GOVERNMENT OF WESTERN AUSTRALIA

Department of **Biodiversity, Conservation and Attractions**

PARKS AND WILDLIFE SERVICE

Bickley Brook Catchment Local Water Quality Improvement Plan Review Summary

June 2018

Acknowledgements
Thank you to the City of Gosnells, South East Regional Centre for Urban Landcare (SERCUL) and Perth NRM for their contributions to the review of the Bickley Brook Catchment Water Quality Improvement Plan (WQIP).

Purpose and use of this document
The Department of Biodiversity, Conservation and Attractions (DBCA), with the support of the organisations noted above, has reviewed the implementation of the Bickley Brook Catchment WQIP. The purpose of this document is to summarise that review and inform future updates of the Bickley Brook Catchment WQIP. The Swan Canning Water Quality Improvement Plan will commence a review process in 2018 including updated catchment modelling which will be used to inform updates of the local WQIPs. It is intended that these documents will be used by partner organisations that will continue to have a role in implementation of the WQIPs.

Front cover photos: Bickley Brook, 2017. Photo - DBCA
White myrtle, *Hypocalymma angustifolium*. Photo - DBCA

Local Water Quality Improvement Plans

The Department of Biodiversity, Conservation and Attractions (DBCA) Parks and Wildlife Service works to reduce nutrients and other contaminants entering the Swan and Canning rivers.

DBCA (and previously the Swan River Trust) developed and invested in the implementation of local Water Quality Improvement Plans (WQIPs). The WQIPs were designed to provide stakeholders with a mechanism to prioritise recommendations and resources and seek funding to improve water quality in catchments contributing the greatest amount of nutrients and contaminants.

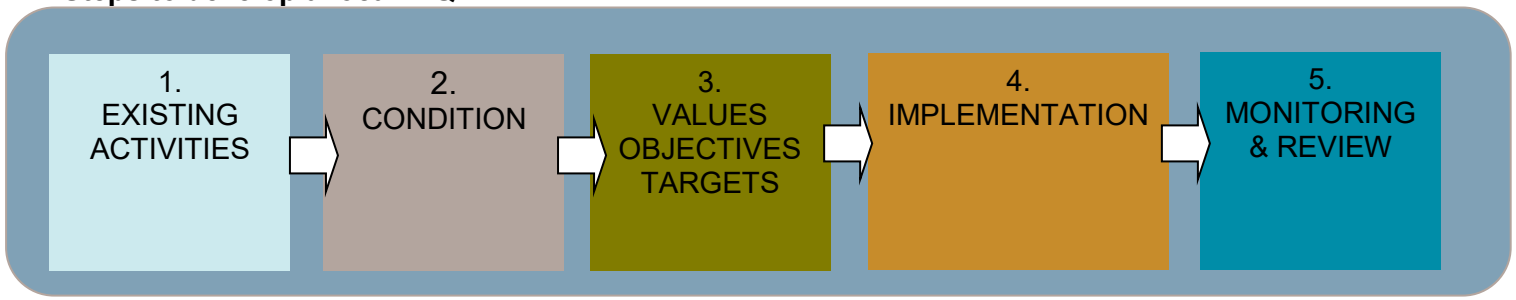
WQIP implementation takes a treatment train approach with actions falling into each of the following stages in the pathway of nutrients and non-nutrients from the source to the discharge point:

1. **Prevention** (Land use planning)
2. **Minimisation** (Ecoefficiency)
3. **Reduction** (Source control)
4. **Amelioration** (Conveyance and transmission)
5. **Treatment – Reuse – Disposal**

Water Quality Improvement Plans:

- 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



Local WQIP Review

Ten local WQIPs were developed between 2008 and 2012 with strong involvement of key stakeholders. Implementation of the WQIPs is ongoing, however many of the actions are complete or require review. There are also actions that are still underway and others that will require an ongoing commitment and additional resources to maintain and improve water quality. This review of the Bickley Brook Catchment WQIP is based on achievements and stakeholder participation.

The monitoring associated with on-ground projects in the Swan Canning Catchment provides evidence that these types of projects are improving water quality. Monitoring the effects of non-structural WQIP actions, such as community education and behaviour change programs, and changes to policies and procedures, on catchment water quality is more complicated. Therefore, statistically linking WQIP actions to changes in catchment water quality is not attempted at this stage. Variations in annual flow, changes in catchment land uses, and the long timeframes required for some catchment management practices to affect water quality at the catchment discharge point are other factors that can contribute to discharge water quality.

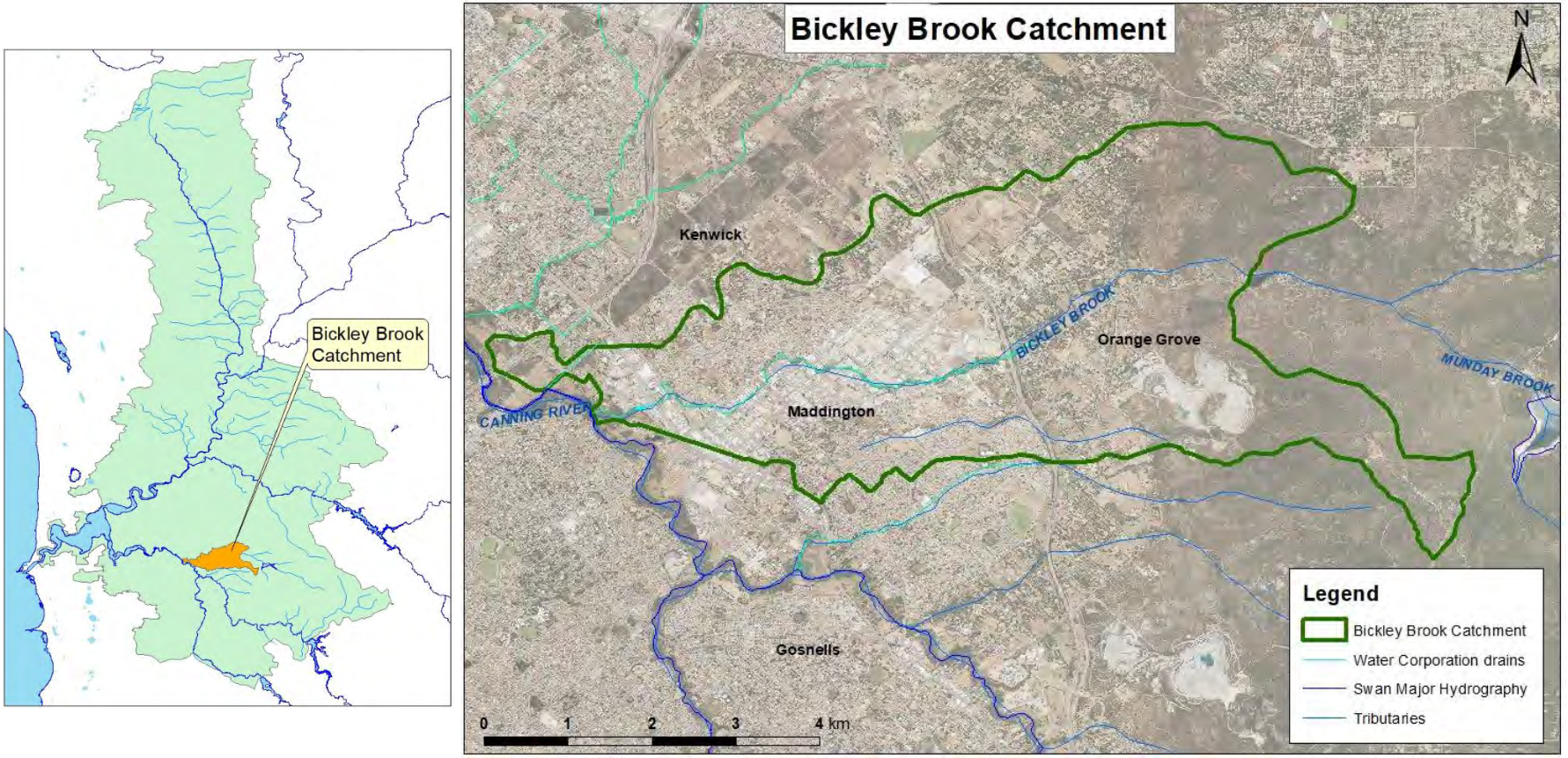
The Swan Canning River Protection Strategy supports the development and implementation of the Swan Canning and local WQIPs as an action to achieve nutrient load reduction targets and provides the framework for DBCA to update local WQIPs. This review will determine the local WQIPs to be updated based on the level of support from key stakeholders and need for further water quality improvement. Modelling of water quality improvement targets is proposed to occur as part of an update of the Swan Canning WQIP in 2018.

Local WQIP front cover for illustration purposes only

Bickley Brook Catchment

The Bickley Brook is a tributary of the Canning River with its headwaters in the Darling Scarp. Munday Brook, a major tributary of the Bickley Brook, was dammed in 1891 creating Victoria Reservoir. The Bickley Dam, which forms Bickley Reservoir, was built in the 1920s resulting in a further reduction in water flow in the downstream section of the Bickley Brook. The Brook is ephemeral, drying out in summer most years. The Bickley Brook WQIP catchment is 21 km^2 and starts at the Bickley Dam. It includes parts of Orange Grove, Maddington and Kenwick. The catchment is mostly cleared and includes areas of remnant vegetation, semi-rural properties, residential and light industry.

The Bickley Brook Catchment is a priority catchment for water quality improvement due to elevated nitrogen levels and the presence of non-nutrient contaminants such as metals, hydrocarbons and gross pollutants.



Bickley Brook WQIP Review Summary

The Bickley Brook WQIP has a total of 20 actions; four have been fully achieved or are close to being fully achieved. Ten actions have been addressed but will require an ongoing commitment or further investment for catchment-wide implementation. The remaining six actions have had little or no progress (see Appendix 1 for details).

Completed Urban Waterways Renewal projects:

- Eva Street Living Stream
- Mandarin Road Living Stream
- Bickley Brook Confluence Living Stream and Floodplain Restoration
- Kelvin Road Rain Gardens

Three significant on-ground projects have been implemented through the Urban Waterways Renewal (UWR) project since the WQIP development. The Eva Street Living Stream has seen the restoration of one side of the Brook for a stretch of approximately 750 metres that was previously weed infested and littered with domestic and industrial waste. The Mandarin Road Living Stream project converted a 200 metre stretch of the Brook into a living stream with rock riffles, bank stabilisation, removal of built-up sediment and rubbish, and installation of local native plants. The Bickley Brook Confluence Living Stream project restored the area where the Bickley Brook meets the Canning River, and included the installation of riffles, native plants and a low flow swale which directs water back through the existing floodplain. Two road-side rain gardens were also installed in Maddington as part of the UWR project.

The City of Gosnells has contributed to improving the operating practices of businesses in the Maddington light industrial area by participating in the DBCA and Department of Water and Environmental Regulation (DWER) led 2015-17 Light Industry Program, focussing on educating business owners and operators on the correct storage, use and disposal of chemicals to avoid releases to the environment. The City has also increased its compliance capacity in planning related breaches along the Bickley Brook.

DBCA has competed a survey of unauthorised drainage inlets entering the Brook, completed a water and sediment quality snapshot at sites from the Canning River confluence up to Bickley Dam, and provided support for educational activities such as drain stencilling in the industrial area. The South East Regional Centre for Urban Landcare (SERCUL), with support from DBCA and the City of Gosnells, completed a Hydrocarbon Track and Trace Project within the light industrial area which identified hydrocarbon hotspots in the drainage network and a system for prioritising inspections of business premises.

The Bickley Brook median total phosphorus concentration is meeting the short and long-term targets (0.2mg/L and 0.1mg/L respectively). The median total nitrogen concentration is meeting the short-term target (2mg/L) but failing the long-term target (1mg/L) (Department of Water and Department of Parks and Wildlife, Bickley Brook Swan Canning Catchment Nutrient Report 2016).

Non-nutrient contaminants such as metals, hydrocarbons, and litter continue to be a concern in the Bickley Brook Catchment. Engaging and, if required, regulating the business community in the light industrial area will continue to be one of the most important mechanisms for improving water quality in the Bickley Brook. The established and new residential areas will also require attention to ensure nutrient outputs of the catchment do not increase.

Local WQIP Action Review Summary						
WQIP catchment	Release date	Total number of actions	Actions fully achieved or on track	Actions implemented but ongoing commitment required	Actions with little or no progress	**% of actions being implemented**
Bickley Brook	Sept 2009	20	4	10	6	**70**

Summary of investment in WQIP (from commencement of WQIP to June 2018)				
	Department of Biodiversity, Conservation and Attractions	Federal Government	Local Government and Community	**Total Investment**
Investment in Bickley Brook WQIP projects	$187,000	$1,222,400	$238,825 City of Gosnells. $108,553 (estimated value of volunteer labour)	**$1,756,778**

There are likely to be other funds contributed by other State Government agencies which have not been captured here.

Future priorities and actions – Bickley Brook Catchment

- Increased and ongoing engagement with light industry in the catchment to reduce contaminants entering the Brook and the Canning River.
- Increase community awareness, education and involvement in catchment management to reduce nutrient and contaminant outputs in residential and semi-rural areas.
- Implement the Swan Canning River Protection Strategy.
- Ensure all development proposals are in line with Perth's transition to a water sensitive city.
- Ensure that all local government planning schemes and policies support the transition to a water sensitive city.
- Land-use planning decisions to ensure the State Planning Policy 2.10 (Swan-Canning River System) requirement for developers to maintain or improve water quality is upheld.
- Ensure all new developments are connected to sewer and aim for infill sewer to all existing urban areas.
- Restore degraded stretches of the Bickley Brook as opportunities arise.
- Investigate projects to reduce gross pollutants such as litter entering the Bickley Brook and the Canning River.
- Continue to look for and take opportunities to improve water quality, habitat, and community benefit of waterways and vegetated areas in the catchment.
- Reduce local government's nutrient outputs through local management practices by providing up-to-date training to all staff involved in fertiliser application, grounds keeping and maintenance of drainage infrastructure, including Water Sensitive Urban Design (WSUD) features.
- Discourage the planting of deciduous trees near drainage infrastructure to reduce organic loads and excessive nutrients entering stormwater.

Bickley Brook Catchment Case Study: Eva Street Living Stream Stage 1

Eva Street Living Stream Stage 1 was completed in 2014 as one of eleven on-ground projects of the Urban Waterways Renewal Project in the Swan Canning Catchment. The highly degraded stretch of the Brook was weed infested and littered with industrial, domestic and building waste before work started.

The project involved the removal of sediment and waste debris from the Brook between Eva Street and Tonkin Highway. The northern bank and riparian zone of the Bickley Brook along this stretch underwent weed control and revegetation. Seed collection was undertaken at this site so that endemic local species of plants could be propagated and planted back into the site. Volunteers helped with planting and have been involved with regular bird surveys at the site.

Project implementation was completed through a partnership between SERCUL, Department of Water and Environmental Regulation (DWER), DBCA (previously Swan River Trust), Water Corporation and the City of Gosnells. The UWR projects were funded through an Australian Government grant and significant contributions by the WA Government. Other project partners also contributed financially and in-kind to the projects.

The revegetated area has established well, and the existing maintenance track is used by the public for walking and enjoying the restored environment.

Ongoing land tenure issues involving the realignment of the boundary between the reserve and the industrial lots backing onto the bank of the brook have prevented restoration work commencing along the southern bank. Restoring the southern bank will form Stage 2 of the Living Stream and is a future priority for restoring degraded sections of the Brook.

Eva Street Living Stream Stage 1

Weedy vegetation along northern bank between Eva Street and Tonkin Highway, May 2010 (photo courtesy of SERCUL)

Revegetation area on the northern bank between Eva Street and Tonkin Highway, Nov 2017

Length of foreshore restored:	750 metres (one side only)
Number of seedlings planted:	38,000
Recorded volunteer hours:	285
Cost of project:	$463,200
Project partners and funding organisations:	South East Regional Centre for Urban Landcare, City of Gosnells, Department of Water and Environmental Regulation, Department of Biodiversity, Conservation and Attractions, Water Corporation, and the Australian Government's Urban Waterways Renewal Project.

Appendix 1: Bickley Brook Catchment WQIP – Action Review

Tally and explanation of action review categories – Bickley Brook Catchment			
Total number of actions	**20**	**Percentage**	**Explanation**
Action achieved	2	10	The action has been completely fulfilled.
Action on track	2	10	Significant progress has been made and the action is likely to be completed in the near future.
Ongoing action	6	30	This action will require ongoing commitment or maintenance.
Projects/Programs implemented	4	20	There are projects and programs in place that address this action, however significantly more investment is required to enable catchment wide implementation.
Little or no progress	4	20	Little or no progress has been made on this action. This can be for various reasons.
No longer relevant or viable	2	10	This action is no longer relevant or viable. Can be for various reasons.
Summary categories			
Total number of actions	**20**	**Percentage**	**Explanation**
Action fully achieved or on track to being achieved	4	20	First two categories above combined.
Action implemented but ongoing commitment required	10	50	Second two categories above combined.
Little or no progress	6	30	Last two categories above combined.

Bickley Brook Catchment WQIP – Action Review						
Treatment train approach	**Management strategies**	**Implementation actions**	**Lead organisations**	**Supporting partners**	**Status comments**	**Review category**
1. Prevention Land use and planning	**1.1** Review planning processes	**1.1.1** Develop a planning process to review: - incorporating water quality outcomes to redevelop existing industrial area; - compliance with planning conditions and provisions of Town Planning Scheme 6; - practices regarding storage, containment and disposal of waste; and - retrofitting of water sensitive urban design where appropriate.	City of Gosnells (CoG)	Department of Planning, Lands and Heritage (DPLH)	No specific planning process developed. Water quality outcomes through development are generally a requirement of the Better Urban Water Management (BUWM) framework, however, this does not apply to brownfield or infill circumstances - if there was an urban renewal project covering a large area of the industrial estate then the BUWM would apply. CoG has considerably increased its compliance capacity and continues to pursue non-compliance in the catchment and on banks of the Brook. A long-standing non-compliance matter was successfully concluded in September 2016, with resolution resulting in remedial action on the Brook foreshore. CoG participated in the 2015-17 Light Industry Program partnership with Department of Water and Environmental Regulation (DWER) and the Department of Biodiversity, Conservation and Attractions (DBCA), providing an Environmental Health Officer to undertake audits in conjunction with a DWER officer within the Maddington industrial area (addressing practices regarding storage, containment and disposal of waste). However, the program only deals with established light industry and does not address planning processes.	

	1.2 Implement local planning policies, strategies and planning conditions incorporating best management practices	**1.2.1** Develop policy for land use activities located in the Bickley Brook Catchment to implement best management practices to reduce nutrient and other pollutant outputs as part of approval conditions for development and redevelopment.	CoG	South East Regional Centre for Urban Landcare (SERCUL), Armadale Gosnells Landcare Group (AGLG)	CoG – Amendment No.174 to Town Planning Scheme 6, which proposes changes to zonings largely along the southern bank of Bickley Brook between Myola South Place and Tonkin Highway to provide for a minimum 15m foreshore Local Open Space reservation was supported by Council at its 14 November 2017 meeting, and forwarded to the Western Australian Planning Commission (WAPC) for determination by the Minister for Planning. CoG – WAPC has, pursuant to the City's recommendation, applied subdivision approval conditions in the rural part of the catchment resulting in the protection and revegetation of Bickley Brook foreshore within the subdivisional area.	
		1.2.2 Continue to implement the draft Foothills Rural Strategy.			The strategy was gradually implemented by CoG focussing on retention of native vegetation during subdivision approval process in the middle and upper catchment. The strategy is currently under review; amendments are proposed to provide for riparian revegetation and erosion protection.	

	1.3 Water Quality Monitoring Program	**1.3.1** Continue water quality monitoring program initiated by the Maddington Kenwick Sustainable Communities Partnership (MKSCP) Bickley Brook Project.	Perth NRM, Department of Water and Environmental Regulation (DWER)	CoG, SERCUL	Funding for the MKSCP Bickley Brook Project is finished. Water quality monitoring at the specific project sites was undertaken as part of the Urban Waterway Renewal Project, however this has also finished. Water quality and flow is monitored fortnightly in the Bickley Brook at a site near the lower end of the catchment to estimate nutrients leaving the catchment (DWER and DBCA), however this does not provide data for the upstream parts of the catchment. DBCA completed two rounds of water sampling and analysis at 12 sites along the Bickley Brook in 2014-15 to inform the Light Industry Program, but this was not an ongoing program. There is currently no in-catchment monitoring in Bickley Brook Catchment.	

2. Minimisation Efficiency in nutrient use	**2.1** Reduce industry output through regulation and education (including hobby farms)	**2.1.1** Continue to expand the Light Industry Area Improvement Project to progressively incorporate 100% of small to medium enterprises in the Bickley Brook Catchment with an emphasis on storage and disposal of hazardous materials.	Perth NRM, DWER	CoG, SERCUL, AGLG	CoG participated in the 2015-17 Light Industry Program partnership with DWER and DBCA, providing an Environmental Health Officer to undertake audits in conjunction with a DWER officer within the Maddington Industrial Area (addressing practices regarding storage, containment and disposal of waste). Audits began in 2015. An earlier Light Industry Audit Program (funded by DBCA and State NRM) implemented by Perth NRM and CoG in 2010/11 focussed on minimising the discharge of contaminants from light industrial small and medium size enterprises. A Hydrocarbon Track and Trace survey was conducted by SERCUL in 2013 in the Maddington industrial area. The catchment upstream of the Mandarin Road living stream project was identified as a priority for reducing hydrocarbons, no point sources were identified. Results were provided to DWER, CoG and (the then) SRT. Stormwater drain inlets on roads in the Maddington area were stencilled in 2013 with the 'Clean Drains River Gains' community awareness message.	
		2.1.2 Review Model Guidelines for Sustainable Industrial Development being developed by the MKSCP and where appropriate apply to new and retrofitted premises.			CoG is not aware of any progress on a review of Model Guidelines for Sustainable Industrial Development. Development of Precinct 1 of the Maddington Kenwick Strategic Employment Area, part of which drains to Bickley Brook, is progressing. Stormwater management planning has not yet been undertaken.	

		2.1.3 Enforce Unauthorised Discharge Regulations.			DBCA and DWER partnered with CoG to audit light industrial premises in the Bickley Brook Catchment as part of the National Landcare Program funded 2015-17 Light Industry Program. Audits were conducted during 2015-17. Infringements were issued if required, under the Unauthorised Discharge Regulations.	
		2.1.4 Implement program to map links between stormwater outfalls and source industrial premises.			In 2013-14 the Bickley Brook from Tonkin Hwy to the Canning River confluence was mapped for all drain outfalls and registered and unregistered ones were identified. One of the unauthorised outfalls was removed immediately after being reported to the Pollution Response Unit of DWER after a pollution incident was witnessed. Water Corporation and CoG were notified and provided with drain outfalls mapping. In 2014-15 DBCA officers conducted sediment and water quality sampling and analysis along the Bickley Brook. Data from the sampling event was provided to DWER and CoG to help identify priority areas for the 2015-17 Light Industry Audit Program.	

	2.2 Nutrient reduction through best management practices	**2.2.1** Encourage Department of Primary Industries and Regional Development (DPIRD) to use slow release low water-soluble phosphorus fertilisers.	Perth NRM	DWER, CoG, DBCA	While not specific to the Bickley Brook Catchment, the Healthy Soils Healthy Rivers Program promotes fertiliser management through soil testing and irrigation water testing to ensure nutrients are not applied to crops unless needed. Many of the horticultural growers that have had the one on one consultations through the program have been able to reduce fertiliser applications by about 30-40%. Horticulturists are mainly using water soluble fertilisers as they apply fertiliser through drip irrigation. The program is a joint initiative of Perth NRM, Wheatbelt NRM and DBCA with funding from the Australian and WA State governments. Since the Fertiliser Action Plan (which was never formally adopted) was developed, the use of slow release fertilisers has been taken up by broad-acre farmers more than other food producers due to the savings that can be made.	
		2.2.2 Identify opportunities/ sites to link to Water Wise on the Farm Program.			Waterwise on the Farm Program no longer exists.	
		2.2.3 Develop and source funding for incentive scheme to encourage adoption of best management practice for specific industries.			Funding for this type of program has been difficult to source in current economic and political climate.	
3. Reduction Source control	**3.1** Reduce council output through local	**3.1.1** Extend soil and leaf testing, use of soil amendments and minimal water use to	CoG	DWER, DBCA, SERCUL	CoG conducts soil and leaf tissue analysis on all sports fields where fertiliser is applied and arranging for moisture testing on sports fields and irrigated parks.	

	management practices	100% of public open space across the catchment.			DBCA provides support for Fertiliser Wise Fertiliser Training for turf managers including local government officers, run through SERCUL.	
		3.1.2 Implement water conservation plans.			CoG is implementing a Water Conservation Plan, however, water conservation plans don't always translate to what is happening on the ground. For example, temporary scheme water meters are put on and used for developments installing new parks and gardens while the land is being sold. CoG Parks Services provides an annual progress report.	
		3.1.3 Increase local plants in landscaped areas.			CoG has landscaping policy in place and local guidelines for development approvals using native vegetation.	
4. Amelioration Conveyance and transmission	**4.1** Nutrient intervention and improved drainage	**4.1.1** Develop a series of living stream projects to enhance nutrient stripping in Bickley Brook.	CoG, DWER	DBCA, SERCUL, AGLG, Water Corporation (WC)	Urban Waterways Renewal (UWR) Project designed and installed living streams and wetlands specifically for nutrient stripping at 3 sites along the Bickley Brook: 1. Bickley Brook Confluence Living Stream 2. Mandarin Road Living Stream 3. Eva to Tonkin Living Stream Projects partners included DWER, SERCUL, DBCA, Water Corporation (WC), CoG and funding support from the Australian Government. While the UWR projects addressed this action, there are many more stretches of the Bickley Brook requiring restoration.	
		4.1.2 Implement at source management strategies and Water Sensitive Urban Design when retrofitting drainage and as new			Two rain gardens along a road in the Maddington light industrial area have been installed as a component of the UWR Project.	

		development and retrofitting occurs.				
		4.1.3 Develop a partnership with a research institution to determine what ecological values exist and can be maintained as part of nutrient-stripping and living stream projects in the catchment.	CoG, DBCA	Research Institutions	Partnerships with research institutions were established to allow detailed monitoring of the Urban Waterways Renewal projects along the Bickley Brook. DWER completed baseline and post-construction monitoring, although the sites were not fully established at the time of the post-construction monitoring. Bird surveys were conducted by BirdLife Australia at restoration sites on the Bickley Brook between 2011 and 2014. A UWA student (Bonita Clark) completed an Honours research project in 2011 titled “Does habitat restoration increase macro invertebrate diversity of urban streams in Perth, Western Australia?” including sites on the Bickley Brook.	
		4.1.4 Prioritise sites for implementing Healthy Wetland Habitat Program.	DBCA	CoG	Wetland sites were identified and prioritised for the Bickley Brook Catchment, however, the Healthy Wetland Habitat Project did not consider Bickley Brook a priority wetland catchment for inclusion in the program. Gilgie Wetland, just upstream of the confluence was scoped for a potential future restoration project site.	

5. Treatment - Reuse-Disposal	**5.1** Full connection to infill sewerage	**5.1.1** Full connection of existing industrial areas to infill sewerage and continue the connection of a new developments and industrial areas.	WC	CoG	CoG - new industrial area in Maddington Kenwick Strategic Employment Area is proposed ultimately to be connected to sewer, unless an exemption is given by the Department of Health under the Government Sewerage Policy. Current developments are receiving approval for Alternative Treatment Units. The existing industrial area is not included in WC's current infill sewerage program.	
		5.1.2 Increase management and maintenance of infrastructure to reduce sewage spills to the stormwater system.			Significant investment by WC has been made in reducing wastewater spills to the environment across the Swan Canning Catchment.	