be affected so that the water quality indicator exceeds levels specified in ANZECC guidelines, Table 4.1 Raw Water for Drinking
Stock water	R1, R2, R3, R4	Surface water and groundwater shall not be affected so that the water quality indicator exceeds levels specified in ANZECC guidelines, Table 5.10
Industry	R1, R2, R3, R4, R5	Surface water and groundwater shall not be affected so that the water quality indicator exceeds levels specified in ANZECC guidelines, Table 6.1-6.11 as applicable
Ecosystem protection	R1, R2, R3, R4, R5	Surface waters shall not be affected so that the water quality indicator exceeds levels specified in: (1) ANZECC , Ch 2 "Protection of aquatic ecosystems", Table 2.1 (2) ANZECC, Ch 3 "Recreational water quality and aesthetics", Table 3.2 (3) DCE Marine and Estuarine Water Quality Protection
Recreational and aesthetics	R1, R2, R3, R4, R5	Same as Ecosystem protection

Reference: National Water Quality Management Strategy - The Australian Water Quality Guidelines for Fresh and Marine Waters (ANZECC 1992b).

Part V Achieving the water quality protection objectives - pollution prevention and best management practices

7.0 Management of point sources of pollution

7.1 Avoiding discharge

7.1.1 The Commission will restrict activities in declared areas highly vulnerable to contamination and which support significant beneficial uses (eg drinking water supply and sensitive ecosystems).

The Commission recognises that there is a potential threat of contamination of water resources from most land use activities. These threats, however, may be minimised if the activity is managed effectively.

The Commission believes that, although these threats may be minimised by best available technology, certain land use activities are not considered compatible in areas highly vulnerable to contamination and which support significant beneficial uses, such as drinking water supply areas, areas close to wetlands on the Swan Coastal Plain and declared waterways areas.

The Commission will meet this objective by:

- determining certain land use activities through land use and water resource planning which it considers pose a high risk and directing them from areas of high protection priority to areas where the pollution risk will be a less significant problem;

- establishing declared waterways, underground water pollution control areas (UWPCAs), public water supply areas and water reserves, and controls on other strategic water resource areas in consultation with relevant State and local government agencies, planning authorities, developers and the community.

The Commission protects Public Drinking Water Supply Areas (PDWSAs) against the effects of pollution by using three levels of water quality protection within all PDWSAs. The PDWSAs are divided into three priority classifications for their present and future public water supply catchments, namely Priority 1 (P1), Priority 2 (P2) and Priority 3 (P3) source protection areas.

Priority 1 (P1) source protection areas are defined to ensure there is ***no degradation*** of the water resource. They cover land generally owned by the State where protection of water quality for public drinking water is the most important beneficial use and ***most development is not permitted.***

Priority 2 (P2) source protection areas are defined to ensure there is ***no increased risk of pollution*** to the water resource. Provision of public water supply is a high priority in these areas. Restricted development may occur under specific conditions.

Priority 3 (P3) source protection areas are defined ***to minimise risk of pollution*** to the water resource. They are areas where substantial water resources of economic or strategic importance exist, but where there has been significant development. The objective is to manage land use rather than restrict development.

7.1.2 Wastes should be directed to sewerage systems with appropriate treatment capacity, unless the regulatory authority is satisfied that connection to sewerage system:

- *is not practicable; or*
- *may threaten the performance of the sewerage system; or*
- *would not result in a lower net environmental risk than a separate means of treatment and disposal of the pollutant.*

7.1.3 Methods to recover, contain, and re-use wastes should be adopted, when opportunities for minimisation and recycling have been fully explored.

7.2 Limiting discharge to surface waters

7.2.1 Waste discharges should be reduced and managed in accordance with the following hierarchy of waste management, arranged in decreasing order of desirability:

- *waste avoidance*
- *waste minimisation/reduction*
- *recycling/reclamation*
- *waste re-use*
- *waste treatment to minimise the threat of polluting materials and*
- *waste disposal.*

7.2.2 The Commission will recommend permissible levels and/or loads of wastes which may be present in discharges to surface waters from point sources of pollution in accordance with this policy, and implement these limits through industry-based guidelines, permits, authorisations or a legal framework as appropriate.

To meet this policy objective and in setting these limits, the Commission will:

(a) consider the following factors which may influence the mobility of released chemicals in the environment during their transport to locations where beneficial uses may be at risk.

These include:

- quantity/quality of discharge
- types of contaminant
- nature of contaminants (stability, solubility)
- fate of chemical in soil and water (extent of degradation, attenuation, adsorption, oxidation, interaction with other chemicals in the environment)
- soil type
- depth to water table
- nature of aquifer
- topography and vegetation cover (if waste is irrigated)
- beneficial uses to be protected
- water quality protection level and sensitivity to degradation
- anticipated dilution/dispersion before impact on beneficial uses

(b) consider the cumulative loads imposed by all activities releasing similar contaminants into the environment when setting discharge limits from point sources of pollution to ensure that water quality objectives established for the protection of beneficial uses of the resources are achieved.

7.3 Setting of discharge limits

7.3.1 The Commission will determine and recommend to the licensing agency, discharge limits for industrial activities where it considers that existing limits are not applied in accordance with the provisions of this policy.

If discharge limits for a "prescribed premises" licensed under the EP Act 1986 are inadequate for the protection of the beneficial use of the water resource, the Commission will make based recommendations to the licensing authority on discharge conditions appropriate for the protection of the water resource

7.4 Role of technology

7.4.1 The Commission recognises the capabilities and limits of technology in the treatment and disposal of wastes and will ensure that discharge limits for specific industrial and commercial activities are set to protect beneficial uses of the resource using the best available technology, where economically viable.

The capacity for technology to contribute to optimal waste management is fundamental. Effective treatment and disposal practices used by industry to meet water quality objectives can be cost effective as they may reduce the need for industry to clean up contamination from ineffective waste management practices.

Table 2 Beneficial uses of water resources classified by the level of total dissolved solids (mg/L)

Range	R1	R2	R3	R4	R5
TDS (mg/L)	0-500	501-1000	1001-3500	3501-13000	greater than 13000
Beneficial uses					
Potable water-desirable	#				
Potable water-acceptable	#	#			
Irrigation[1]	#	#	#		
Stock water[2]	#	#	#	#	
Industry	#	#	#	#	#
Ecosystem protection[3]	#	#	#	#	#
Recreational and aesthetics	#	#	#	#	#

Notes: 1 depends on sensitivity of irrigated vegetation to salt

2 depends on domestic animal species, eg pigs least tolerant, sheep most tolerant to high salinities

3 where it can be demonstrated that groundwater will not discharge to a surface water or karst system, ecosystem protection will not be regarded as a potential beneficial use for the aquifer in question

# denotes a beneficial use which can be achieved given the level of total dissolved solids

The Commission recognises, however, that the best available technology may not be adequate to protect specific beneficial uses and therefore treatment may not be the acceptable option in all cases and export of wastes to another location may be required.

7.4.2 Where waste minimisation, or changes in the waste stream, through improved technology have indicated a relative cost benefit to an industry when compared to the cost of treating waste streams to meet the needs of water resources, the industry will be encouraged to use this technology.

Given the Commission's commitment to ecologically sustainable development and recognition of high economic, environmental and social costs of water degradation, it will be appropriate that industry work towards a 'cleaner production' initiative, which relies on the principle of waste minimisation.

This requires those discharging to the environment to seek to minimise the generation of wastes by adopting more efficient commercial, industrial and domestic processes.

7.4.3 Where a water resource has a significant beneficial use and is under threat from pollution, or where degradation has already occurred, then, where possible, the best available technology shall be used to minimise the threats.

Modern and efficient technology can be rapidly installed in new developments. However for existing plants or sites, progressive introduction of the most urgent and cost effective requirements is recommended. Normally a compliance period will be set based on local circumstances and the economic capacity of the industry. Priority would be given to those sites where upgrading or expansion provides the opportunity to install superior technology within an area considered to be important for water resource protection.

7.5 Mixing zones

7.5.1 The concept of mixing zones when releasing contaminants to the environment is only supported to the extent that local beneficial uses are not lost, established beneficial usage is sustainable, and the receiving water body disperses the contaminant load without adverse impact; mixing zones are generally not applicable to lakes, wetlands, narrow streams or tidal estuaries.

Mixing zones are areas within water bodies where contaminated wastewaters from point and diffuse sources mix with the receiving water environment and within which beneficial uses are not applied.

Mixing zones, when used, must be set in accordance with the following principles:

(a) Where a mixing zone has been designated, discharge limits must be set at levels which will not compromise the achievement of water quality objectives at or beyond the boundary of the mixing zone.

(b) Mixing zones should not generally be designated in waters which:

- receive significant and regular use for primary contact recreation,
- are close to potable water supply bores, or
- require the protection of unique or highly valued beneficial uses including protection of pristine aquatic ecosystems.

7.6 Direct waste discharge to groundwater

7.6.1 Direct discharge of wastewater to aquifers using deep bore injection, mineshaft, well, infiltration basin or other similar structure will not be permitted, unless the proponent can demonstrate that the discharge will be of equivalent quality to that of the receiving aquifer.

This demonstration includes the establishment, operation and reporting on monitoring systems designed to enable protection predictions to be validated.

7.6.2 Direct discharge of wastes to aquifers may be acceptable for the purpose of:

- *aquifer recharge for improved beneficial use*
- *saline drainage and groundwater disposal*
- *backfilling of mineshafts with tailings*

where the applicant satisfies the Commission that the objective of this policy can be met and there is no adverse impact on the beneficial use of the resource.

A direct discharge to groundwater is where waste is discharged directly into groundwater or below the water table using a bore, mineshaft, well, infiltration basin or other similar structure.

7.7 Disposal of wastes by land application (indirect discharge to groundwater)

7.7.1 No single activity may use up the capacity of the receiving environment to attenuate contaminants to meet the water quality objectives required to protect the existing and future beneficial uses. Conservative assessments require that provision be made for the impacts of other future developments within the catchment.

7.7.2 The allowable discharge load of a contaminant which may be attributable to a single activity will be based on a percentage of the total load that may be sustained in that area.

7.7.3 Where it is considered acceptable to permit release of some contaminants to the environment, the quantity of contaminants (load) which may be released into a water body is directly related to the area of land under the ownership or legal control of the activity operator.

The beneficial re-use of wastewater and waste organic solids by land application is an environmentally acceptable method of disposal if managed and controlled in a sustainable manner. Most soil types have the capacity to accommodate a given level of

contaminant, and providing the disposal is regulated and managed efficiently, the potential impact of pollution to water resources can be minimised.

Soils have the potential to adsorb and assimilate pollutants, however when the adsorption capacity is exceeded problems can occur. Some of these problems include soil clogging, erosion, groundwater mounding, surface runoff, generation of odours and vegetation loss due to waterlogging and soil toxicity.

In assessing proposals dealing with land application for waste disposal, the Commission will establish acceptable application rates for disposal of wastewater by considering the type of disposal system, eg via spray irrigation, sump and storage ponds.

In determining these loads the Commission will consider potential off-site transport of contaminants, the infiltration rate through soil, and surface runoff.

7.8 Attenuation zones

7.8.1 The Commission may accept an attenuation zone in relation to a direct or indirect discharge of wastes where it considers that the zone would provide an assured, practical, affordable and long term means of protecting the water resource.

7.8.2 Attenuation zones will not be allowed for activities which may be detrimental to an existing and future beneficial use. For example, attenuation zones may not be applicable in aquifers with high permeability and/or low attenuation properties, including coarse silica sands, karst rock and fractured rock aquifers.

Attenuation is a process where contaminants disperse and are removed from the waste stream through a number of physical, chemical and biological means when disposed to land or when present within an aquifer.

An attenuation zone provides a mechanism for risk management using the conservative viewpoint that all contaminants when disposed to land have the potential of causing off-site impacts through transport via the soil and water.

To define the zone, where viable, the Commission will consider the following factors:

- soil and aquifer lithology
- slope of land
- natural recharge
- presence of karst and other features which may enhance natural recharge
- nature of contaminants applied to land (eg toxicity, volatilisation, chemical and biological conversion)
- quantity and quality of wastewater discharge
- fate of contaminants in soil and water (eg adsorption/desorption, oxidation, volatilisation, degradation)
- groundwater movement (eg dilution, attenuation)
- downstream beneficial uses

7.9 Rehabilitation or remediation

*7.9.1 The Commission will require clean-up of contaminated **soil** where it is considered that the contaminated soil poses a threat to water quality and may potentially affect the beneficial use of the resource.*

*7.9.2 The Commission will require clean-up of contaminated **water** where it is considered that the contaminated water poses a threat to human health and the beneficial use of the resource.*

7.9.3 The responsibility for investigation costs and clean-up rests with the owner of the property on which the pollution occurred or with the person so identified in the licensing permit. The responsibility will transfer with transfer of the property or permit.

In the case of pollution caused at a public place, such as a road reserve, the responsibility will rest with the person or company responsible for the material that caused the contamination.

The requirement for and the ability of the polluter to clean up is critical to the success of a market-based approach to water quality protection.

An important factor of this policy is how soon the pollution is detected, as it is much cheaper to remove contaminated soil than to treat the groundwater once the contaminants have reached the water table.

The Commission may issue a direction, under the provisions of its by-laws or via delegated powers under section 20 of the EP Act 1986, to the polluter or premise occupier to undertake remediation where water resources are under threat and/or the policy water quality objectives are exceeded.

8.0 Management of diffuse sources of pollution

8.1 Integrated catchment management

Diffuse sources of pollution are more difficult to manage than point sources. Diffuse sources of pollution should be reduced and managed through the development and implementation of Best Practice Environmental Management (BPEM).

The Commission is progressing an Integrated Catchment Management (ICM) program to deal with problems of diffuse water pollution and soil conservation. The ICM program will encourage community participation and consultation in the determination and protection of existing and future beneficial uses.

The ICM program will address the following:

- seek community, government and industry input on the specific beneficial uses to be adopted;
- resolve competing interests for adoption of beneficial uses having varying costs consequences for the community;
- develop strategic plans for water quality management within specific waters;
- develop strategies for the control of diffuse sources not amenable to licensing and for sound land use practices;
- promote educational packages which explain the nature and benefits of practices designed to protect and enhance water resources.

8.2 Control of stormwater runoff

8.2.1 Any stormwater runoff from a development site that has the potential for off-site contamination of water resources should be contained on-site unless appropriate safeguards to reduce the transport of pollutants off-site are installed.

8.2.2 The use of stormwater drains for the disposal of untreated process water from industrial activity is not acceptable.

Stormwater drainage water can enter wetlands, rivers, streams and groundwater through seepage basins and if contaminated can affect water quality.

Stormwater leaving an industrial site can be contaminated with process chemicals and therefore it is important that stormwater quality is acceptable before discharge to the receiving environment.

8.2.3 The Commission will require the use of best management practices in the design of stormwater drainage systems to ensure that stormwater runoff does not adversely affect the quality of water resources.

Stormwater management strategies should address both the construction phase and continued operation of developments. Planning schemes must require that land use and development is consistent with the physical capacity of the land so that the potential for erosion and subsequent water quality degradation is minimised.

Stormwater systems should be designed to permit monitoring of the quality of discharge and the containment and recovery of pollutants.

The strategy for the control of stormwater runoff includes best planning practices and best management practices appropriate to the stormwater drainage design. The design should address the issues of water quality, water conservation and landscape protection as well as other drainage considerations such as peak flow attenuation and discharge capacity.

Drainage designs should incorporate appropriate elements of water sensitive designs to ensure:

- minimal change to local and/or regional water balance
- water conservation
- maintenance of ecosystems
- protection of water quality
- enhancement of beneficial uses of water resources

8.3 Nutrient and irrigation management plans (NIMP)

8.3.1 The Commission will require the preparation of nutrient and irrigation management plans for activities involving large scale fertiliser use for broad scale agriculture in sensitive designated areas.

Large scale use of fertiliser for public reserves, sports ovals and turf farms, and the operation of horticultural and intensive animal industries such as piggeries adjacent to waterways and surface catchments could pollute waterways if not managed and controlled.

The main concern associated with these activities is the transport of nutrients, particularly nitrogen and phosphorus, into surface waters.

The Commission believes that a NIMP will produce the following outcomes:

- minimise use of water for irrigation
- minimise nutrient use
- minimise nutrient export from the site
- retain all water on-site
- reduce operating ongoing costs
- maintain healthy and attractive waterways areas
- reduce impacts on foreshore reserves and waterways

9.0 Management of other sources of pollution

9.1 Accidental chemical spillages

9.1.1 The Commission will, in conjunction with other agencies, develop strategies and management plans to deal with accidental spillages which may pose a threat to the quality of water resources.

Accidental chemical spillages can pose a risk to groundwaters and surface waters from pollution if the spilled chemicals enter a water resource via drains, sumps, pits and surface runoff.

The Commission is developing management plans to deal with accidental spills. In addition, the Emergency Pollution Response Plan (EPRP) sets out the Commission's roles, responsibilities and operating procedures to manage pollution emergencies.

The EPRP applies to all declared Public Water Supply Areas, wetlands, waterways and other terrestrial water resource areas within Western Australia.

The Commission responds to incidents of non-hazardous spills and assists the Western Australian Hazardous Materials Emergency Management Scheme (WAHMEMS) during emergency spill management to ensure the protection of the State's water resources.

9.2 Overflows from sewerage systems

9.2.1 No untreated sewage is to be discharged in such a manner as to enter any water resource.

Sewage entering a river, stream or groundwater can cause at least three forms of pollution. These are:

- contamination with bacteria and viruses which can affect human health;
- contamination with organic matter or chemicals which consume the oxygen in water and can cause death of fish and other biota and generate foul odours; and
- contamination with plant growth stimulants, especially nitrogen and phosphorus which can lead to excessive growth of algae.

Sewage pump stations are essential components of reticulated municipal sewerage schemes. Pump stations are generally located in low lying areas due to the reliance of the system on gravity feed prior to reaching the treatment plant. Unfortunately, the low lying areas are the wetlands or river systems and

priority should also be given to protection of these water resources.

9.3 Septic tanks

9.3.1 The Commission recognises that private septic tanks will continue to operate in rural and small townships in the absence of reticulated sewerage and therefore considers it necessary to prescribe measures for the protection of water quality.

A large proportion of households in the State are serviced by private septic tanks in the absence of reticulated sewerage systems. These sealed concrete tanks, which act as anaerobic digestion chambers, discharge the treated effluent into soak wells or leach drains. Improper siting of the leach drain systems particularly in high water table and sandy soils can contribute to pollution of surface water and groundwaters.

9.4 Water allocation

9.4.1 When issuing or reviewing water allocation and other licences or permits which allow water abstraction or diversion, the Commission will consider the potential effects of the abstraction or diversion of water and land use on the quality and beneficial uses of the water resource.

If the allocation and use of water is not managed in a ecologically sustainable manner, the quality of the resource may be affected. The Commission will develop policy and management planning strategies to ensure that water quality of the resource is not adversely affected when allocating water to human usage.

9.5 Dewatering

9.5.1 When assessing proposals for the disposal of dewater, the Commission will consider the following:

- *proposed location for the disposal of dewater*
- *quantity and quality of the dewater*
- *duration of discharge*
- *potential impacts to water resources*

Dewatering operations can cause environmental problems both in the process of groundwater abstraction and the disposal of the pumped effluent.

Whereas the disposal of dewater is licensed under the EP Act 1986, the abstraction of groundwater is licensed under the *Rights in Water and Irrigation Act 1914.*

Excessive water table drawdown in sandy soils near wetlands can adversely affect the fringing vegetation and its habitat. Pumped groundwater containing high silt loads, high salinity or other contaminants may contaminate the water resource if discharged to it.

In coastal areas, pollution of the superficial aquifer can be brought about by saltwater intrusion causing water quality in superficial bores to be affected. On-site recharge is a reasonable option provided it does not degrade the existing beneficial uses of the water resource.

9.6 Dredging

9.6.1 Any proposal for dredging in estuarine systems will require assessment by the Commission.

Dredging operations can impact on water quality, aquatic fauna and fringing vegetation. Dredging can reduce the dissolved oxygen concentrations in the water column, increase the turbidity and potentially mobilise contaminants present in sediments into the water column. The management of dredge spoil and the return wastewaters requires careful consideration to minimise disturbances to the aquatic environment.

Part VI Implementation, evaluation and impact

10.0 Monitoring

10.1 Responsibility for monitoring

10.1.1 The operators of activities which give rise to significant point sources of pollutants shall monitor their effluent for pollutants, to ensure compliance with water quality conditions set in permits and licences issued by statutory authorities.

Discharge of wastes from premises is controlled primarily under the *Environmental Protection Act 1986*. The protection of Public Water Supply Areas against the effects of pollution is also managed under the *Metropolitan Water Supply, Sewerage and Drainage Act 1909* (MWSS&D Act) and the *Country Areas Water Supply Act 1947*.

Certain prescribed premises are required to be licensed under the EP Act. Under this licence, the activity is controlled by a set of conditions to ensure that the quality of water resources is not adversely affected.

Similarly, waste discharges may be controlled within Public Water Supply Areas by the issue of permits under the MWSS&D Act and by-laws. Conditions are set in the permits to ensure that the activity does not adversely affect the quality of water resources.

10.1.2 Activities that have the potential to pollute water resources by diffuse source discharges, directly or indirectly, shall be managed by conditions which require the operator of that activity to contribute to the ambient monitoring of the receiving waters.

This should include baseline monitoring which should form part of the licence requirements. The level of monitoring should be proportional to the level of risk posed to water resources.

10.1.3 The Commission requires proponents, developers and industry to carry out a 'water audit' for activities which are sensitive to water resource allocation and/or pose a threat to water resource quality.

The process of assessing water use is called water auditing which involves:

- undertaking measurements of stream water quantity and quality
- assessing the cost effective options for efficiency gains or improvement

The Commission believes that proper water use assessment will assist developers and industry, in particular, to minimise the risk of water pollution.

The process will also assist industry to identify waste streams and to separate clean water from contaminated water.

Monitoring is a critical component of water quality management. Authorities responsible for the management of water resources and environmental protection should ensure that adequate monitoring is carried out to determine whether water quality objectives are being achieved.

The methodology of assessing water quality will involve site inspections to determine the aesthetic quality, and the collection and analysis of water and soil samples using accepted Australian Standards for sampling, preservation and analysis. An ecological audit is required where a surface resource is perceived to have high conservation value.

For effective data collection and management, a water quality monitoring program should:

- determine key water quality indicators
- identify catchments and define location of sampling sites for surface and groundwater
- specify temporal or spatial sampling frequency
- use standard sample collection and preservation procedures as specified in AS 2031
- use National Association of Testing Authorities (NATA) laboratories

- choose appropriate chemical analytical methods to achieve maximum sensitivity and reliability of test results
- use appropriate quality control procedures for checking reliability of test results
- evaluate and review test results and adjust the monitoring program
- store information on a database
- include reporting and review

The responsibility for monitoring should be determined in accordance with the following principles:

- Water resource managers should contribute to baseline monitoring of ambient water quality as a component of their water resource management responsibility and on behalf of water users and beneficiaries.

- Independent audit checks of potentially polluting activities and their effects on water resources are considered necessary as part of the strategic approach to water quality protection.

10.2 Quality control and coordination

10.2.1 Monitoring programs should be designed to include Quality Assurance/Quality Control (QA/QC) procedures throughout the sampling and analysis program to ensure that high quality data is reported.

The QA/QC program will ensure that the following procedures are recorded and maintained:

- sample collection, preservation and storage
- sample logging and tracking
- equipment calibration and maintenance
- analytical and sub-sampling methodology

11.0 Activity guidelines

Guidelines for a range of industrial and commercial activities which are likely to give rise to point and diffuse source discharges of pollutants to water resources are being prepared.

The Commission will adopt the following key principles for limiting discharge from point sources.

(a) To minimise the risks of pollution of water resources, the Commission will develop guidelines, policies and by-laws on specific land use and industrial activities which have the potential to cause pollution of groundwater and surface waters from point and diffuse source discharges. The guidelines will also address diffuse sources of pollution from activities such as horticulture, landfills and wastewater treatment plants where disposal is via an irrigation scheme.

These guidelines will:

- be consistent with the provisions of the policy;
- define where they are applicable;
- be developed in consultation with relevant interested parties;
- be made available for public comment to relevant parties prior to being finalised; and
- provide an operational framework for industry in relation to the management of wastes from point source discharges.

(b) Where activity guidelines have been published, regulatory authorities should set discharge limits compatible with the guidelines unless:

- there are case specific issues discussed in activity management guidelines which make the guidelines inappropriate for use within the industry; or

- it can be demonstrated by the operator of the activity that it is not reasonable or practicable to comply with the limits specified in the guidelines, and that water quality objectives will not be compromised if the guidelines are not adopted.

12.0 Assessment of proposals

12.1 Works approvals, licences and statutory referrals

12.1.1 The Commission will provide advice on the following projects and statutory referrals submitted from local and State government agencies, industry and developers in accordance with the policy and principles.

Ministry for Planning and local government authorities

- *planning and development proposals*

Environmental Protection Act

Part IV Formal Environmental Assessments

- *consultative environmental review (CER), public environmental review (PER) and environmental review and management program (ERMP)*

Part IV Informal review and advice

Part V and VI Pollution

- *works approval*
- *licences*

State projects

- *statutory referrals from the Department of Commerce and Trade and Department of Resources Development*

Others

- *other proposals referred under the following Acts:*

Petroleum Act 1967
Strata Title Act 1985
Fisheries Resource Management Act 1994
Soil and Land Conservation Act 1945
Mining Act 1978
Main Roads Act 1930

12.1.2 The Commission will assess proposals which may have the potential to impact on water resources particularly in UWPCAs, and issue permits under the Metropolitan Water Supply, Sewerage and Drainage Act and by-laws.

12.2 Hydrological assessment

12.2.1 The Commission will require a hydrological and hydrogeological assessment to be carried out where it considers or suspects that a water resource may be at risk, or where contamination has occurred and a detailed assessment of the potential impact is necessary to determine the required action to be taken.

In considering an application for a works approval, licence upgrade or notice of intent, the Commission may require a hydrological and hydrogeological assessment to be undertaken by the applicant to determine any risk to groundwater and surface water quality and the subsequent threat to the environmental value due to the proposed discharge or activity.

13.0 Water resource management plans

The Commission will work with its regional personnel, Water Corporation, consultants, government agencies and local government authorities to ensure that water resource plans for the protection of public water supply source aquifers, wetlands and river segments, declared water catchment and waterways management areas are developed.

Water resource management plans will include detailed information on hydrology, geology, land use, soil, existing water quality and quantity, and potential risk to beneficial uses of downstream water bodies. They will propose specific land and water management requirements that enable the objectives of this policy to be met. Individual groundwater management plans may be added as schedules to this policy.

14.0 Role of Commission on contaminated site management

The Commission is developing guidelines for the management of contaminated sites that may pose a threat to water resource quality.

The purpose of these guidelines is to provide the Department of Environmental Protection, local government authorities, industry and the public with advice on the Commission's role in the management of contaminated sites in Western Australia.

The guidelines will address the following issues:

- investigation of potentially contaminated sites
- risk assessment
- remediation of contaminated soil and groundwater
- disposal of contaminated soil and groundwater
- site registration, audit and signoff by government

15.0 Research and investigation

The Commission will continue to carry out research and investigation on the following in relation to the protection of water from pollution sources:

- the ecology of streams, rivers and aquifers
- the processes which affect wastewaters once released to the environment
- activities that are known to cause degradation of water resources
- waste management technologies
- the flow and quality regime of streams and rivers
- effects of stored wastes on water resource quality
- sustainable yield of surface and groundwater systems

16.0 Public awareness and education

Increased public awareness of beneficial uses and threats of pollution to our water resources will assist in the protection of water quality.

Awareness by industry and commerce of the effects of industrial and commercial contaminants on water resource quality and the environment will also assist in achieving the policy objectives. A clear understanding of the potential risk of an industrial activity, the nature and fate of chemicals in the environment, the high cost of clean-up and the legislation dealing with polluters, would also assist industry in managing its activities.

17.0 Review of policy and guidelines

This policy will be reviewed by the Commission no later than 5 years from the date of its publication and the activity guidelines will be reviewed no later than 2 years from the date of publication.

The policy will however be updated as required on the basis of experience with its use and where necessary to afford improved protection to water resources.

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Appendix A

The types and sources of contamination that potentially can contaminate groundwater and surface water

(source Draft Australian Standard for "The Sampling of Potentially Contaminated Soil, April 1994)

Activity	Type of Chemical	Contaminants
Agricultural/horticultural activities		See fertiliser, insecticides, fungicides, herbicides under Chemicals manufacture and use
Airports	Hydrocarbons	Aviation fuels
	Metals	Particularly aluminium, magnesium, chromium
Asbestos production and disposal		Asbestos
Battery manufacture and recycling	Metals	Lead, manganese, zinc, cadmium, nickel, cobalt mercury, silver, antimony
	Acids	Sulphuric acid
Breweries/distilleries	Alcohol	Ethanol, methanol, esters
Chemicals manufacture and use	Acid/alkali	Mercury (chlor/alkali), sulphuric, hydrochloric and nitric acids, sodium and calcium hydroxides
	Adhesives/resins	Polyvinyl acetate, phenol, formaldehyde, acrylates, phthalates
	Dyes	Chromium, titanium, cobalt, sulphur and nitrogen organic compounds, sulphates, solvents
	Explosives	Acetone, nitric acid, ammonium nitrate, pentachlorophenol, ammonia, sulphuric acid, nitroglycerine, calcium cyanamide, lead, ethylene glycol, methanol, copper, aluminium, bis(2-ethylhexyl) adipate, dibutyl phthalate, sodium hydroxide, mercury, silver
	Fertiliser	Calcium phosphate, calcium sulphate, nitrates, ammonium sulphate, carbonates, potassium, copper, magnesium, molybdenum, boron, cadmium
	Flocculants	Aluminium
	Foam production	Urethane, formaldehyde, styrene
	Fungicides	Carbamates, copper sulphate, copper chloride, sulphur, chromium
	Herbicides	Ammonium thiocyanate, carbamates, organochlorines, organophosphates, arsenic, mercury
	Paints	
	Heavy metals	Arsenic, barium, cadmium, chromium, cobalt, lead, manganese, mercury, selenium, zinc
	General	Titanium dioxide
	Solvent	Toluene oils natural (e.g. pine oil) or synthetic
	Pesticides	Arsenic, lead, organochlorines, organophosphates,
	Active ingredients	sodium, tetraborate, carbamates, sulphur, synthetic pyrethroids

Activity	Type of Chemical	Contaminants
Chemicals manufacture and use (Contd)	Solvents	Xylene, kerosene, methyl isobutyl ketone, amyl acetate, chlorinated solvents
	Pharmacy	
	General	Dextrose, starch
	Solvents	Acetone, Cyclohexane, methylene chloride, ethyl acetate, butyl acetate, methanol, ethanol, isopropanol, butanol, pyridine methyl ethyl ketone, methyl isobutyl ketone, tetrahydrofuran
	Photography	Hydroquinone, sodium carbonate, sodium sulphite, potassium bromide, monomethyl para-aminophenol sulphates, ferricyanide, chromium, silver, thiocyanate, ammonium compounds, sulphur compounds, phosphate, phenylene diamine, ethyl alcohol, thiosulphates, formaldehyde
	Plastics	Sulphates, carbonates, cadmium, solvents, acrylates, phthalates, styrene
	Rubber	Carbon black
	Soap/detergent	
	General	Potassium compounds, phosphates, ammonia alcohols, esters, sodium hydroxide, surfactants (sodium lauryl sulfate), silicate compounds
	Acids	Sulphuric acid and stearic acid
	Oils	Palm, coconut, pine, teatree
	Solvents	
	General	Ammonia
	Hydrocarbons	e.g. BTEX (benzene, toluene, ethylbenzene, xylene)
	Chlorinated organics	e.g., trichloroethane, carbon tetrachloride, methylene chloride
Defence works		See Explosives under Chemicals manufacture and use, foundries, engine works, service stations
Drum reconditioning		See Chemicals manufacture and use
Dry cleaning		Trichlorethylene and ethane Carbon tetrachloride Perchlorethylene
Electrical		PCBs (transformers and capacitors), solvents, tin, lead, copper
Engine works	Hydrocarbons Metals Solvents Acids/alkalis Refrigerants Antifreeze	Ethylene glycol, nitrates, phosphates, silicates
Foundries	Metals	Particularly aluminium, manganese, iron, copper, nickel, chromium zinc, cadmium and lead and oxides, chlorides, fluorides and sulphates of these metals

Activity	Type of Chemical	Contaminants
Foundries (Contd)	Acids	Sulphuric and phosphoric Phenolics and amines Coke/graphite dust
Gas works	Inorganics Metals Semi volatiles	Ammonia, cyanide, nitrate, sulphide, thiocyanate Aluminium, antimony, arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, selenium, silver, vanadium, zinc Benzene, ethylbenzene, toluene, total xylenes coal tar, phenolics and PAHs
Iron and steel works		Metals and oxides of iron, nickel, copper, chromium, magnesium and graphite
Landfill sites		Methane, hydrogen sulphides, heavy metals, complex acids
Marinas	 Antifouling paints	See Engine works, Metal treatments, electroplating Copper, tributyltin (TBT)
Metal treatments	Electroplating Metals Acids General Liquid carburising baths	 Nickel, chromium, zinc, aluminium, copper, lead, cadmium, tin Sulphuric, hydrochloric, nitric, phosphoric Sodium hydroxide, 1,1,1-trichloroethane, tetrachloroethylene, toluene, ethylene glycol, cyanide compounds Sodium, cyanide, barium, chloride, potassium chloride, sodium chloride, sodium carbonate, sodium cyanate
Mining and extractive industries		Arsenic, mercury and cyanides, also refer to Explosives
Power stations		Asbestos, PCBs, fly ash metals
Printing shops		Acids, alkalis, solvents, chromium
Railway yards		Hydrocarbons, arsenic, phenolics (creosote), heavy metals, nitrates and ammonia
Scrap yards		Hydrocarbons, metals, solvents
Service stations and fuel storage facilities		Aliphatic hydrocarbons BTEX (i.e., benzene, toluene, ethylbenzene, xylene) PAHs (e.g., benzo(a)pyrene) Phenols, lead
Sheep and cattle dips		Arsenic, organochlorines and organophosphates, carbamates, and synthetic pyrethoids
Smelting and refining		Metals and the fluorides, chlorides and oxides of copper, tin, silver, gold, selenium, lead, aluminium
Tanning and associated trades	Metals General	Chromium, manganese, aluminium Ammonium sulphate, ammonia, ammonium nitrate, phenolics (Creosote), formaldehyde, tannic acid
Wood preservation	Metals General	Chromium, copper, arsenic Naphthalene, ammonia, pentachlorophenol, dibenzofuran, anthracene, biphenyl, ammonium sulfate, quinoline, boron, creosote, organochlorine pesticides