



Local Government Natural Resource Management Policy Manual



Summary and Principles



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Setting the Context

1.1 Natural Resource Management

The State Government Framework to assist in achieving sustainable natural resource management in Western Australia recognises the need for an integrated and coordinated approach to the management of natural resources. Natural resource management (NRM) can be defined as:

The ecologically sustainable management of land, water and biodiversity resources for the benefit of existing and future generations and the maintenance of the life support capability of the biosphere (Government of Western Australia 2000).

Local Government has an important role in the protection of natural resources such as bushland, biodiversity, wetlands and coasts at the local and regional scale. As an important stakeholder and partner with lead agencies, NRM by local government is a key extension of the core functions of land use planning and development control.

1.2 Swan River Trust and the Swan-Canning Cleanup Program

The Swan River Trust (Trust) was established in 1989 and operates under the *Swan and Canning Rivers Management Act 2006*, which came into effect in September 2007. This legislation provides a new direction for future protection and management of the rivers by setting up a more coordinated management framework to deal with commercial and recreational activities and urban and rural influences on the rivers.

In 1994 the Trust launched the Swan-Canning Cleanup Program (SCCP) to study the problems causing increased algal blooms in the Swan Canning river system. The SCCP Action Plan was developed and implementation began in 1999 to tackle the increased nutrient concentrations and reduce the frequency and occurrence of algal blooms occurring in the river system.

As part of this, it was recognised that participation and support of local governments was needed, but also that in some areas capacity was lacking. For this reason the Local Government NRM Policy Development Project was established to deliver recommendation 3.4 of the SCCP Action Plan:

Financially support the appointment of environmental officers to formulate and prepare local government natural resource management strategies and policies.

The Healthy Rivers Program has been developed based on the learnings and achievements of SCCP and will drive the next phase of managing our rivers. It presents a new approach through a series of more targeted and integrated programs to protect the environmental health and community benefit of the rivers by improving water quality.

1.3 Local Government Natural Resource Management Policy Development Project and Policy Manual

The Local Government NRM Policy Development Project commenced in 2000 as a project to reduce nutrient input and other pollutants to the river system.

To date this has been achieved through the development of a range of NRM policies, guidelines, best management practices and checklists related to land use planning, land management and local government operations, culminating in a Local Government NRM Policy Manual.



The guidelines and other material in the NRM Policy Manual have been designed for use by local government staff to assist in the assessment of development applications and in the guidance of day-to-day operations. It enables local government to better manage natural resources in their jurisdiction, and helps to maintain and enhance local and regional environmental quality.

The guidelines are for use by local government officers in the following areas:

- land use planning - strategic and statutory planning system;
- urban design and landscaping - design of public areas and infrastructure;
- land management - council operations and development sites;
- stormwater treatment and flow management - structural measures and non-structural measures; and
- community education and awareness - through media, education programs and participation.

The NRM Policy Manual is broad in its scope and in application. The purpose of this Local Government NRM Policy Manual Summary and Principles document is to present a summary of the major issues explored in the NRM Policy Manual and some key best management practices and principles.

The NRM Policy Manual is presented in five sections:

1. Introduction
2. Planning and Design
3. Stormwater Management
4. Land Management
5. Source Controls

In each of these sections there are the following sub-section themes or modules of the NRM Policy Manual:

- Introduction
- Policy (where applicable)
- BMP Guidelines (including checklist, where applicable)
- Contacts and References (for further information)



1.0 Introduction



1 Introduction

The State Government Framework to assist in achieving Sustainable Natural Resource Management in Western Australia recognises the need for an integrated and coordinated approach to the management of natural resources NRM can be defined as:

The ecologically sustainable management of land, water and biodiversity resources for the benefit of existing and future generations and the maintenance of the life support capability of the biosphere.

Many local governments are actively involved with the community in the management of local natural resources such as bushland reserves, wetlands, streams and foreshores and catchment management.

There are a range of key NRM initiatives in the Swan Region of south-west Western Australia to assist stakeholders – including local government – with the implementation of NRM, such as the Swan Regional NRM Strategy and Healthy Rivers Program. These strategies share a focus on the key areas of ecologically sustainable development, biodiversity and water resource protection.

Key Principles and Strategies

With respect to **ecologically sustainable development**, the WA State Government released its Sustainability Strategy – ‘Hope for the Future’ in September 2003. Principles in the strategy include:

- **Long-term economic health:** Sustainability recognises the needs of current and future generations for long-term economic health, diversity and productivity of the earth;
- **Biodiversity and ecological integrity:** Sustainability recognises that all life has intrinsic value, is interconnected and that biodiversity and ecological integrity are part of the irreplaceable life support systems on which life depends;
- **Common good from planning:** Sustainability recognises that planning for the common good requires equitable distribution of public resources (like air, water and open space) so that natural carrying capacities are not exceeded and a shared resource is available to all; and
- **Precaution:** Sustainability requires caution, avoiding poorly understood risks or serious or irreversible damage, designing for surprise and managing for adaptation.

For more information

Please refer to the Local Government NRM Policy Manual, section 1.0 *Introduction* for more information on relevant strategies, principles and legislation that have a significant bearing on the management of natural resources in Western Australia.



2.0 Planning and Design



2 Planning and Design

2.1 *Natural Resource Management in a Planning Framework*

Widespread clearing of native vegetation, together with agricultural and urban land uses have had a significant impact on the natural resources of the Swan Region.

Any change in land use from native bushland will have a corresponding impact on the quantity and quality of surface runoff and groundwater. Removal of native vegetation changes the water balance by increasing rainfall infiltration and reducing the amount of water taken up by deep-rooted plants, which in turn raises groundwater levels.

Land use is a significant contributor of nutrients to groundwater and surface water bodies on the Swan Coastal Plain due to the highly porous sandy soils with very poor nutrient retention capacity, particularly phosphorus. Urban development, such as construction of roads, paving and buildings, reduces permeability of the soil and increases runoff via stormwater systems. Agricultural land uses include the application of fertilisers, which when applied in excess can be lost into waterways via leaching and soil erosion.

Managing the impacts of the range of land uses across the Swan Coastal Plain is a challenge. ***A fundamental strategy should be to design all urban development with water efficiency and nutrient reduction in mind, incorporating the principles of Water Sensitive Urban Design wherever practicable.***

How the land is managed is important in determining the extent of ongoing impacts of a specific land use. It is important that best management practices are followed so that land is managed in a sustainable manner, to ensure that offsite environmental impacts are minimised and the land resource is sustained in the future.

Mechanisms exist in the Western Australian Planning Policy Framework, at the State and local levels, to ensure that natural resources are protected and managed sustainably. These include:

- State Planning Policy (SPP) Framework for NRM, highlighting various SPP's (such as the Environment and Natural Resources SPP, the Draft Bushland SPP, and the Water Resources SPP)
- Local Planning Policy Framework
- establishing a Planning Framework for NRM

Key Principles and Strategies

In accordance with the *Environment and Natural Resources State Planning Policy (SPP 2.0)*, planning strategies, schemes and decision making should:

- avoid developments that may result in unacceptable environmental damage;
- seek opportunities for improved environmental outcomes, including support for development which provides for environmental restoration or enhancement;



Key Principles and Strategies (cont):

- take account of the availability and condition of natural resources, based on best available information;
- take into account the potential for economic, environmental or social (including cultural) effects on natural resources;
- recognise that certain natural resources, including biological resources, are restricted to particular areas and that these geographical areas or land types may need to be identified accordingly and appropriate provision made to protect areas for the utilisation of those resources;
- take account of the potential for off-site (e.g. whole of catchment) impacts on the environment and natural resources;
- support conservation, protection and management of native remnant vegetation where possible, to enhance soil and land quality, water quality, biodiversity, fauna habitat, landscape, amenity values and ecosystem function; and
- consider any relevant accredited NRM Regional Strategy, or catchment management strategies prepared by catchment groups and endorsed by State Government agencies, with a view to integrating implementation of appropriate and relevant parts through local planning schemes and assessment of developments.

For more information

For further information on NRM in a planning framework, please see Local Government NRM Policy Manual section 2.1 *Natural Resource Management in a Planning Framework*.

2.2 Land Use Planning

Rapid changes in land use are occurring on the Swan Coastal Plain from the development pressures of a growing city population. Clearing of native vegetation and resulting loss of biodiversity is a significant issue for the Swan Coastal Plain.

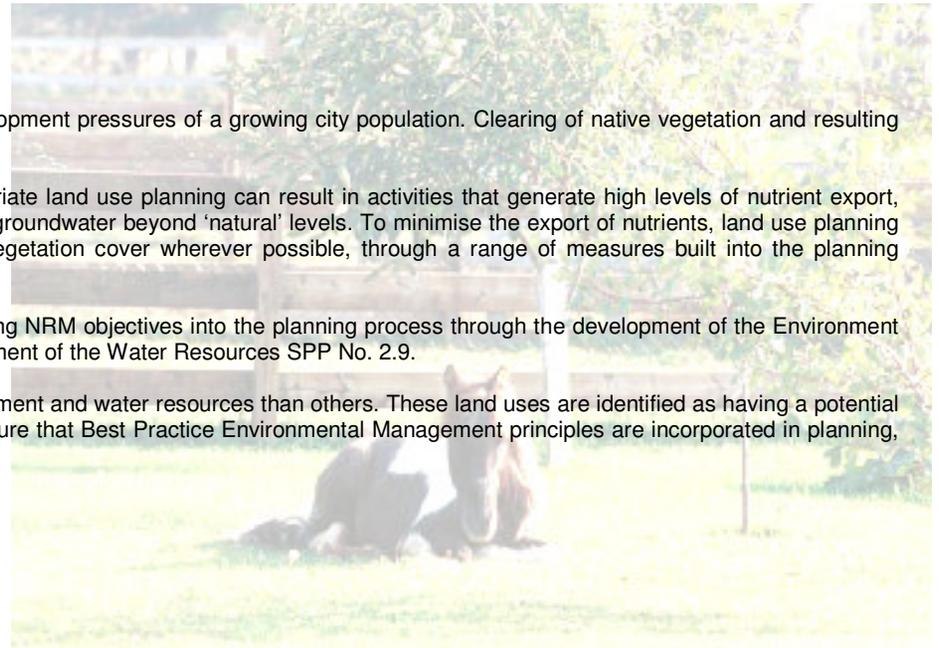
Land use planning decisions can affect nutrient export and flow regimes. Inappropriate land use planning can result in activities that generate high levels of nutrient export, sediments and other contaminants from the land into the waterways, wetlands and groundwater beyond 'natural' levels. To minimise the export of nutrients, land use planning must ensure that land use activities maintain natural hydrological features and vegetation cover wherever possible, through a range of measures built into the planning approval process.

The SPP Framework is progressively providing guidance to planners on incorporating NRM objectives into the planning process through the development of the Environment and Natural Resources SPP No. 2.0 and supplementary guidelines and the development of the Water Resources SPP No. 2.9.

Some land use changes have significantly greater potential to impact on the environment and water resources than others. These land uses are identified as having a potential risk of nutrient export and should be subject to closer scrutiny and regulation to ensure that Best Practice Environmental Management principles are incorporated in planning, design and management of developments to protect the area's natural assets.

Such major land uses include:

- Small Rural Properties (2-5 ha)
- Horticulture
- Animal-based Industries





2.2.1 Biodiversity Planning

This section provides an overview of the Biodiversity Planning Guidelines and the systematic and transparent process used for the identification, prioritisation and development of a strategy for the protection of local natural areas.

For more information

Please refer to Local Government NRM Policy Manual section *2.2.1 Biodiversity Planning*.

2.2.2 Small Rural Properties (2-5 ha)

There is considerable potential to use the planning process to deal with degradation on small rural properties, particularly when the land use is changing, such as the creation of lots for rural-residential development or for small hobby farm holdings.

Small Rural Properties Assessment Guidelines for Local Government in the Local Government NRM Policy Manual have been developed for use by local government staff involved in both strategic and statutory planning processes, and outline local government's role in the planning of small rural properties with regards to the key principles of NRM.

The guidelines assist local government by providing a comprehensive suite of measures that are applicable at relevant stages in the planning hierarchy. The guidelines also provide information for specific land use activities, and define criteria and issues for specific types of development, including broad land use categories such as the keeping of stock, poultry and horticulture.

For more information

Please refer to Local Government NRM Policy Manual section *2.2.2 Small Rural Properties*.

2.2.3 Horticulture

Horticultural activities generally involve the application of nutrient fertilisers and irrigation to grow crops such as market gardens, greenhouse flowers, turf farms, vineyards, orchards and nurseries. In the past this has been carried out on soils that often have a very low fertility. New landholders who wish to undertake horticultural activities may be inexperienced in land management and unaware of the cumulative impacts that result from horticultural activities. e.g. excessive nutrients applied to the sandy soils of the Swan Coastal Plain.

Cumulative impacts subsequently arising from poorly managed horticultural activities include:

- leaching of nutrients, leading to eutrophication of wetlands and waterways, and algal blooms;
- pollution of groundwater, waterways and wetlands from inappropriate use of agricultural chemicals, namely fertilisers, insecticides, fungicides and herbicides; and
- increased soil acidity and disturbance of acid sulphate soils.

Pursuit siting, nutrient and irrigation management, drainage design and storage and handling of chemicals such as pesticides and herbicides is therefore important in terms of minimising the amount of nutrients and other pollutants potentially being exported from the site via stormwater and groundwater to waterways.



For more information

For further information on these issues, general best practice principles, design requirements and standards to assist in the assessment of horticultural development applications, please refer to Local Government NRM Policy Manual section 2.2.3 *Horticulture*.

2.2.4 Animal-based Industries

Intensive animal-based industries include poultry farms, piggeries, stables, feedlots, kennels and stock agistment. Environmental issues associated with the siting and operation of intensive animal-based industries requires careful management and controls to be incorporated into planning decisions.

Animal-based Industries Guidelines for Local Government are available in the Local Government NRM Policy Manual, and provide a clear and concise 'Best Management Practice' approach, complete with checklist, for the reduction of contaminant export from commercial animal-based industries, including poultry farms, piggeries, cattle feedlots and dog kennels.

For more information

Please refer to Local Government NRM Policy Manual section 2.2.4 *Animal-based Industries*.

Key Principles and Strategies

Biodiversity Protection

- Horticulture or animal-based industry should be prohibited in the areas of remnant vegetation that link waterways and other large areas of remnant vegetation.
- Land use planning should ensure that land use activities maintain natural hydrological features and vegetation cover wherever possible, through a range of measures built into the planning approval process.

Waterways Management – Small Rural Properties

- Unrestricted stock can denude the foreshore of vegetation, exacerbating erosion and allowing the infestation of weeds, and should be restricted through fencing and riparian restoration.

Nutrient Management

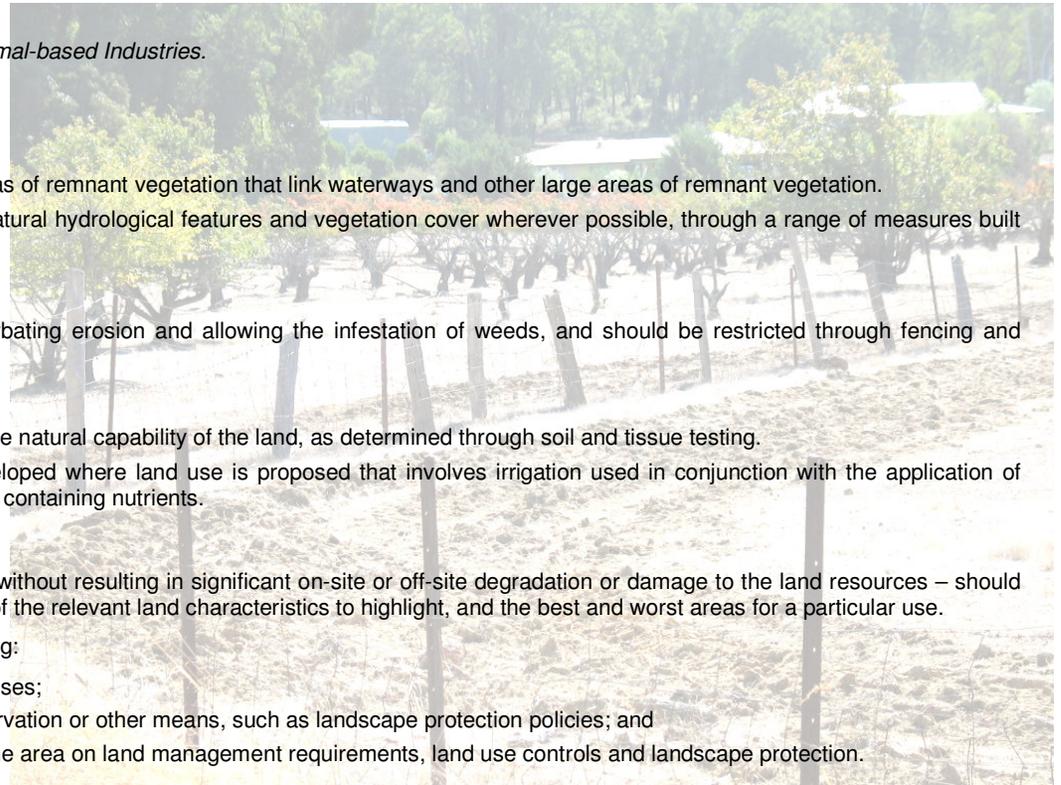
- Nutrient management should be guided as much as practicable by the natural capability of the land, as determined through soil and tissue testing.
- A Nutrient and Irrigation Management Plan (NIMP) should be developed where land use is proposed that involves irrigation used in conjunction with the application of artificial fertilisers, animal holding and/or application of organic solids containing nutrients.

Land Capability

- Land capability is the ability for land to sustain a specified land use without resulting in significant on-site or off-site degradation or damage to the land resources – should be used as a basis for land use planning, as it presents a synthesis of the relevant land characteristics to highlight, and the best and worst areas for a particular use.

Land use capability assessment should be used to assist in identifying:

- which areas are suitable and should be developed for particular uses;
- which hazardous or fragile areas are best protected through reservation or other means, such as landscape protection policies; and
- general and detailed policy statements for the whole or parts of the area on land management requirements, land use controls and landscape protection.





Key Principles and Strategies (cont):

Planning and Development – Small Rural Properties

- Generally, the earlier environmental issues can be addressed in the planning and design process, the more effectively with which they can be dealt.

Section 5.0 *Planning and Development* of the *Small Rural Properties Guidelines* focuses on planning strategies (strategic and statutory) to minimise land degradation on small rural properties. It sets out in tabular form, policy measures for a range of environmental issues that are applicable at each level in the planning hierarchy, namely:

- Local Rural Strategy (LRS)
- Local Planning Scheme (LPS)
- Structure Plan (SP)
- Subdivision
- Individual Lot

The policy measures addressed in each table are largely drawn from the Western Australian Planning Commission's (WAPC) Statements of Planning Policy (SPP):

- No. 2.0: *Environment and Natural Resources* (2003), together with associated *Guidelines for Implementation of SPP 2.0: Environment and Natural Resources*;
- No. 2.7: *Public Drinking Water Source Policy* (2003); and
- No. 2.9: *Water Resources* (2006).

These policy measures should be addressed when undertaking land use planning activities, in the preparation of new or amended LRS, LPS, and in the assessment of any rural smallholdings development application.

Horticulture

- The Department of Agriculture and Food Western Australia (DAFWA) generally supports the creation of lots for horticulture, provided that:
 - lands identified as suitable for a horticultural pursuit consider a range of suitability factors including land capability, water supply, buffer zones required, drainage and wastewater management, infrastructure requirements, and protection of remnant vegetation and biodiversity; and
 - intending developers and producers are aware that horticultural production must be practiced in accordance with the *Environmental Code of Practice for Agriculture* prepared under the *Environmental Protection Act* (1986).
- New horticultural developments must be directed away from high-risk nutrient-loss areas, including:
 - areas with a high watertable; and
 - soils prone to wind and water erosion, waterlogging and riverine flooding. Soils with a low (<5) Phosphorus Retention Index (PRI – please refer to section 4.6.1 *Phosphorus Retention* of the *Small Rural Property Assessment Guidelines for Local Government* for more information).



Key Principles and Strategies (cont):

- Generally, land categorised as 'low' (<5) or 'very low' (<2) capability (according to the DAFWA assessment) is considered unsuitable for horticulture developments (Land capability and PRI is addressed further in section 4.3.3 of the *Small Rural Property Assessment Guidelines for Local Government*, in the Local Government NRM Policy Manual).
- For those soils which fall in the higher phosphorus export susceptibility risk category (lower PRI), soil amendment should be incorporated into the management plan, to boost the nutrient retention capacity of the soil. A site with a PRI of <5 should not be approved for horticulture.
- The heavy use of fertilisers and irrigation water has the potential to pollute unconfined groundwater supplies, waterways and wetlands. It is necessary to locate horticultural land use outside declared catchment areas and PDWSAs, and away from wetlands, waterways and drains which flow into them.
- Horticultural developments should be located on flat to gently undulating (<10%) plains with deep to moderately deep sandy to loamy soils.
- The horticultural pursuit must not be located where there will be conflict with, or disadvantage to, the occupiers of neighbouring land.

For more information

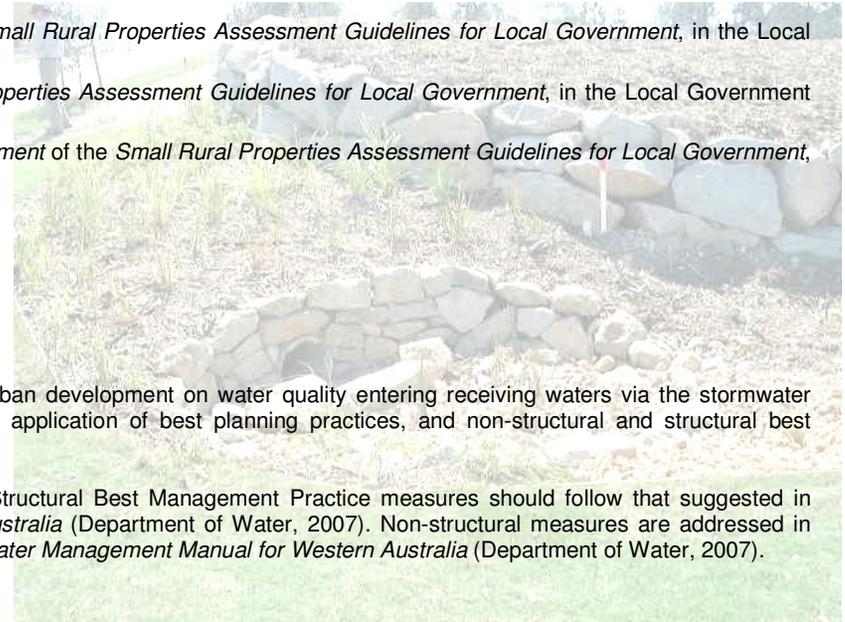
- Biodiversity Protection: Local Government NRM Policy Manual section 2.2 *Land Use Planning*.
- Waterways Management for Small Rural Properties: Section 4.1.1 *Waterways Management* (page 63) of section 2.2.2 *Small Rural Properties Assessment Guidelines for Local Government*, in the Local Government NRM Policy Manual.
- Nutrient Management: Section 4.4.3 *Nutrient Management* (page 64) of section 2.2.2 *Small Rural Properties Assessment Guidelines for Local Government*, in the Local Government NRM Policy Manual.
- Land Capability: Section 4.6 *Land Capability* (page 66) of section 2.2.2 *Small Rural Properties Assessment Guidelines for Local Government*, in the Local Government NRM Policy Manual.
- Planning and Development for Small Rural Properties: Section 5.0 *Planning and Development* of the *Small Rural Properties Assessment Guidelines for Local Government*, in the Local Government NRM Policy Manual.
- Horticulture: Section 2.2.3 *Horticulture*, in the Local Government NRM Policy Manual.

2.3 Urban Design

2.3.1 Water Sensitive Urban Design

Water Sensitive Urban Design (WSUD) is a design approach to minimise the impact of urban development on water quality entering receiving waters via the stormwater system. WSUD incorporates a number of principles into urban development through the application of best planning practices, and non-structural and structural best management practices.

Selection of Stormwater and Water Sensitive Urban Design Best Planning Practice and Structural Best Management Practice measures should follow that suggested in *Liveable Neighbourhoods* (2004) and the *Stormwater Management Manual for Western Australia* (Department of Water, 2007). Non-structural measures are addressed in section 5.0 of the Local Government NRM Policy Manual *Source Controls*, and in the *Stormwater Management Manual for Western Australia* (Department of Water, 2007).





These measures are supported by the Western Australian Planning Commission's (WAPC) Planning Bulletin No. 61 *Urban Stormwater Management*. This bulletin outlines the WAPC's policy and practice regarding urban stormwater management, including WSUD objectives, when dealing with new subdivisions.

In line with the Best Planning and Management Practices presented in these strategic documents, a Water Sensitive Urban Design Local Planning Policy is available in the Local Government NRM Policy Manual.

Policy Objectives

Policy objectives of the Water Sensitive Urban Design Local Planning Policy are:

- (a) protect the values of the Swan and Canning rivers and watercourses, consistent with the requirements of the *Environmental Protection (Swan and Canning rivers) Policy 1998*;
- (b) ensure water sensitive design best management practices are implemented for new development proposals so as to minimise nutrient and other pollutants exported to the Swan and Canning rivers
- (c) protect and where possible restore and enhance the environmental, economic and social (i.e. recreation and scenic) values of waterways and protected wetlands; and
- (d) retain or enhance open drains by converting them to 'living streams' in multiple-use corridors that provide habitat for wildlife and passive recreation opportunities wherever possible.

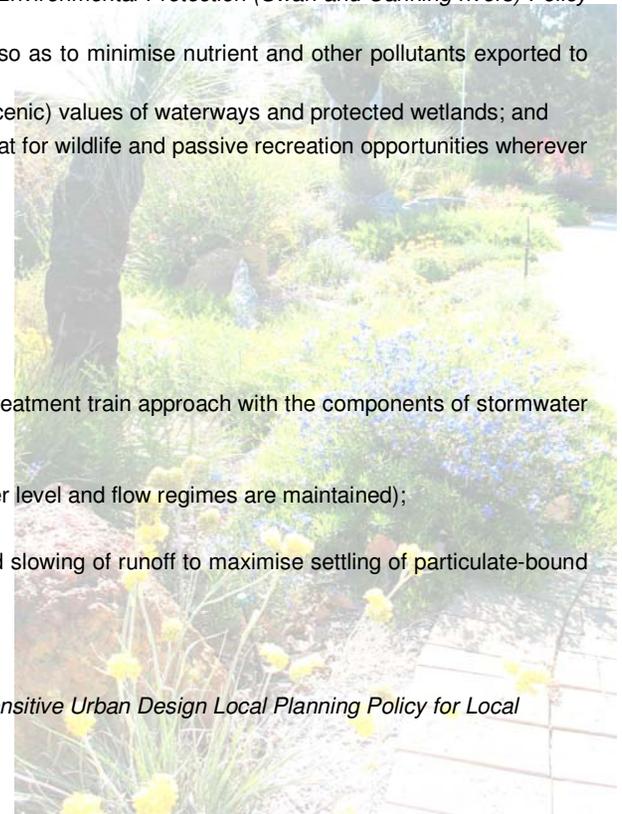
Key Principles and Strategies

Key water sensitive planning and management principles are:

- incorporation of water resource issues early in the land use planning process;
- addressing water resource management at the catchment and sub-catchment level;
- storage and stormwater reuse and stormwater treatment occur as high as possible in the catchment - use of a treatment train approach with the components of stormwater management located so that they follow the natural contours;
- property is protected from flooding or damage by surface water or groundwater;
- post-urban development conditions in watercourses approximate or improve upon pre-urban conditions (i.e. water level and flow regimes are maintained);
- stormwater system design incorporates as much as possible features of waterways that improve water quality;
- the use of vegetation (particularly native riparian vegetation) in stormwater management to promote filtering and slowing of runoff to maximise settling of particulate-bound pollutants; and
- multiple use corridors are used where appropriate.

For more information

These principles and associated best management practices are explored in greater detail in section 2.3.1 *Water Sensitive Urban Design Local Planning Policy for Local Government* in the Local Government NRM Policy Manual.





2.3.2 Landscaping

Landscaping is an increasingly important function in local government to improve the amenity value of both public and private areas. Conditions placed on development approval for residential subdivision and commercial development by local government usually include the requirement for a landscape plan to be submitted.

A sustainable approach to streetscaping and landscaping can save money and resources as well enhancing local biodiversity and a 'sense of place'.

Sustainable landscaping and streetscaping, including local native plants by soil type for the Swan Region, is addressed in the *Landscaping with Local Plants Policy and Guidelines for Local Government*, in the Local Government NRM Policy Manual.

Policy Objectives

The policy objectives of the *Landscaping with Local Plants Policy* are for council, developers and property owners to:

- (a) Increase the use of local native plants in landscaping across the public and private land.
- (b) Ensure that landscaping is more sustainable by:
 - i) reducing the amount of irrigation water required;
 - ii) reducing the amount of fertiliser required, and to minimise nutrient export to groundwater, wetlands and the Swan Canning river system;
 - iii) reducing threats to biodiversity by avoiding plant selection that may lead to future environmental weed problems; and
 - iv) preserving and enhancing the identity and 'sense of place' for the local community through appropriate landscaping.
- (c) Enhance local biodiversity by conserving existing native vegetation areas and restoring and creating new native vegetation areas to create habitat for indigenous fauna.

Key Principles and Strategies

The *Landscaping with Local Plants Guidelines for Local Government* in the NRM Policy Manual addresses a number of principles and practices concerning sustainable landscaping/streetscaping. Key guiding principles are:

- **Ecological corridors** - Linear remnants of native vegetation, such as along roadsides, on private property, or in drainage or other service corridors can provide important habitat and links between isolated areas of remnant vegetation.
- **Water quality** - Excessive fertiliser, watering practices and organic loads from leaf drop in urban areas are recognised as key contributors of nutrients to surface water bodies such as the Swan Canning river system via groundwater and stormwater drainage networks.
- **Water conservation** - Low water-use native gardens and landscape designs are increasingly being promoted due to the shortage of potable water supply and water restrictions imposed by State Government. Local native plants are well adapted to the harsh West Australian climate and do not usually require summer watering beyond the establishment period of the first two summers.
- **Planning and design** - Landscape design in a public setting should minimise areas of grass – particularly irrigated grass to active areas – and utilise local native plants as much as possible to minimise environmental impacts and ongoing maintenance costs, while increasing the area's biodiversity value.

Key strategic planning objectives for parks, open space and landscape areas should include:





- maintain and enhance local native conservation areas and significant trees;
 - use local native plants as the first choice;
 - develop a network of ecological corridors providing linkages to isolated existing and potential natural areas;
 - emphasise natural systems (in species selection) where the street network crosses or abuts bushland, wetlands or waterways;
 - basing the planting design of gateways on natural systems and showcasing signature local native species (e.g. grass trees, Banksias, Eucalypts);
 - minimise the use of irrigated planting areas; and
 - minimise the use of open grass areas (limit to functional areas only).
- **Plant Selection** - Street trees selected should be based upon a number of selection criteria *Biological-ecological*; *Social and aesthetic*; and *Functional*. These are elaborated upon in the *Landscaping with Local Plants Guidelines for Local Government*, section 3.3.4 *Sustainable Street Trees*, page 22.

For more information

For information on planning and design considerations; plant selection; sustainable street trees; education, awareness and capacity building; and a checklist for landscaping with local plants, please refer to section 2.3.2 *Landscaping with Local Plants* in the Local Government NRM Policy Manual.



3.0 Stormwater Management



3 Stormwater Management

Until relatively recently, little attention or resources have been allocated to considering the environmental impacts of urbanisation and the consequences of changed flow regimes on the transport of contaminants to the Swan Canning river system and other water bodies.

Urbanisation leads to changes in both the quantity and quality of water that is delivered to receiving waters. Unmanaged, the cumulative impact of these changes can result in considerable damage to the environment.

The drying climate in south-west Western Australia during the past 30 years, and increasing community environmental awareness, are driving a change in stormwater management from being almost solely managed as a waste product to being valued as a resource and managed for multiple outcomes.

Stormwater objectives and management principles for Western Australia, together with an outline of the information contained in the *Stormwater Management Manual for Western Australia* is available in section 3.0 *Stormwater Management* of the Local Government NRM Policy Manual.

Key Principles and Strategies

- Incorporate water resource issues as early as possible in the land use planning process.
- Address water resource issues at the catchment and sub-catchment level.
- Ensure that stormwater management is part of the total water cycle and natural resource management.
- Define stormwater quality management objectives in relation to the sustainability of the receiving environment.
- Determine stormwater management objectives through adequate and appropriate community consultation and involvement.
- Ensure stormwater management planning is precautionary, recognising intergenerational equity, conservation of biodiversity and ecological integrity.
- Recognise stormwater as a valuable resource and ensure its protection, conservation and reuse.
- Recognise the need for site specific solutions and implement appropriate non-structural and structural solutions.

The approach recommended to achieve the objectives and principles is outlined below.

Protect water quality

To ensure stormwater remains clean and retains its high value:

- implement best management practices on site;
- implement non-structural controls, including education and awareness programs;



Key Principles and Strategies (cont):

- install structural controls at source or near source;
- use in-system management measures; and
- undertake regular and timely maintenance of infrastructure and streetscapes.

Protect infrastructure from flooding and inundation

Ensuring stormwater runoff from infrequent high intensity rainfall events is safely stored and conveyed by:

- creating a safe passage of excess runoff from large rainfall events towards watercourses and wetlands;
- storing and detaining excess runoff from large rainfall events in parks and multiple use corridors; and
- safely conveying excessive groundwater to the nearest watercourse.

Minimise runoff

Slow the migration of rainwater from the catchment and reduce peak flows by:

- retaining and infiltrating rainfall within property boundaries;
- using rainfall on-site or as high in the catchment as possible;
- maximising the amount of permeable surfaces in the catchment;
- using non-kerbed roads and car parks; and
- planting trees with large canopies over sealed surfaces such as roads and carparks.

Maximise local infiltration

To achieve fewer water quality and flooding problems:

- minimise impervious areas;
- use vegetated swales;
- use soakwells and minimise use of piped drainage systems;
- create vegetated buffer and filter strips; and
- recharge the groundwater table for local bore water use.





Key Principles and Strategies (cont):

Make the most of nature's drainage

To develop cost effective and safe alternatives to pipes and drains:

- retain natural channels and incorporate into public open space;
- retain and restore riparian vegetation to improve water quality through bio-filtration;
- create riffles and pools to improve water quality and provide refuge for flora and fauna;
- protect valuable natural ecosystems; and
- minimise the use of artificial drainage systems.

Minimise changes to the natural water balance

Avoid summer algal blooms and midge problems and protect our groundwater resources by:

- retaining seasonal wetlands and vegetation;
- maintaining the natural water balance of wetlands;
- not directing drainage to conservation category wetlands or their buffers, or to conservation value wetlands or their buffers, where appropriate; and
- recharge groundwater by stormwater infiltration.

Integrate stormwater into the landscape

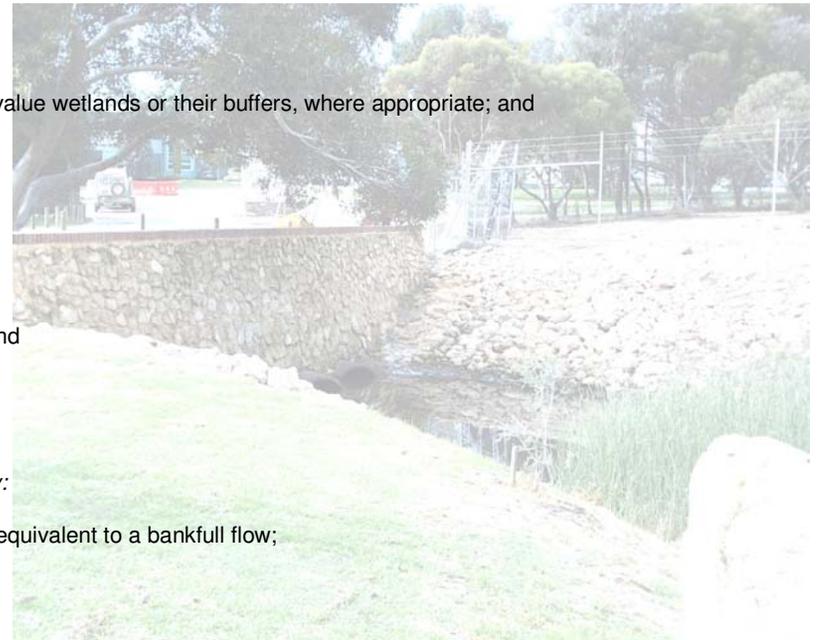
Add value while minimising development costs by:

- incorporating natural drainage systems into public open space systems;
- adopting water sensitive urban design approach to road layout, lot layout and streetscape; and
- maximising environmental, cultural and recreational opportunities.

Convert drains into natural streams

Lower flow velocities, benefit from natural flood water storage and improve waterway ecology by:

- creating stable streams, with a channel size suitable for one in one year ARI rainfall events, equivalent to a bankfull flow;
- accommodating large and infrequent storm events in the floodplain; and
- creating habitat diversity to support a healthy ecologically functioning waterway.





Key Principles and Strategies (cont):

For more information

More detail can be found in the Department of Water (2007) *Stormwater Management Manual for Western Australia*, available from:
www.water.wa.gov.au



4.0 Land Management



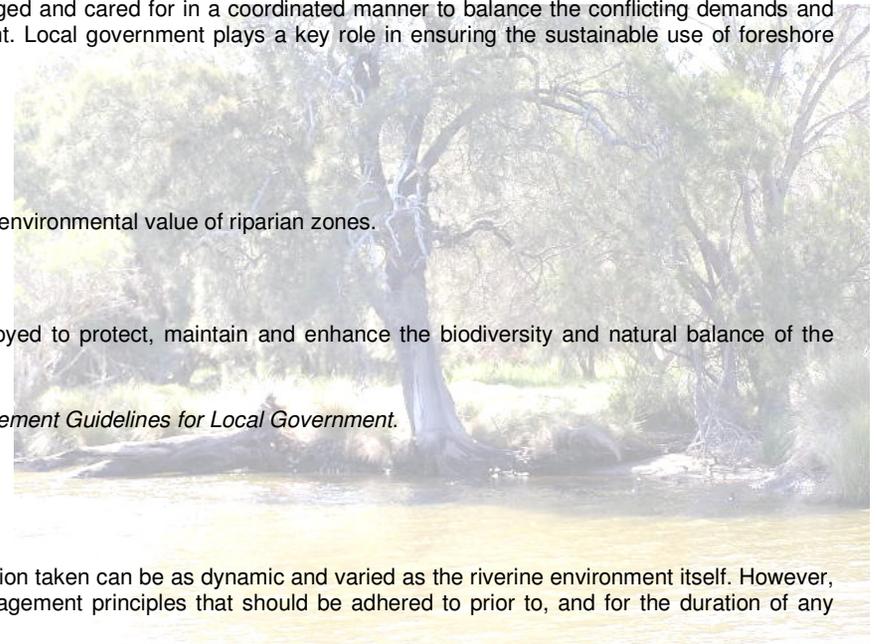
4 Land Management

4.1 Foreshore Management

A 'foreshore' is defined as: 'land adjoining or directly influencing a body of water that is managed to protect waterway and riparian values' (Water and Rivers Commission *Foreshore Policy 1*, 2002). Foreshores are a major conservation and recreational resource and highly regarded due to people's desire to live and recreate near water. Foreshores play a very important role in maintaining waterway health, filtering nutrients and sediments, and providing habitat areas for many plants and animals.

Foreshores are a particularly dynamic part of the landscape and can change markedly – even under natural conditions. However, human impact since European settlement has resulted in widespread and large-scale degradation of these vulnerable areas.

Disturbance and the subsequent impact of degradation have raised awareness of the need for careful use and management of foreshore areas. Foreshores must be managed and cared for in a coordinated manner to balance the conflicting demands and provide for the protection of the environment. Local government plays a key role in ensuring the sustainable use of foreshore areas.



Policy Objectives

Policy objectives for foreshore management are:

- Land use or development to be undertaken is sustainable, and does not undermine the environmental value of riparian zones.
- Protection of native plant and animal communities (biodiversity).
- Minimise disturbance to the foreshore ecosystem through effective management.
- Ensure that best management practices, strategies and other mechanisms are employed to protect, maintain and enhance the biodiversity and natural balance of the foreshore ecosystem.

These objectives can be achieved through implementation of section 4.1 *Foreshore Management Guidelines for Local Government*.

Key Principles and Strategies

Some key overarching guiding principles are described below.

Effective foreshore management is an ongoing task. The management techniques or direction taken can be as dynamic and varied as the riverine environment itself. However, regardless of the works to be done on an area, there are a series of planning and management principles that should be adhered to prior to, and for the duration of any restorative undertaking.



Key Principles and Strategies (cont):

- **Set clear goals.** This is predominantly to ensure that all those involved in the project share a common vision.
- **Find a balance.** It may be necessary to find a compromise or balance trade-offs.
- **Management should be adaptive.** Management efforts should be based upon a system of cautious intervention that progresses the system towards a solution, and incorporates learning by doing.
- **Plans for foreshore management should not be prescriptive.** They should be flexible and amenable to change.
- **Take a large-scale, ecosystem approach wherever possible, recognising how the area fits into the landscape, and acknowledging that the problem may not be restricted to one site, but may be a catchment-wide issue.**
- **It is usually more effective to protect a foreshore that remains in good condition first, than to spend large amounts of money trying to rehabilitate parts that are already degraded.** In effect, protection is the best form of rehabilitation. The focus of rehabilitation of degraded foreshore areas should be on those areas with the greatest risk of long-term degradation, as well as potential for recovery.
- **Recognise the intrinsic need to engage community and stakeholders.** Community involvement is an effective way of gaining public ownership of foreshore management problems and active community participation will significantly enhance the level of activity in foreshore restoration projects.
- **Recognise the implementation of a foreshore management strategy will require long-term commitment,** e.g. stabilisation, weed control, infill planting.

For more information

For information on foreshore issues; relevant policies and legislation; statutory and non-statutory planning and development mechanisms; foreshore management plans; foreshore condition assessment; restoration and other management issues, please see section 4.1 *Foreshore Management*.

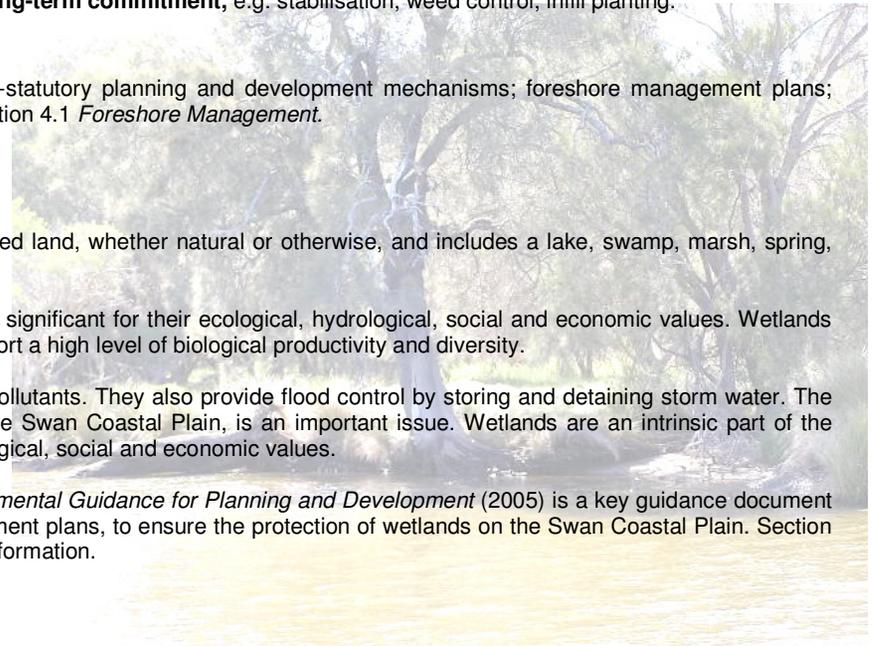
4.2 Wetland Management

A 'wetland' is 'an area of seasonally, intermittently or permanently waterlogged or inundated land, whether natural or otherwise, and includes a lake, swamp, marsh, spring, dampland, tidal flat or estuary' (*Environmental Protection Act 1986*) (EP Act).

Wetlands are an intrinsic part of the hydrology of a region. They are widely recognised as significant for their ecological, hydrological, social and economic values. Wetlands have characteristic vegetation, faunal assemblages and geomorphology, and typically support a high level of biological productivity and diversity.

Wetlands can act as biological filters by retaining sediment, and absorbing nutrients and pollutants. They also provide flood control by storing and detaining storm water. The continued degradation and loss of wetland habitat in Western Australia, particularly on the Swan Coastal Plain, is an important issue. Wetlands are an intrinsic part of the hydrology of a region. They are widely recognised as significant for their ecological, hydrological, social and economic values.

The Environmental Protection Authority (EPA) *Draft Guidance Statement No. 33 – Environmental Guidance for Planning and Development* (2005) is a key guidance document for proper planning and management measures, including preparation of wetland management plans, to ensure the protection of wetlands on the Swan Coastal Plain. Section 4.2 *Wetland Management* in the Local Government NRM Policy Manual, draws upon this information.





Key Objectives

The EPA's *Position Statement No. 4 Environmental Protection of Wetlands* (EPA 2004) sets out the EPA's position on wetlands.

- **Avoid impacts on wetlands**
Avoid direct, indirect and cumulative impacts that may adversely affect the environmental values and functions of wetland areas. In all cases where some loss of any wetland value or function is unavoidable, the EPA recommends that compensatory actions are implemented, with a view to achieving 'no net loss of wetland values and functions'.
- **Adequate information and consultation**
The management of a wetland should derive from an adequate evaluation of the wetland's attributes, values and functions, and threatening processes. Decisions on the significance of a wetland and its appropriate environmental objectives and management measures should be based on a thorough set of information and appropriate consultation with the community, stakeholders, key government agencies and environmental professionals with recognised expertise in wetland issues.
- **Protection based on the wetland management category**
Identify the management category of the wetland. This provides a guide for the management of land use and development around a wetland.

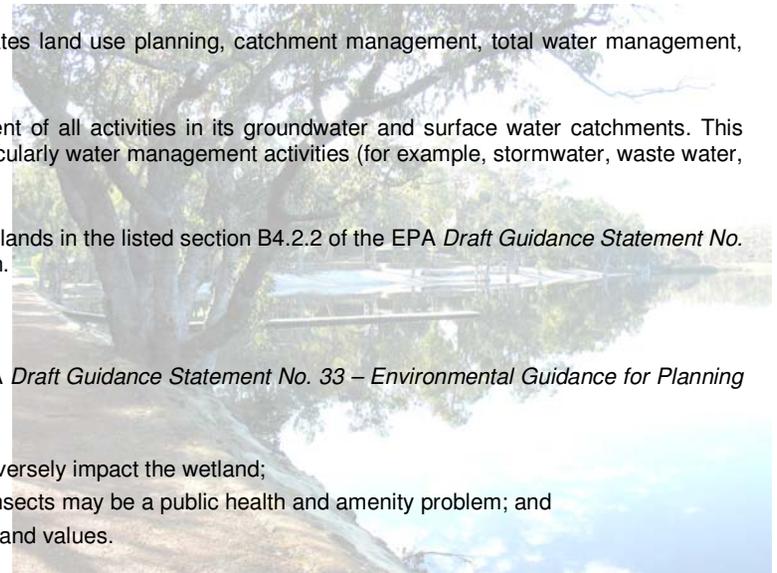
For more information

For information on the wetland management categories, please see Water and Rivers Commission *Wetlands Position Statement (2001)*, available from the Department of Environment and Conservation (DEC) website at: www.dec.wa.gov.au

- **Integrated management approach**
Take a holistic approach to the management of activities in the wetland catchment that integrates land use planning, catchment management, total water management, natural resource management and biodiversity protection.
- **Management of activities in the catchment**
To protect the key values and functions of wetlands, the EPA expects appropriate management of all activities in its groundwater and surface water catchments. This includes activities that may individually or cumulatively impact adversely on wetland values, particularly water management activities (for example, stormwater, waste water, irrigation, water abstraction) and the clearing of native vegetation.

* For the purposes of the environmental impact assessment process, the EPA considers that the wetlands in the listed section B4.2.2 of the EPA *Draft Guidance Statement No. 33 – Environmental Guidance for Planning and Development* (2005) require a high level of protection.

- **Management near protected wetlands**
To protect a wetland's values, key management actions should include the following:
 - fully protect the wetland and buffer area (see attachment B4-3 and section B4.3.2 of the EPA *Draft Guidance Statement No. 33 – Environmental Guidance for Planning and Development* (2005), available from: www.epa.wa.gov.au);
 - rehabilitate disturbed areas and manage threatening processes;
 - implement separation requirements between the wetland and land uses with a potential to adversely impact the wetland;
 - implement separation between wetlands and land uses where disease-vector and nuisance insects may be a public health and amenity problem; and
 - manage activities and developments outside the buffer area to avoid adverse impacts on wetland values.





Key Objectives (cont):

- **Mitigation of impacts**

In all cases where projects may cause unavoidable loss of wetland value or function, the EPA recommends that compensatory actions are implemented. The preferred order of preference as set out in *Preliminary Position Statement No. 9 Environmental Offsets* (EPA, 2004) is:

- avoidance of adverse impacts;
- minimisation of adverse impacts;
- rectification through repair and restoration of impacted sites as soon as possible;
- reduction and elimination of adverse impacts through time; and
- offsets carried out to counterbalance adverse impacts (at a distance from the impacted site).

Identify the level of environmental significance and broad environmental objectives for the wetlands that may be impacted by activities in the study area. These considerations are typically represented by the wetland management category. For sites on the Swan Coastal Plain refer to the Geomorphic Wetlands Swan Coastal Plain dataset to identify if a wetland has a current management category.

Where information is not available or the dataset is in dispute, submit results of investigations and proposed management to the DEC for comment and advice at an appropriate time. Ensure that approved methodologies are used.

For more information

For more information on Local Area Planning; potential management measures relevant to siting and design; setting of conditions on development; and preparing a wetland management plan, please refer to section 4.2 *Wetland Management*.

4.3 *Bushland Management*

Perth's unusual, diverse natural flora and fauna is unique. The biodiversity found in the region makes it one of the 25 global biodiversity hot spots. However, clearing and urban growth also threaten this natural heritage.

During the past decade numerous State and local government agencies and the community have helped protect many regionally significant natural areas.

Guidelines have been prepared for local government to develop strategic approaches to conserving biodiversity. The *Local Government Biodiversity Planning Guidelines* sets out a process for the development of a biodiversity strategy by local government which includes planning for the management of biodiversity on local government managed land such as bushland and foreshore areas.

Key Principles and Strategies

Nine guiding principles for biodiversity planning and conservation reflected throughout the *Local Government Biodiversity Planning Guidelines*, are outlined below.



Key Principles and Strategies (cont):

- **Retaining at least 30% of the pre-European extent of each ecological community is required to prevent an exponential loss of species and failure of ecosystem processes.**
- **Protect regionally and locally significant natural areas.** The protection of these local areas are important for the following three primary reasons:
 1. to maintain a basic level of natural diversity (by adding to and complementing areas identified to be protected by State and regional processes, moving towards 30% retention and protection where this is possible within existing constraints);
 2. to buffer and provide connectivity between protected regionally significant natural areas; and
 3. local community benefits (passive recreation, sense of place, amenity, and local environmental services).
- **Protect existing vegetation before revegetating other areas.** Conserving viable natural areas of native vegetation, wetlands and waterways is by far the most effective way to conserve biodiversity from both an ecological and an economic perspective.
- **Regeneration is a higher priority than revegetation.** Where degradation has occurred, natural regeneration should first be encouraged before direct seeding and revegetation is attempted.
- **Prioritise protection and management of the highest biodiversity value natural areas.** Resources should be prioritised to those natural areas that have the highest biodiversity value and are viable.
- **Community involvement in helping conserve biodiversity.** Engaging the local community to help identify, protect and manage important natural areas will lead to support and ownership in the community of any biodiversity outcomes.
- **Biodiversity values must be made transparent in decision-making processes.** Only when biodiversity values are fully recognised can the community and land managers fully comprehend the loss or gain associated with the removal or retention of natural areas.
- **Site-specific field survey is essential to understand biodiversity value.**
- **Natural area conservation is a legitimate land use.** The protection of natural areas is a legitimate land use within all land zonings, including urban zoned land. Natural areas have intrinsic values and provide key environmental infrastructure to underpin all types of land use.

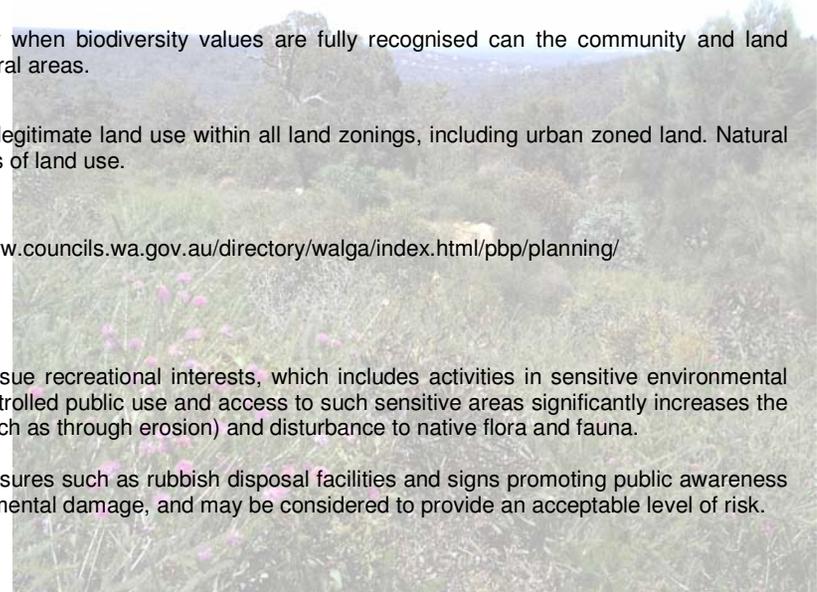
For more information

Please refer to the *Local Government Biodiversity Planning Guidelines*, available from: <http://www.councils.wa.gov.au/directory/walga/index.html/pbp/planning/>

4.4 Recreation

As Western Australia's population has grown, there has been an increase in pressure to pursue recreational interests, which includes activities in sensitive environmental areas, such as wetlands, lakes, foreshore areas and public drinking water source areas. Uncontrolled public use and access to such sensitive areas significantly increases the risk of contamination to nearby waterbodies and drinking water sources, damage to the land (such as through erosion) and disturbance to native flora and fauna.

Controlled access for certain types of recreational activities, with appropriate management measures such as rubbish disposal facilities and signs promoting public awareness of water quality issues, would reduce the potential for contamination and other forms of environmental damage, and may be considered to provide an acceptable level of risk.





There are a range of strategic recreation management measures that may be applied to the sensitive environments of wetlands, lakes and foreshore areas. These are outlined in section 4.4 *Recreation*, in the Local Government NRM Policy Manual.

Key Principles and Strategies

- **Where development of recreational facilities is desired, the creation of nodes, or a clustering of related activities, is recommended.** For example, commercial developments associated with recreation and tourist facilities could be clustered in one suitable location, such as already modified areas. Through this process it is also possible to reduce pressure on sensitive areas that require restricted access and greater levels of protection.
- **The selection of sites suitable for human access and recreation, such as picnicking, fishing and swimming, requires careful consideration and planning.**
 - Development for recreation to have regard for;
 - natural morphology of the area;
 - degree of modification to the environment;
 - ability of the environment to sustain added pressure from usage;
 - predominant characteristics of adjoining residential areas; and
 - degree of protection afforded to the area.
 - Select sites that are stable, or at least not prone to erosion, and have ample potential to be hardened or protected with good vegetative cover. This will reduce the environmental impact and cost of maintenance.
 - Access to the foreshore for recreational sailing, boating, windsurfing, swimming and other water sports does not cause damage to foreshore vegetation or erosion of the banks. Local government should refer to, and ensure compliance with Swan River Trust Regulation 7.1 *Launching of Boats* and Swan River Trust Policy DE23 – *Launching Ramps and Slipways* (2002), available from the Trust website www.swanrivertrust.wa.gov.au
 - Fringing vegetation, well delineated with fencing or log bollards and signage, be maintained on the riparian zone to provide tree root support of the bank, shade and habitat.
 - Development must be set back from the riparian zone, with an adequate buffer zone between the development and waterway/waterbody.
 - Restrict areas of active recreation to nodes to minimise impacts on environmentally sensitive areas. Recreation in foreshore reserves should be restricted, where possible, to passive activities.
- Land use and management strategies made regarding recreational activities in public drinking water source areas should be consistent with the Water and Rivers Commission (2003) *Policy and Guidelines for Recreation within Public Drinking Water Source Areas on Crown Land* (see www.water.wa.gov.au), the primary aim of which is to protect the drinking water environmental value of these areas on Crown land, in the interest of public health.

For more information

Please refer to section 4.4 *Recreation* in the Local Government NRM Policy Manual.



5.0 Source Controls



5 Source Controls

Dealing with pollution at source is by far the most effective means of protecting water quality. Prevention is far better and cheaper than the cure in the case of pollution.

The EPA regulates the pollution generating activities of businesses and industry through licensing and regulations. However, there are many waste generating activities that are not part of major industrial processes and are not subject to licensing that still have significant potential to pollute stormwater and receiving waters.

Responsibility for dealing with these small pollution-generating activities rests with local government, business managers and the community. The *Unauthorised Discharge Regulations 2004* provide a mechanism to prosecute small to medium businesses and mobile operators for offences which would not be considered large enough to be pollution under the *Environmental Protection Act 1986*. This provides a disincentive to bad practice which, when coupled with promotion and education encouraging good environmental practices, prevents the unauthorised discharge of waste to the environment.

Education backed by enforcement is considered the best means of ensuring business operators are aware of their potential to pollute stormwater and have knowledge of the measures available to minimise pollution risks.

5.1 Best Management Practice

5.1.1 Nutrient and Irrigation Management

The application of artificial fertilisers and irrigated water supply can have unwanted impacts on the natural environment, especially water bodies, if not carefully managed. Problems linked to historic irrigation and fertiliser application practice include soil erosion with resultant turbidity and excessive sediment in wetlands and waterways; elevated levels of leached salts entering the watertable and harming the downstream ecology; eutrophication (excessive aquatic plant growth) in streams and wetlands which can displace or kill plants or animals due to toxicity, shading or oxygen starvation; and excessive levels of dissolved ammonia toxic to fish.

An adaptive approach to fertiliser and irrigation management is required which includes monitoring to ensure that peak plant growth is matched with efficient resource use (e.g. that fertiliser and water is not wasted).

The importance of this issue is evidenced in the Department of Water (DoW) - Water Quality Protection Note (WQPN): *Nutrient and Irrigation Management Plans (NIMPs)*, which provides guidance on establishment of crops, turf trees and gardens, and the preparation of NIMPs; and initiatives such as TurfSustain, a training package and handbook for turf practitioners, which provides practical guidance for local government on best environmental management practices.

For more information

Please refer to section 5.1.1 *Nutrient Management* in the Local Government NRM Policy Manual.



5.1.2 Erosion and Sediment Control

Water erosion and the subsequent sedimentation of streams and watercourses are recognised as a primary contributor to the degradation of waterways and water quality. The potential for accelerated erosion exists wherever vegetation is removed and soil disturbed, and overland flow of stormwater runoff is altered.

Erosion and sedimentation in urban catchments results from the disturbance of soil associated with urban development and building works, changes in land use, the installation of services and infrastructure, and subsequent disposal of stormwater into receiving waters. Regulation by planning and building authorities is used to reduce the amount of erosion, sedimentation and nutrient export associated with the development of land.

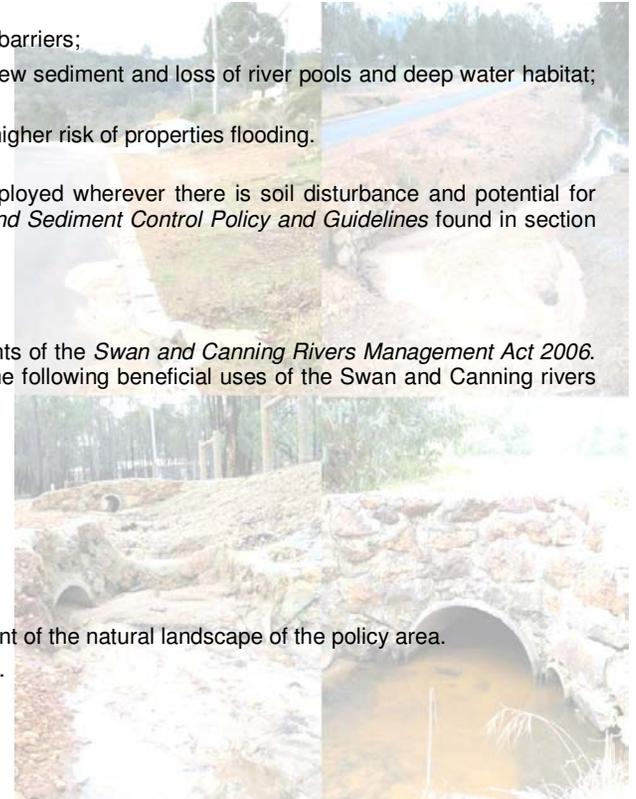
On the Swan Coastal Plain and in the Darling Range there is increased evidence of adverse impacts from erosion and subsequent sediment deposition including:

- nutrient enrichment and eutrophication of our rivers, as phosphorus and nitrogen bind to eroded particulates;
- reduced capacity of flood ways, particularly as weeds grow on deposited sediment, stabilising it into permanent barriers;
- adverse impacts on native fauna (including fish) from turbid water reaching the watercourse, weed growth on new sediment and loss of river pools and deep water habitat; and
- reduced capacity of stormwater systems due to drainage pipes becoming blocked with sediment, resulting in a higher risk of properties flooding.

The control of erosion is therefore important. Soil conservation and site management techniques should be employed wherever there is soil disturbance and potential for erosion such as road and building construction. Such techniques are available and are explored in the *Erosion and Sediment Control Policy and Guidelines* found in section 5.1.2 of the Local Government NRM Policy Manual.

Policy Objectives

- (a) Protect the beneficial uses of the Swan and Canning rivers and watercourses, consistent with the requirements of the *Swan and Canning Rivers Management Act 2006*. In particular, by preventing adverse impacts from sedimentation of eroded material, enhance protection of the following beneficial uses of the Swan and Canning rivers and waterways:
 - (i) as a habitat for:
 - locally indigenous fauna, including migratory and threatened species; and
 - locally indigenous flora, including threatened species.
 - (ii) for the maintenance of the diversity and abundance of locally indigenous fauna and flora species;
 - (iii) to provide a biologically productive and genetically diverse natural environment;
 - (iv) to maintain ecological processes; and
 - (v) together with their beds, banks and contours, the use of fringing native vegetation as an important element of the natural landscape of the policy area.
- (b) Reduce turbidity of runoff from disturbed sites by taking measures to prevent erosion and detain any sediment.





Key Principles and Strategies

There are five basic steps to reducing the impacts of erosion and sedimentation from urban development sites. These steps should be followed when preparing an erosion and sediment control plan.

○ Stopping it before it gets started

Tests show that up to 100 times more soil can be lost where the ground cover has been disturbed, than from where cover has been maintained. Therefore, minimising the amount of the site you disturb is critical. Ways to achieve this are:

- Wherever possible, maintain a good grass cover along the road verge during construction.
- Ensure the only vehicles that go on the site are essential for works activities.
- Consider temporary fencing to keep some areas 'out of bounds'.
- Disturb only the ground where it is essential for the construction process.
- Consider erosion potential during planning of site works and minimise period of disturbance.
- Construct a single, stabilised entrance to ensure vehicles can access the site in wet conditions and not track mud/sand back out onto the road when they leave.

○ Keeping the topsoil on the site

The topsoil which must be disturbed needs to be protected and kept for reuse later. Management methods are:

- Create a stockpile to one side where it will be secure.
- Put the stockpile on the block (not the footpath or the neighbour's land).
- Construct a sediment fence on the downhill side of the stockpile.
- Keep stockpile away from areas where water may flow.
- Cover the topsoil if it will be stockpiled for more than a three week period.
- Never place a stockpile within two metres of a stormwater inlet pit unless the pit is inactive and covered.

○ Preventing the soil being washed off the site

Water flowing over the disturbed surface is the main cause of erosion. By reducing the amount of water flowing over the site or by directing water to safe areas, soil can be kept on the site. Re-establishing disturbed areas quickly is essential to reduce the potential for erosion.

- Where surface water can run along a path more than 100 metres long before it reaches the construction site, construct earth banks along the topside to divert water around the disturbed area.
- Put in the permanent stormwater system before roofing is commenced.
- Plan to finish the paved areas (at least to a gravel standard) early in the process rather than leaving them bare for the duration of the job.





Key Principles and Strategies (cont):

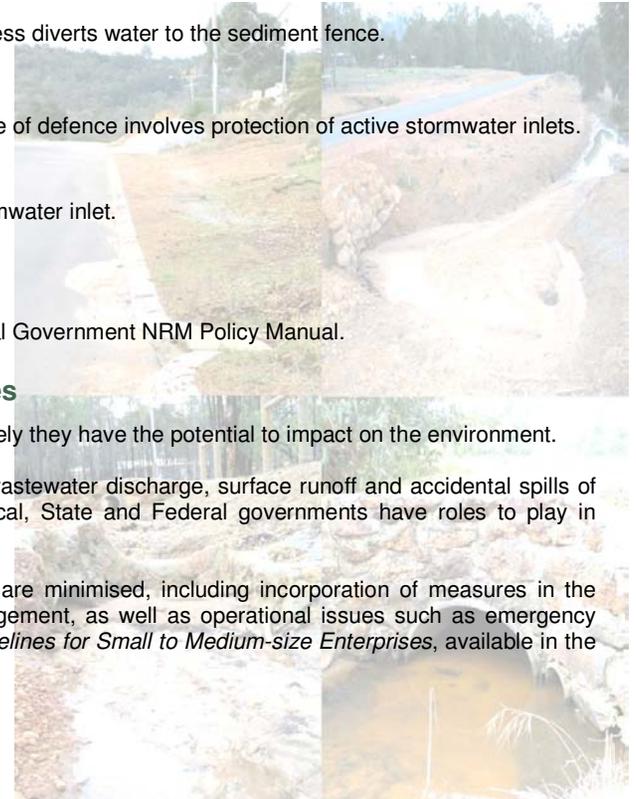
- Once a section of work is completed, reinstate the disturbed ground around it before moving on to the next part of the job (reinstatement can be sowing of grass, laying of turf or mulching).
- o **Catching what does wash off**

Even when the land disturbance is kept to a minimum, significant soil losses can still occur. Acknowledging that some erosion is going to occur, steps must be taken to intercept and retain mobile sediment in the work site. An effective way to retain sediment on site is to erect a sediment fence.

 - Erect sediment fences along the bottom edge of the disturbed area to collect the materials being washed off.
 - Use an approved filter fabric with the bottom 150mm buried to prevent soil washing under the fence.
 - Where the stabilised access is on the low side of the block, ensure that the small hump in the stabilised access diverts water to the sediment fence.
- o **Keeping the soil out of the drainage system**

Finally, despite the application of the above practices, some eroded material may still leave the site. The last line of defence involves protection of active stormwater inlets.

 - Place a sock made of geotextile and filled with gravel over the entrance to the stormwater pit.
 - Do not use a sock where it can become a traffic hazard or where it might simply divert water to another stormwater inlet.
 - Do not wash down equipment or dispose of waste into the stormwater system.



For more information

Please refer to section 5.1.2 *Erosion and Sediment Control Policy and Guidelines for Local Government* in the Local Government NRM Policy Manual.

5.1.3 Cleaner Production and Pollution Prevention for Small to Medium-size Enterprises

Small to medium-sized enterprises (SME) are important to the economy. However, if they are not managed effectively they have the potential to impact on the environment.

SME are numerous on the Swan Coastal Plain and have the potential to contaminate water resources through wastewater discharge, surface runoff and accidental spills of hazardous chemicals. It is increasingly recognised that the community, industry, education institutions, and local, State and Federal governments have roles to play in preventing pollution.

Best management practices must be employed to ensure that risks to stormwater and receiving water quality are minimised, including incorporation of measures in the planning and building design of industrial developments (e.g. chemical storage, bunding and stormwater management, as well as operational issues such as emergency preparedness and response). Such measures are addressed in *Cleaner Production and Pollution Prevention Guidelines for Small to Medium-size Enterprises*, available in the Local Government NRM Policy Manual.



Key Principles and Strategies

Consideration should be given to the following issues in determining the suitability of zoning commercial/industrial land uses in the government local planning scheme:

- access to waste disposal service (e.g. deep sewerage);
- sufficient area to provide for safe and effective management of waste products;
- buffers from sensitive environments (e.g. residential areas, wetlands, land subject to flooding, public drinking water source areas); and
- transport impacts.

In determining the best planning practices with regards to industrial developments it is best to establish the type of industry and the potential risks associated with its operations at the outset of the development approval process. A pre-emptive approach would be to ask the following questions of the applicant.

- What is proposed to happen at the premises?
- What are the inputs?
- What are the outputs?
- What will the waste products be?
- How will wastes be disposed of?

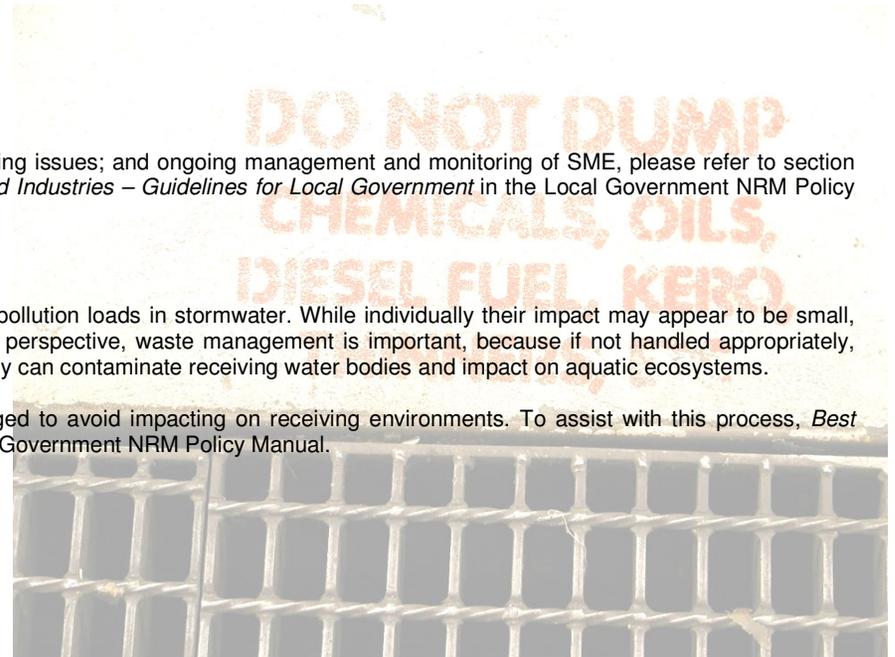
For more information

For information on relevant policy and legislation; land use planning; planning and building issues; and ongoing management and monitoring of SME, please refer to section 5.1.3 *Cleaner Production and Pollution Prevention Guidelines for Small to Medium Sized Industries – Guidelines for Local Government* in the Local Government NRM Policy Manual.

5.1.4 Waste Management

Diffuse sources of waste and pollution are widely recognised as a major contributor of pollution loads in stormwater. While individually their impact may appear to be small, cumulatively these pollutants can have a significant impact. From a stormwater quality perspective, waste management is important, because if not handled appropriately, wastes from a variety of sources can be introduced into the stormwater system where they can contaminate receiving water bodies and impact on aquatic ecosystems.

It is through simple everyday actions that much of this diffuse pollution can be managed to avoid impacting on receiving environments. To assist with this process, *Best Practice Waste Management Guidelines for Local Government* are available in the Local Government NRM Policy Manual.





Key Principles and Strategies

The Waste Management Hierarchy

The waste management hierarchy (Department of Environment, 2004) provides the basis for waste management policy and strategy development. The hierarchy incorporates a range of strategies – avoid, minimise, recycle, treat and dispose - that can be used to guide waste management decision-making. In terms of environmental desirability, the hierarchy moves from the most preferred option (avoidance) to the least preferred option (disposal).

- **Avoidance:** Complete removal of materials from the waste stream through a change in process or practice.
- **Reduction:** Changes to a product or process that reduce the amount of pollution or waste produced (e.g. replacing disposable items with more durable alternatives).
- **Reuse:** Use of products and materials that can be reused with minimal processing (e.g. using waste materials from one process as the raw material for another process).
- **Recycling:** Converting products back into their constituent raw materials and reprocessing this raw material in new articles.
- **Treatment:** Removing pollutants in waste streams by chemical or physical methods and thereby decreasing the environmental impacts.
- **Disposal:** Transferring waste to another location under controlled conditions for specialised treatment or long-term storage (no further use).

For more information

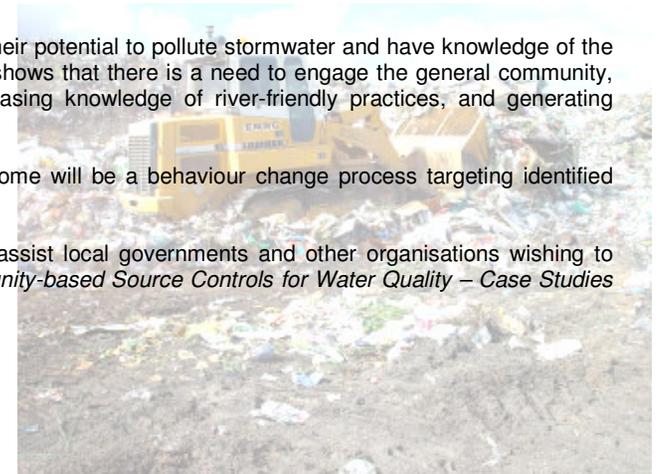
For information on relevant policy and legislation, waste streams, illegal dumping, litter management, street sweeping, stormwater waste collection measures, depot management, and a BMP checklist, please see section 5.1.4 *Best Practice Waste Management Guidelines for Local Government* in the Local Government NRM Policy Manual.

5.2 Education and Awareness

Education, backed by enforcement, is considered the best means of ensuring business operators are aware of their potential to pollute stormwater and have knowledge of the measures available to minimise pollution risks. An evaluation by the Swan-Canning Cleanup Program (SCCP) shows that there is a need to engage the general community, increase awareness of river health issues – focussing on reduction of nutrients and other pollutants, increasing knowledge of river-friendly practices, and generating behavioural change.

The new phase of SCCP, the Healthy Rivers Program, focuses on community behaviour change. A key outcome will be a behaviour change process targeting identified stakeholder groups in priority areas and facilitating adoption of practices that will result in increasing river health.

Local government, as the first point of contact, can play a key role in educating and raising awareness. To assist local governments and other organisations wishing to establish community-based source control programs, the Local Government NRM Project has produced *Community-based Source Controls for Water Quality – Case Studies for Local Government*, available in the Local Government NRM Policy Manual.





Key Principles and Strategies

- Targeted engagement is required to increase awareness and knowledge, and change community behaviour.
- Increase focus on public participation in urban stormwater management, involving the community in deliberative decision-making processes, as opposed to traditional community education approaches (e.g. distribution of education materials). By encouraging community involvement, greater ownership of issues and solutions to pollution control at the source is facilitated.
- Key messages for development of community-based source controls, as drawn from the highlighted case studies, are:
 - Educating the community to make difficult and complex changes is an ongoing challenge.
 - Local government can play a key role in the promotion, awareness-raising and ultimately behaviour change to protect the environment.
 - The extent to which the desired change in community behaviour is achieved, is directly related to the efficacy of the public education program.
 - Programs should utilise clear, simple messages, and a diversity of media exposure.
 - Programs should utilise some form of evaluation and feedback. Ideally, programs should use an initial pre-intervention survey to establish community attitudes and barriers to undertaking sustainable activities, followed by post-implementation feedback to review effectiveness and improve where necessary.
 - Information should be tailored to a particular area and/or at different sectors of the community, and linked by consistent messages around community attitudes.
 - Where appropriate, develop and maintain high-profile demonstration sites that show the community what can be achieved (e.g. water-wise gardens).

For more information

For information on available community-based source control initiatives, and strengths and weaknesses of each, please refer to section 5.2 *Education and Awareness* in the Local Government NRM Policy Manual.

