

5. Monitoring and review

Strategy	Implementation	Lead organisations	Supporting partners	Timing
How do we measure our success?	<ul style="list-style-type: none"> Organise initial stakeholder meeting to determine Key Performance Indicators (KPIs) and annual reviews to assess progress on KPIs, identify funding opportunities, and determine objectives and actions for next 12 months Seek funding and support to ensure ongoing implementation and monitoring of the effectiveness of strategies and actions 	CoC, CoG, Trust	BCCG, DEC, DoW, Main Roads, SERCUL, Water Corporation	Starting 2011

Annual reviews to assess progress will include lead organisations reporting on WQIP actions. This will contribute to an overall key performance indicator of the Healthy Rivers Action Plan that aims for a measured improvement in the percentage of WQIP actions being implemented each year.

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 Swan River Trust was responsible for preparing the regional Water Quality Improvement Plan 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.



Revegetation work at the Whaleback Golf Course (summer 2007)



Pollution event in the Bannister Creek Catchment (2009)



Water quality sampling in the Bannister Creek Catchment

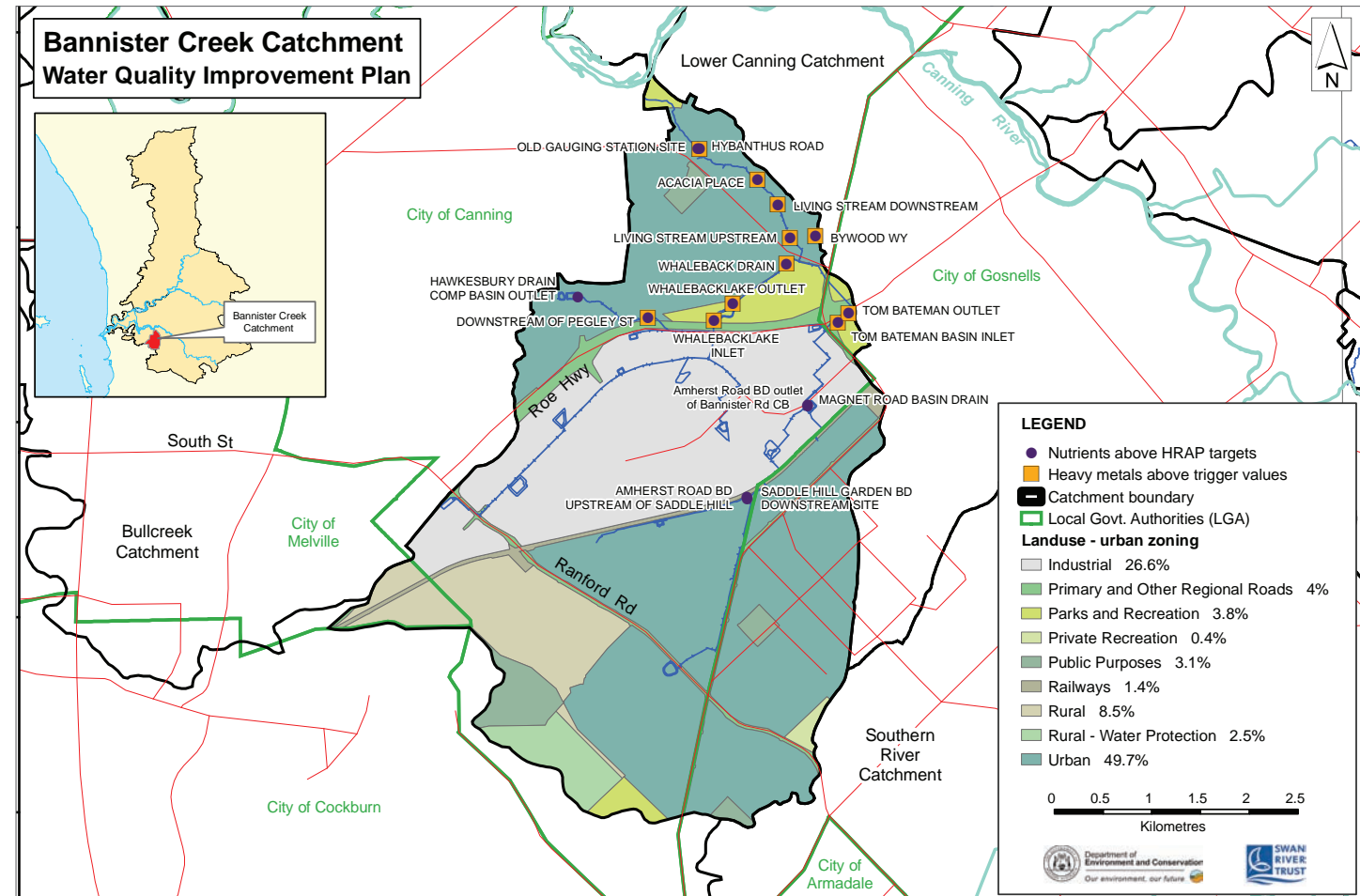
Further Reading:

Australian and New Zealand Guidelines for Freshwater and Marine Water Quality, Volume 1, The Guidelines (ANZECC, 2000) http://www.mincos.gov.au/publications/australian_and_new_zealand_guidelines_for_fresh_and_marine_water_quality

Healthy Rivers Action Plan (Swan River Trust, 2008) <http://www.swanrivertrust.wa.gov.au/science/program/Documents/healthy%20rivers%20action%20plan.pdf>

Swan Canning Water Quality Improvement Plan (Swan River Trust, 2009) http://www.swanrivertrust.wa.gov.au/science/river/Documents/swan_canning_water_quality_improvement_plan_final_dec_2009.pdf

Map



Data from the Water Information (WIN) database between July 2000 and June 2010 was analysed to produce this map

Partners

The Trust, in partnership with the Bannister Creek Catchment Group (BCCG), City of Canning, City of Gosnells, Department of Environment and Conservation, Department of Water, Main Roads Western Australia, South East Regional Centre for Urban Landcare (SERCUL) and Water Corporation is implementing a number of nutrient intervention projects throughout the catchment to reduce nutrient loads entering the Canning River.

The Bannister Creek Catchment Group is involved in the protection, enhancement and restoration of natural resources in the catchment. SERCUL is a sub-regional natural resource management group facilitating education and rehabilitation projects to improve water quality in the south east region.

This WQIP was developed in consultation with the following stakeholders:



Caring for the Swan Canning Riverpark

April 2011

Local Water Quality Improvement Plan Bannister Creek Catchment



Background

The Swan River Trust (Trust) and partners work 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 government authorities 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.

Actions within WQIPs address nutrient and pollutant pathways through catchments from their source to the discharge point. Under the Healthy Rivers Action Plan (HRAP), the Bannister Creek Catchment is identified as one of eight priority catchments in the Swan Canning river system.

Bannister Creek Catchment

The 23.35 square kilometre Bannister Creek Catchment is a highly modified natural system converted to a drainage network that winds through parts of the City of Gosnells (CoG) and the City of Canning (CoC) before it discharges into the Canning River, downstream of the Kent Street Weir. Much of the catchment has been cleared for industrial and residential purposes; however, there is remnant vegetation in Canning River Regional Park and along Bannister Creek at the end of the catchment. Bannister Creek, enhanced through revegetation projects and weed removal, functions as a living stream.

The catchment is predominately Bassendean and Southern River sands soil types. The drainage network receives water from stormwater runoff and groundwater, with Bannister Creek flowing year round. A small portion of the catchment also falls in the Jandakot Ground Water Pollution Control Area.

One of the major issues in the catchment is nutrient inputs (nitrogen and phosphorus) and non-nutrient contaminants (e.g. heavy metals) entering the drainage network. Each landuse requires different nutrient and non nutrient intervention management.

Environmental weeds (e.g. blackberry and hydracotyl) and algal blooms are also a concern in the catchment.

Outcomes

The Water Quality Improvement Plan will:

- identify water quality issues and hot spots;
- 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 catchment. They draw together activities contributing to improved water quality and target future investments for optimal water quality outcomes. Projects are based on partnerships with local government, community and shared stakeholders.

Examples of key existing programs in the Bannister Creek Catchment include:

Living Streams Projects

A number of drains in the Bannister Creek Catchment are being restored and managed as living streams or wetlands such as Bannister Creek living stream, Tom Bateman constructed wetlands and Canvale Lake restoration projects. Other project sites include Bannister Creek Reserve, Velgrove Reserve, Canning River Regional Park, Hawksebury Lakes and Whaleback Lake, and proposed at Willer Park, Hossack Park and Blancoa Road.

Partners: Bannister Creek Catchment Group (BCCG), City of Canning, City of Gosnells, Department of Environment and Conservation (DEC), Department of Water (DoW), South East Regional Centre for Urban Landcare (SERCUL), Water Corporation (WC)

Outcomes: Medium improvement in water quality and improvement in ecosystems function

Community Activities and Education

Phosphorus Awareness Project

The Phosphorus Awareness Project, funded by the Trust and delivered through SERCUL, is an education program for light industry, local government, school groups and the local community. It provides information on reducing the amount of nutrients and pollutants reaching waterways and raises awareness of the impacts of elevated nutrients in the river system. The City of Canning and the City of Gosnells have been involved in the Annual Nutrient Survey for local government as part of the project.

Partners: City of Canning, City of Gosnells, community, SERCUL, Swan River Trust

Outcomes: Medium improvement in water quality

Community groups

There are a number of volunteer organisations that work with key stakeholders to coordinate and implement onground actions to improve wetland and catchment health. They consist of community members who work to raise awareness of the impacts of nutrients to waterways and protect the catchment's ecological values.

Partners: Armadale Gosnells Landcare Group (AGLG), BCCG, Canning River Regional Park Community Advisory Committee, Canning River Regional Park Volunteers, City of Canning, City of Gosnells, DEC, SERCUL, Swan River Trust

Outcomes: Medium improvement in water quality and improvement in biodiversity

Tom Bateman Wetlands, September 2010 (All photos courtesy of SERCUL)



2. Condition

What are the water quality issues in the Bannister Creek Catchment?

The condition of the Bannister Creek Catchment is assessed against a number of criteria. Table 1 lists the most relevant water quality issues in the catchment and pollution indicators.

Water quality issues and pollution indicators in the Bannister Creek Catchment

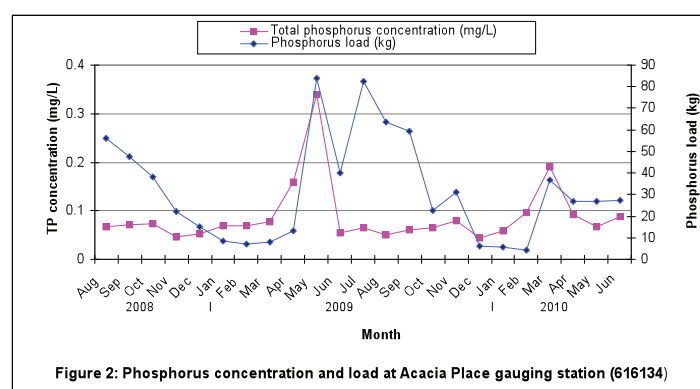
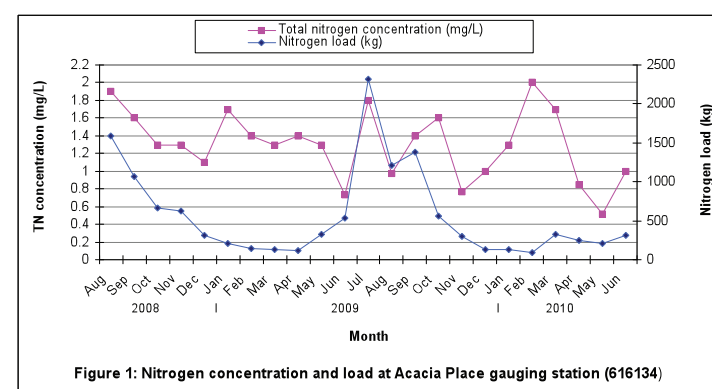
Contaminants	Biotic/environmental
<ul style="list-style-type: none"> Nitrogen and/or phosphorus concentrations exceeding HRAP targets non-nutrient contaminants concentrations exceeding ANZECC guidelines (e.g. heavy metals) potential remobilisation of pollutants from sediments possible acid-sulphate soils pH variations high colour, suspended solids and turbidity pollution events gross pollutants surfactants, hydrocarbons and pesticides 	<ul style="list-style-type: none"> nuisance growth of aquatic plants algal blooms in wetlands (frequency and extent) odour from decaying algae and hydrogen-sulphide gas microbial contamination orange, muddy water death/stress of desirable aquatic flora and fauna, loss of biodiversity

Nitrogen, phosphorus and non-nutrient contaminants

Water quality is monitored in the Bannister Creek Catchment fortnightly at Hybanthus Road by the Department of Water (DoW) and monthly at the other sampling sites in the catchment by the South East Regional Centre for Urban Landcare (SERCUL). End of catchment data is reported through a catchment nutrient report on the Trust website (www.swanrivertrust.wa.gov.au). The report provides information on concentrations, nutrient fractions and seasonal variations. Whole of catchment data is

available on the Water INformation (WIN) database (www.water.wa.gov.au).

Figures 1 and 2 show nutrient concentrations and loads at the Acacia Place gauging station, located in Bannister Creek, near where it discharges into the Canning River. Nutrient concentrations exceeding HRAP targets may lead to the biotic/environmental issues identified in Table 1. The map shows sites in the catchment where the HRAP targets for nitrogen and phosphorus were exceeded.



Data for non-nutrient contaminant concentrations, collected between 2006-2009, showed environmental trigger values for heavy metals (aluminium, chromium,

copper, iron and zinc) were exceeded at a number of sites (see map).

Seasonal flow variability

Between 1989 and 1993, Hybanthus Rd (gauging station 616091) recorded an annual flow range from 5.5 to 20.6 gigalitres. Since 2007, flow data has been recorded at Acacia Place (gauging station 616134). Records indicate that the annual flow range during 2007 and 2009 was between 5.0 and 6.5 gigalitres. Flow and nutrient loads,

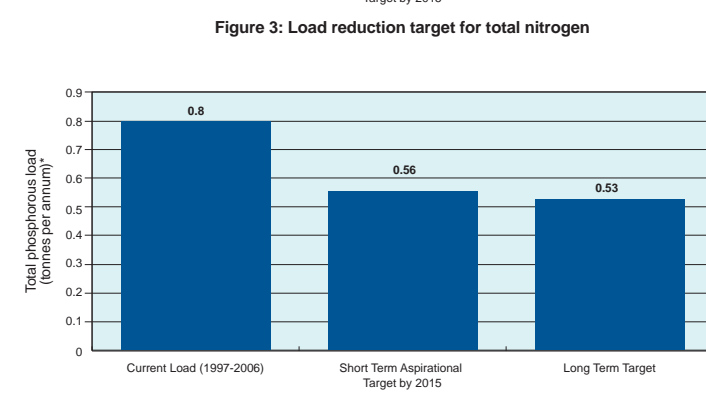
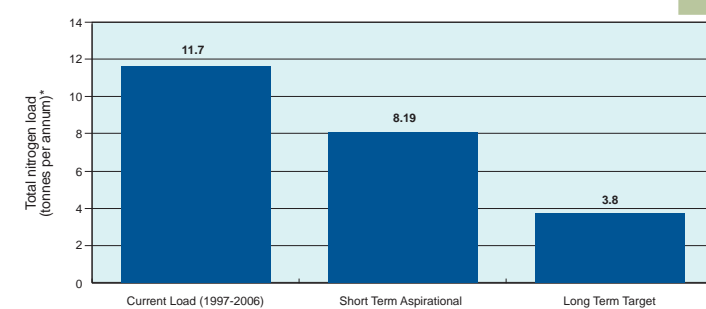
and nutrient concentrations are intrinsically linked. Typically, greater flow volumes in winter leads to an increase in nutrient load, but a decrease in concentration, with the reverse situation in summer. It is important that this seasonality is given consideration in terms of management of the catchment.

3. Values, objectives and targets

What water quality improvements would we like to achieve in the Bannister Creek Catchment?

Values	Objectives
Stream flow (SF) Flows from the Bannister Creek Catchment drainage network contribute to the freshwater flow and maintaining pools in Bannister Creek	<ul style="list-style-type: none"> Optimising peak flows, restore the water cycle and improve water flow management
Aquatic ecosystem health (AH) The Bannister Creek Catchment is a highly urbanised and industrial catchment with stressed environmental values. Bannister Creek flows through Canning River Regional Park and discharges into the Canning River. As such, the Bannister Creek Catchment can affect the values of the Canning River ecosystem through delivery of stormwater with elevated nutrients, non-nutrient contaminants and highly altered flow regimes. Improved ecological health of environmental values relies on education, rehabilitation and nutrient intervention projects	<ul style="list-style-type: none"> Continue to reduce nutrient and non-nutrient input entering the catchment's drainage network via source control and discharge from Bannister Creek into the Canning River Enhance and protect aquatic ecosystem health values
Cultural and spiritual (CS) The Bannister Creek Catchment is culturally and spiritually significant to the whole community shown through a high level of community involvement in the catchment. There are a number of Aboriginal significant sites listed on the Department of Indigenous Affairs Registrar of Aboriginal Sites and the Canning River Regional Park is listed on the Register of National Estate	<ul style="list-style-type: none"> Enhance and protect cultural and spiritual values
Recreation and aesthetics (RA) The living stream and parklands in the area provide opportunities for recreation in the catchment. Some of the drainage water is also used for irrigating parkland	<ul style="list-style-type: none"> Enhance and protect recreation and aesthetic values Maintain community expectations in the catchment e.g. access, aesthetics

Nutrient or non-nutrient contaminant	Target	
Total nitrogen (TN)	Concentration throughout the catchment	1.0mg/L (HRAP)
	Load at end of catchment gauging station*	30% reduction by 2015
Total phosphorus (TP)	Concentration throughout the catchment	0.1mg/L (HRAP)
	Load at end of catchment gauging station*	30% reduction by 2015
Non-nutrient contaminants	Concentration in the catchment	ANZECC (2000) trigger values (various) (80% protection level)**
	Concentration at end of catchment gauging station*	ANZECC (2000) trigger values (various) (95% protection level)**



Nutrient modelling

The aim is to reduce average TN and TP loads discharging into the Canning River by 30% by 2015 as a short-term aspirational target. Predictive modelling from the Swan Canning Regional WQIP has demonstrated that in the longer term a reduction in annual load of 67% for TN and 34% for TP from the Bannister Creek Catchment is needed to meet nutrient targets (see Figures 3 and 4).

*Nutrient modelling is based on the average annual flow data and applies to similar annual river discharge loads at the end of catchment gauging station.

**As this is a highly disturbed system the guideline for trigger value concentrations in the catchment is at 80% protection level. The 95% protection level at the end of the catchment is reflective of the receiving body (the Canning River) being a slightly disturbed system.

4. Implementation

How do we achieve the water quality targets?

Treatment train approach	Management strategies	Implementation	Lead organisations	Supporting partners	Timing
1. Prevention Land use and planning	1.1 Review urban and infrastructure planning to incorporate best management practices'	1.1.1 Integrate the use of DoW predictive modelling and decision support tools to determine priority sites to reduce nutrient exports and improve water flow management (AH)	CoC, CoG, Department of Planning (DoP)	DEC, DoW, Main Roads, SERCUL, Trust, Western Australian Local Government Association (WALGA)	Starting 2010/2011
		1.1.2 Ensure water sensitive urban design is part of all coordinated redevelopment structure plans consistent with the requirements of the Better Urban Water Management, State Planning Policy 2.9 Water Resources and local environmental conditions (AH)	CoC, CoG	DEC, DoP, DoW, Main Roads, SERCUL, Trust, (WALGA)	Starting 2010/2011
		1.1.3 Identify and map opportunities to reduce groundwater interception, increase biofiltration treatment in open drain sections of the system and identify potential acid sulphate soils (AH)	CoC, CoG	DEC, DoW, SERCUL, Trust	Starting 2010/2011
		1.1.4 Develop and implement standard development conditions for small to medium sized enterprises in industrial areas to incorporate appropriate wastewater treatment and disposal (AH)	Trust	CoC, CoG, SERCUL	Starting 2010/2011
		1.1.5 Review the catchment boundary and update the dataset (SF)	CoC, CoG	DoW, SERCUL	Starting 2010/2011
2. Minimisation Ecoefficiency	1.2 Application of water sensitive urban design (WSUD) practices'	1.2.1 Develop a policy to ensure existing local government open drains remain open systems and where possible implement living stream principles (AH)	CoC, CoG	DoW, SERCUL	Starting 2010/2011
		1.2.2 Ensure WSUD accommodates other uses, functions (e.g. recreational use) and existing environmental values of the particular location to facilitate safe use for the whole community (RA, CS)	CoC, CoG, Main Roads	DoW, SERCUL	Starting 2010/2011
		1.2.3 Include <i>Stormwater Management Manual</i> WSUD principles in future road capital works programs (AH)	DoW, Perth Region NRM, Trust	CoC, CoG, SERCUL	Starting 2010/2011
		1.2.1 Reduce urban fertiliser use through education and accreditation programs (AH)	DEC, Trust	CoC, CoG, Phosphorus Awareness Project, SERCUL	Ongoing
		2.2 Reduce nutrient and non-nutrient input from industry	CoC, CoG	DEC, Perth Region NRM	Ongoing
3. Reduction Source control	2.3 Reduce nutrient input from recreational areas	2.3.1 Encourage local governments to adopt an auditing process and implement education and awareness programs for small to medium enterprises to ensure compliance with the <i>Environmental Protection (Unauthorised Discharges) Regulations 2004</i> and reducing stormwater contamination (AH)	SERCUL	CoC, CoG, DEC, DoW	Ongoing
		2.3.2 Encourage uptake and participation in the Small Factory Environmental Management Support Program (AH)	CoC, CoG, Department of Education	CoC, CoG, DEC, DoW	Starting 2010/2011
		2.3.1 Develop and implement nutrient and irrigation/water conservation plans that includes soil and leaf nutrient testing, use of soil amendments and irrigation water efficiency for all public open space and school reserves (AH, RA)	CoC, CoG, SERCUL, Trust	DEC, DoW, Main Roads, Perth Region NRM, WC	Starting 2010/2011
		3.1 Apply best management practice for nutrient outputs management	CoC, CoG	Main Roads, SERCUL	Starting 2010/2011
		3.1.2 Create vegetated buffer zones/verges and implement WSUD principles between waterways and turf in council reserves and road reserves to help prevent herbicides, fertilisers and grass clippings entering waterways, where practical (AH)	CoC, CoG		Ongoing
4. Amelioration Conveyance and transmission	3.2 Reduce outputs by building community capacity and through regulation and education of industry	3.1.3 Maintain street sweeping program and develop a monitoring plan to assess efficiency of current schedules and future procedures (AH)	CoC, CoG, Main Roads	AGLG, BCCG, SERCUL	Ongoing
		3.2.1 Encourage use of local native plants in landscaped areas and streetscapes (AH, CS, RA)	AGLG, BCCG, SERCUL	CoC, CoG, Main Roads	Ongoing
		3.2.2 Raise community awareness through involvement in revegetation and education activities (AH, CS, RA)	CoC, CoG, DEC, Trust	AGLG, BCCG, DoW, SERCUL, WC	Starting 2010/2011
		4.1 Improve urban drainage design and support structural nutrient intervention'	CoC, CoG	Main Roads	Starting 2011/2012
		4.1.2 Increase biofiltration treatment and retention time in identified high priority sites (AH) (links to 1.1.1)	CoC	BCCG, DoW, SERCUL, WC	Starting 2011/2012
5. Treatment - Reuse - Disposal	4.1.3 Review the Bannister Creek Reserve Management Plan (SF, AH)	4.1.4 Develop a management plan for Tom Bateman Wetlands (SF, AH)	CoC, SERCUL, WC	BCCG, DoW, Trust	Starting 2010/2011
		4.1.5 Seek opportunities for retrofitting stormwater management systems to achieve improved water quality outcomes (i.e. in council road reconstruction programs) (AH)	CoC, CoG, Main Roads		Starting 2010/2011
		4.1.6 Maximise localisation of road runoff treatment (AH)	CoC	WC	Ongoing
		5.1 Achieve zero nutrient contribution from sewage	CoC, CoG, Main Roads		Ongoing
		5.2 Promote urban drainage initiatives	CoC, CoG, Main Roads	DoW, SERCUL	Ongoing

*new management strategy

**new management actions

(SF) = streamflow, (CS) = cultural and spiritual, (RA) = recreation and aesthetics, (AH) = aquatic ecosystem health. Links to catchment values in Section 3.

The Bannister Creek 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 non-nutrient contaminant losses to waterways.

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