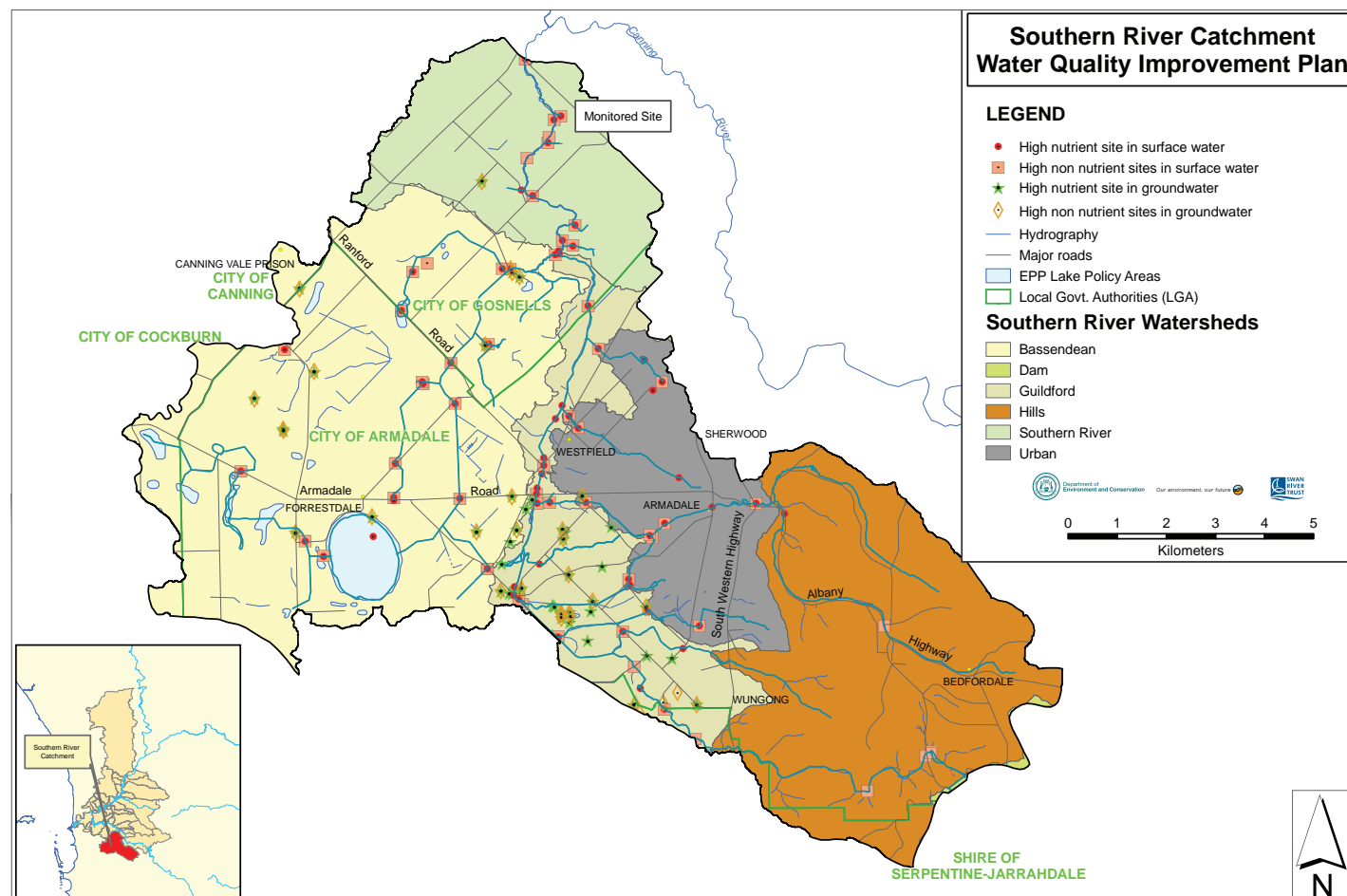


5. Monitoring and review

Strategy	Implementation	Lead organisations	Supporting partners	Timing
How do we measure our success?	<p>The study on <i>Surface Water and Groundwater Quality in the Southern River Catchment</i> (CSIRO 2008) and the Trust's annual catchment nutrient reports provide a baseline for water quality condition.</p> <ul style="list-style-type: none"> Design and conduct a water quality monitoring plan for the 2009-10 period Annual stakeholder meeting to assess progress on current and new programs, identify funding opportunities and determine objectives and actions for the next 12 months 	Trust, SERCUL	WC, DoP, CoA, CoG, CSIRO, Perth Region NRM, DoW, DEC, AGLG, developers, ARA	Starting 2009-10

Maps



Coastal Catchments Initiative

In June 2006 the Swan Canning river system was identified as a hotspot for water quality issues as part of the Australian Government's Coastal Catchments Initiative (CCI). The Trust was responsible for preparing the regional WQIP for the Swan Canning river system.

The regional WQIP provides a roadmap for reducing

nutrient levels in the river system using scientific models and decision support tools prepared under this new initiative.

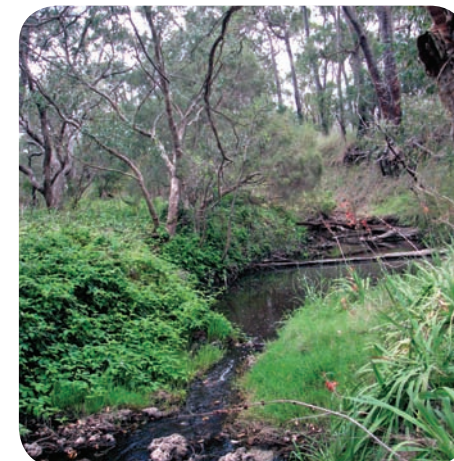
Integrating science and management actions, an accredited WQIP will underpin a long-term investment strategy to improve water quality in known hotspots such as the Swan Canning river system.



School children working on the Phosphorus Action Group catchment model



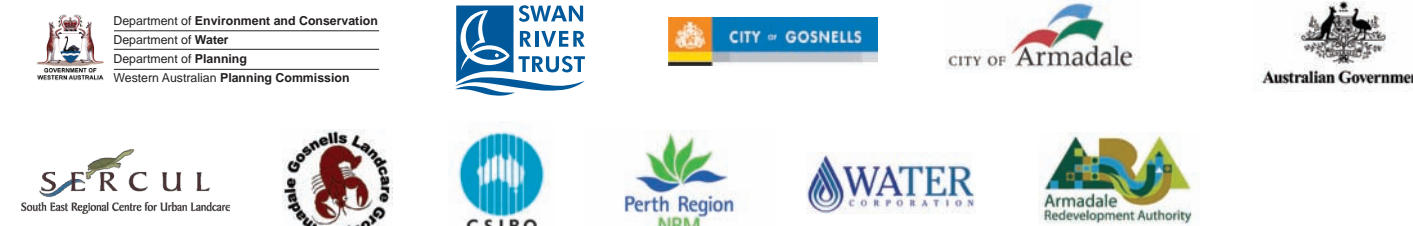
Catchment Activity Day organised by Armadale Gosnells Landcare Group and Swan River Trust



Southern River

Partners

This WQIP has been developed in consultation with the following stakeholders



For further information contact

City of Armadale Ph 9399 0111 www.armadale.wa.gov.au
 City of Gosnells Ph 9391 3222 www.gosnells.wa.gov.au
 Swan River Trust Ph 9278 0900 www.swanrivertrust.wa.gov.au

Caring for the Swan Canning Riverpark

September 2009

Local Water Quality Improvement Plan Southern River Catchment



Background

The Swan River Trust (Trust) works to reduce nutrients and other contaminants entering the Swan and Canning rivers.

The Trust has developed and is investing in local **Water Quality Improvement Plans** (WQIPs). These will provide local councils and communities with a mechanism to prioritise recommendations and resources, and seek funding to improve water quality in catchments contributing the greatest amount of nutrients. These plans should be reviewed annually and assessed after five years. Under the Healthy Rivers Action Plan (HRAP), the Southern River Catchment is identified as one of eight priority catchments in the Swan Canning Catchment.

WQIPs trace nutrient and pollutant pathways through catchments from their source to the discharge point.

Southern River Catchment Water Quality Improvement Plan

The Southern River Catchment incorporates Southern River and its tributaries, Wungong River, Neerigen Brook and Forrestdale Main Drain. Wungong River is dammed within its hill catchment and managed as a drain by the Water Corporation in the low lying area. The catchment covers an area of 149km², has a variety of soil types and includes a number of drains and natural waterways flowing into the Canning River.

The Southern River Catchment is characterised by low lying areas and high groundwater. It contributes more water to the Canning River than any other monitored catchment. Many wetlands in the catchment have been filled and large areas of semi-rural land approved for urban development.

Clearing native vegetation has already caused severe weed infestations, erosion and degradation of the Southern River and its natural waterways by siltation and flow restrictions. Future development must balance ecological impacts with urban expansion.

The cities of Armadale and Gosnells have worked with catchment management groups since 1998 to develop the Upper Canning Southern Wungong Catchment Management Team (now the Armadale Gosnells Landcare Group (AGLG)). These cities also work in partnership with the South East Regional Centre for Urban Landcare (SERCUL) and AGLG.

Outcomes

The Water Quality Improvement Plan will:

- identify ecological condition and water quality;
- identify environmental values of water bodies and water quality objectives required to protect the values; and
- identify and commit to a set of cost-effective management measures to achieve and maintain those values and objectives.



Steps to develop a local WQIP

1. Existing activities

What are we doing to improve water quality?

Local WQIPs link to existing projects and programs in the target area. They draw together activities contributing to improved water quality and target future investment for optimal water quality outcomes. Projects are based on partnerships with local government, community and shared stakeholders.

Examples of key programs in the Southern River Catchment:

Community awareness and education

The Phosphorus Awareness Project, funded by the Trust and delivered through SERCUL, delivers education to light industry, local government, school groups and the community. It provides information on reducing the amount of nutrients reaching waterways and raises awareness of the impacts of elevated nutrients in the river system.

The City of Armadale delivers a community behaviour change program in Harrisdale and Piara Waters encouraging residents to use Fertilise Wise products retaining nutrients in the soil while enhancing plant growth.

Partners: Cities of Armadale and Gosnells, SERCUL, AGLG and the Trust
Outcomes: Medium improvement in water quality

Light Industry Survey and Auditing Program

This program engages small to medium enterprises in environmental management by providing support and education with a focus on protecting stormwater quality.

Partners: Perth Region NRM, SERCUL, the Trust, City of Armadale and Department of Water
Outcomes: Low improvement in water quality for nutrients, medium for non-nutrients

SERCUL Light Industry Project

'Winning with the Laggards' is a research project assessing the behavioural response and cost effectiveness of direct collaborative engagement with the poorest environmentally-performing micro-sized light industrial businesses.

Partners: City of Canning, SERCUL, Department of Water, Waste Management Authority and Murdoch University

Outcomes: Medium improvement in water quality

Sustainable landscaping strategies

The City of Gosnells is minimising fertiliser and water use in public open spaces through tissue analysis before fertilising, soil amendments, plant selection and computerised irrigation programming. The City of Armadale uses tissue analysis before fertilising and only fertilises active recreation reserves.

Both cities encourage Waterwise and Fertiliser Wise landscape designs and construction.

Partners: Cities of Armadale and Gosnells, SERCUL, AGLG, the Trust, Perth Region NRM and developers

Outcomes: Medium improvement in water quality and low improvement in biodiversity

Rehabilitation programs

These collaborative projects between local governments, regional NRM groups, community groups, lead agencies and the Trust involve the removal of weed species and rehabilitation with indigenous vegetation.

Partners: Cities of Armadale and Gosnells, Western Australian Planning Commission, AGLG, SERCUL, Perth Region NRM, industry, Main Roads and the Trust
Outcomes: Low improvement in water quality and high improvement in biodiversity

Wungong Urban Water project

The Wungong Urban Water (WUW) project is a significant project of the Armadale Redevelopment Authority demonstrating total water cycle management and water sensitive urban design (WSUD) to manage water quality and quantity.

The project trials large-scale water treatment in an urban development area as a national demonstration project through the Water Smart Australia Program.

Partners: Armadale Redevelopment Authority, City of Armadale, the Trust, Department of Planning, Department of Water, CSIRO and Department of the Environment, Water, Heritage and the Arts
Outcomes: Medium improvement in water quality

2. Condition

What are the water quality and quantity issues in the Southern River Catchment?

High levels of nitrogen, phosphorus and non-nutrient contaminants

Water quality is monitored fortnightly by the Department of Water on behalf of the Trust and reported through catchment nutrient reports at www.swanrivertrust.wa.gov.au. These reports provide information across a 10-year period on concentrations, nutrient fractions and seasonal variations. Data indicates total nitrogen (TN) and total phosphorus (TP) have been an issue.

As part of its *Surface Water and Groundwater Quality in the Southern River Catchment* sampling, CSIRO tested surface and groundwater throughout the catchment from 2005-07. The sampling program identified groundwater levels of TN between 0.02mg/L and 120mg/L and a median for TP of 0.18mg/L with some samples several times higher. Results from

shallow groundwater were consistently higher in concentration than deeper groundwater samples.

For surface water, concentrations ranged from <0.01mg/L to 16mg/L for TN and <0.01mg/L to 2.4mg/L for TP. Variations were found between soil types with higher concentrations prevalent in Bassendean sands.

Parameters for non-nutrients were limited but indicated the Australian and New Zealand Guidelines for Freshwater and Marine Water Quality (ANZECC & ARMICANZ 2000) were exceeded for aluminium, iron and chloride in surface and groundwater samples.

Water quality issues	Pollutant indicators	Pollutants / issues of concern
Contaminants <ul style="list-style-type: none"> High nitrogen levels High phosphorus levels High non-nutrient contaminant levels Potential remobilisation of pollutants from sediments Possible acid-sulphate sediments 	Contaminants <ul style="list-style-type: none"> High nutrient and non-nutrient pollutant concentrations Acidity High colour, suspended solids (sediment) and turbidity 	Nutrients <ul style="list-style-type: none"> Total phosphorus Total nitrogen Mobilisation of nutrients in groundwater through infiltration into the drainage system Accumulation of nutrients in sediment
Biotic <ul style="list-style-type: none"> Nuisance growth of aquatic plants Algal blooms in wetlands Odour from decaying algae and hydrogen-sulphide gas Microbial contamination Orange, muddy water (may be due to the presence of iron bacteria or pollution events) 	Biotic <ul style="list-style-type: none"> Frequency and extent of algal blooms Absence of desirable aquatic plants and animals, loss of biodiversity Odour from decaying algae Turbidity Chlorophyll-a Sick or dying birds 	Non-nutrients <ul style="list-style-type: none"> Aluminium, iron and chloride Accumulation of non-nutrients in sediment Microbial hazards Pollution events

Maintaining seasonal flow variability

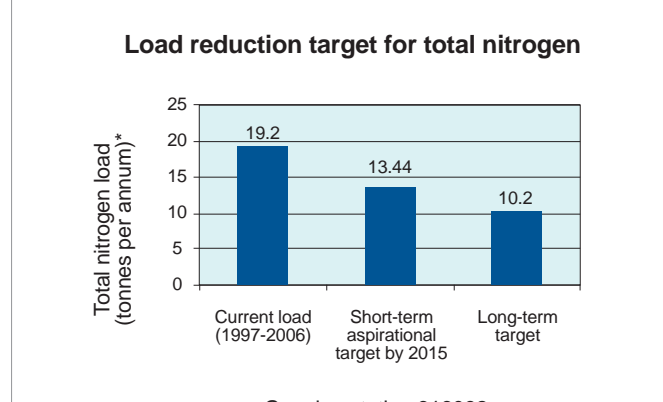
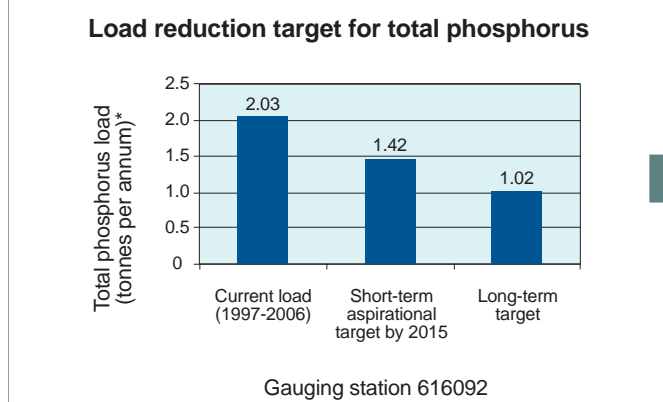
The amount of water entering the Canning River from the catchment is important to maintain environmental values in the river. Data collected at gauging station

S616092 from 1997-2006 indicated annual flow ranged from 5.8 to 23 gegalitres per year. With climate change this variability is likely to continue.

3. Values, objectives and targets

What water quality improvements would we like to achieve in the Southern River Catchment?

Values	Objectives	Targets
River flow (RF) Flows in Southern River protect environmental values in the system	<ul style="list-style-type: none"> Mimic natural inundation and drying patterns which protect wetlands and floodplains Minimise the effect of dams and extraction on water quality by mimicking natural frequency, duration and seasonal flow 	No suitable target available for flow as this is a regulated catchment Environmental Water Requirements study is necessary to quantify target
Aquatic ecosystem health (AH) The Southern River Catchment is a combination of modified and natural systems. There are 28 lakes recognised under the <i>Environmental Protection Policy (Swan Coastal Plain Lakes) 1992</i> in the catchment which require ecological management. Natural systems must be protected from the impact of urban development to ensure ecosystem health is part of drainage planning in new developments. SERCUL and AGLG work with the cities of Armadale and Gosnells to rehabilitate and restore natural ecosystems	<ul style="list-style-type: none"> Protect aquatic ecosystem health, recreation and aesthetics, and cultural and spiritual values Improve water quality by a 30% reduction in TN and TP annual loads by 2015 	Nutrients The aim is to reduce average TN and TP loads by 30% by 2015 as a short-term aspirational target Predictive modelling from the Swan Canning regional WQIP has demonstrated that long-term reduction in annual load of 50% for TP and 47% for TN from the Southern River Catchment is needed Non-nutrients The target for non-nutrient contaminants is to meet ANZECC & ARMICANZ 2000 guidelines for environmental health at all monitored sites
Recreation and aesthetics (RA) The Southern River and other waterways have key recreational and aesthetic value, in their natural state and as part of future urban development. They have been identified as critical in providing visual and aesthetic amenity and are integral to many recreational activities		
Cultural and spiritual (CS) The Southern and Wungong rivers are Aboriginal sites of significance. The strong spiritual connections to these waterways mean they need to be protected for their cultural significance		



*Based on average annual flow data from 1997-2006 and applies to annual river discharge loads similar to 1997-2006

4. Implementation

How do we achieve the water quality targets?

The Southern River Catchment WQIP aims to reduce nutrient loads entering the Canning River through nutrient intervention and changed management practices. By using a treatment train approach, a combined set of management actions are applied along nutrient pathways to minimise nutrient and contaminant losses to waterways.

The lead organisations and supporting partners will implement this WQIP in the constraints of existing budgets and resources. They are committed to working together to actively seek new resource opportunities.

Treatment train approach	Management strategies	Implementation	Lead organisations	Supporting partners	Timing
1. Prevention Land use and planning	1.1 Review planning framework and targets*	<ul style="list-style-type: none"> Use the Better Urban Water Management Framework to assess monitoring of data against targets, objectives and procedures in the Southern River Integrated Land and Water Management Plan (AH) Develop a research-focused monitoring program to determine effectiveness of best management practices for Water Sensitive Urban Design trialled in new developments such as Wungong Urban Water project (AH) 	Department of Planning (DoP), Swan River Trust (Trust), Armadale Redevelopment Authority (ARA)	Cities of Armadale and Gosnells (CoA, CoG), Western Australian Local Government Association (WALGA), CSIRO, Water Corporation (WC), Department of Water (DoW)	Starting 2009-10
	1.2 Implement local planning policies, strategies and planning conditions incorporating best management practices	<ul style="list-style-type: none"> **Examine planning mechanisms to help control and manage sediment from urban development (RF, AH, CS) Developers to prepare and implement erosion and sediment control plans as part of condition for approval (AH, RA) Implement water sensitive urban design into new developments and retrofitting of drainage systems (AH, RA) Assess funding requirements to retrofit drainage in existing urban areas (AH) Incorporate roof runoff treatment and harvesting into development conditions (AH) 			
	1.3 Water Quality Monitoring Program	<ul style="list-style-type: none"> Seek funding to continue water quality monitoring program (AH) 			
2. Minimisation Ecoefficiency	2.1 Light Industry Survey and Auditing Program	<ul style="list-style-type: none"> Investigate expansion of the Light Industry Survey and Auditing Program to progressively incorporate all small to medium enterprises in the Southern River Catchment (AH) **Develop and implement Sustainable Industrial Development Guidelines (AH) 	SERCUL, CoA, CoG, Department of Environment and Conservation (DEC), Perth Region NRM	DoW	Starting 2009-10
3. Reduction Source control	3.1 Soil and sediment best management practice trial*	<ul style="list-style-type: none"> Develop and implement trial of best management practice to reduce sediment before entering the Southern and Wungong rivers and their tributaries (RF, AH, CS, RA) Trial soil amendments in situ to determine effectiveness in reducing nutrient run-off and groundwater contamination (AH) Develop guidelines to prevent nutrients in groundwater from reaching surface waters (AH) 	Trust, SERCUL	CoA, CoG, developers, WC, CSIRO, DEC, Perth Region NRM, DoW	Starting 2009-10
	3.2 Reduce council outputs through local management practices*	<ul style="list-style-type: none"> Extend soil and leaf nutrition testing, use of soil amendments and irrigation water efficiency to all public open spaces across the catchment (AH, CS) Implement water conservation plans (RF, AH) Encourage the use of local plants in landscaped areas (AH, CS, RA) Council premises such as works depots should extend beyond compliance with environmental legislation and demonstrate best management practices (AH) 	CoA, CoG	DoW, DEC, developers, SERCUL, Armadale Gosnells Landcare Group (AGLG)	Starting 2009-10
	3.3 Reduce outputs by developers*	<ul style="list-style-type: none"> Implement sediment reduction program developed through trial outcomes and learnings (RF, AH) Annual reporting on monitoring against water quality targets in the relevant District Water Management Strategy (AH) 	Developers, CoA, CoG AGLG, ARA	DEC, SERCUL, DoW	Starting 2009-10
	3.4 Reduce outputs by building community capacity	<ul style="list-style-type: none"> Educate the community to use soil amendments and sustainable landscaping practices (AH) If the North Forrestdale behaviour change study is successful investigate expansion to educate the community on the use of Fertilise Wise products (AH) Raise community awareness through involvement in revegetation activities (AH, RA, CS) 	AGLG, SERCUL, Trust	CoA, CoG, Phosphorus Action Group, WC	Ongoing
4. Amelioration Conveyance and transmission	4.1 Nutrient intervention and improved drainage*	<ul style="list-style-type: none"> Develop a series of nutrient-stripping and living stream projects targeting high nutrient sites (AH, RA) 	Lead organisation to be identified when funding is resourced	DoW, WC, CoA, CoG, Trust, SERCUL, AGLG, CSIRO	Starting 2009-10
		<ul style="list-style-type: none"> Develop and implement a Critical Habitat Study into Southern and Wungong rivers to identify and prioritise sites requiring nutrient reduction to achieve ecological restoration (RF, AH, RA, CS) 	ARA, DEC	DoW, WC, CoA, CoG, Trust, SERCUL, AGLG, CSIRO	
5. Treatment - Reuse - Disposal	5.1 Full connection to inflow sewerage	<ul style="list-style-type: none"> Full connection of industrial areas to existing inflow sewerage and infrastructure to connect new residential and industrial areas (AH) Increase management and maintenance of infrastructure to reduce sewage spills to the stormwater system (AH, CS, RA) 	WC	CoA, CoG	Ongoing

*new management strategy

**new management actions

(AH) = aquatic ecosystem health, links to values for the catchment in Section 3