GOVERNMENT OF WESTERN AUSTRALIA
Department of **Biodiversity, Conservation and Attractions**
PARKS AND WILDLIFE SERVICE

Mounts Bay Catchment Local Water Quality Improvement Plan Review Summary

August 2017

Acknowledgements
Thank you to the Claise Brook Catchment Group, Cities of Perth, Subiaco and Vincent, Town of Cambridge, Main Roads WA and LandCorp for their contributions to the review of the Mounts Bay Water Quality Improvement Plan.

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 Mounts Bay Catchment WQIP. The purpose of this document is to summarise that review and inform future updates of the Mounts Bay Catchment WQIP. The Swan Canning Water Quality Improvement Plan is proposed to be reviewed in 2018 and if undertaken any updated catchment modelling 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 photo: Mabel Talbot Lake. Photo – City of Subiaco
City buildings at night. 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.

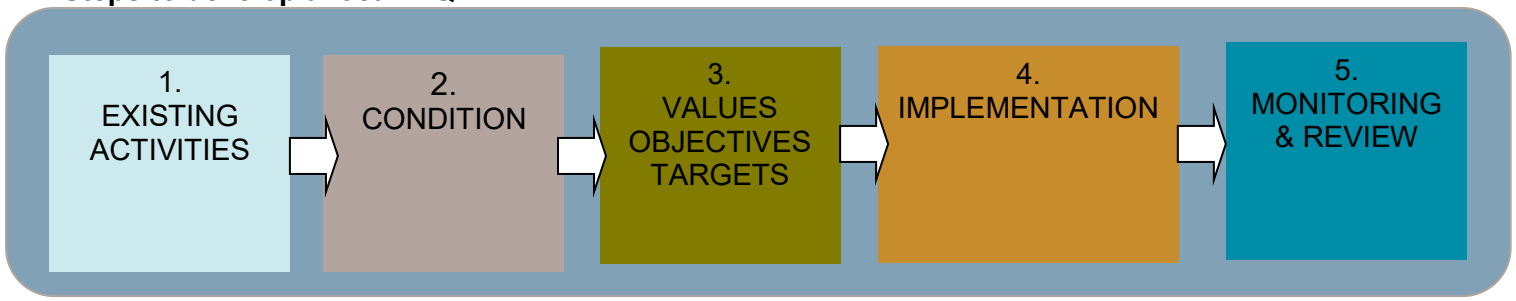
WQIP implementation takes a treatment train approach with actions falling into each of the following stages in the pathway of nutrients and non-nutrients from the source to the discharge point:

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 Mounts Bay 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.

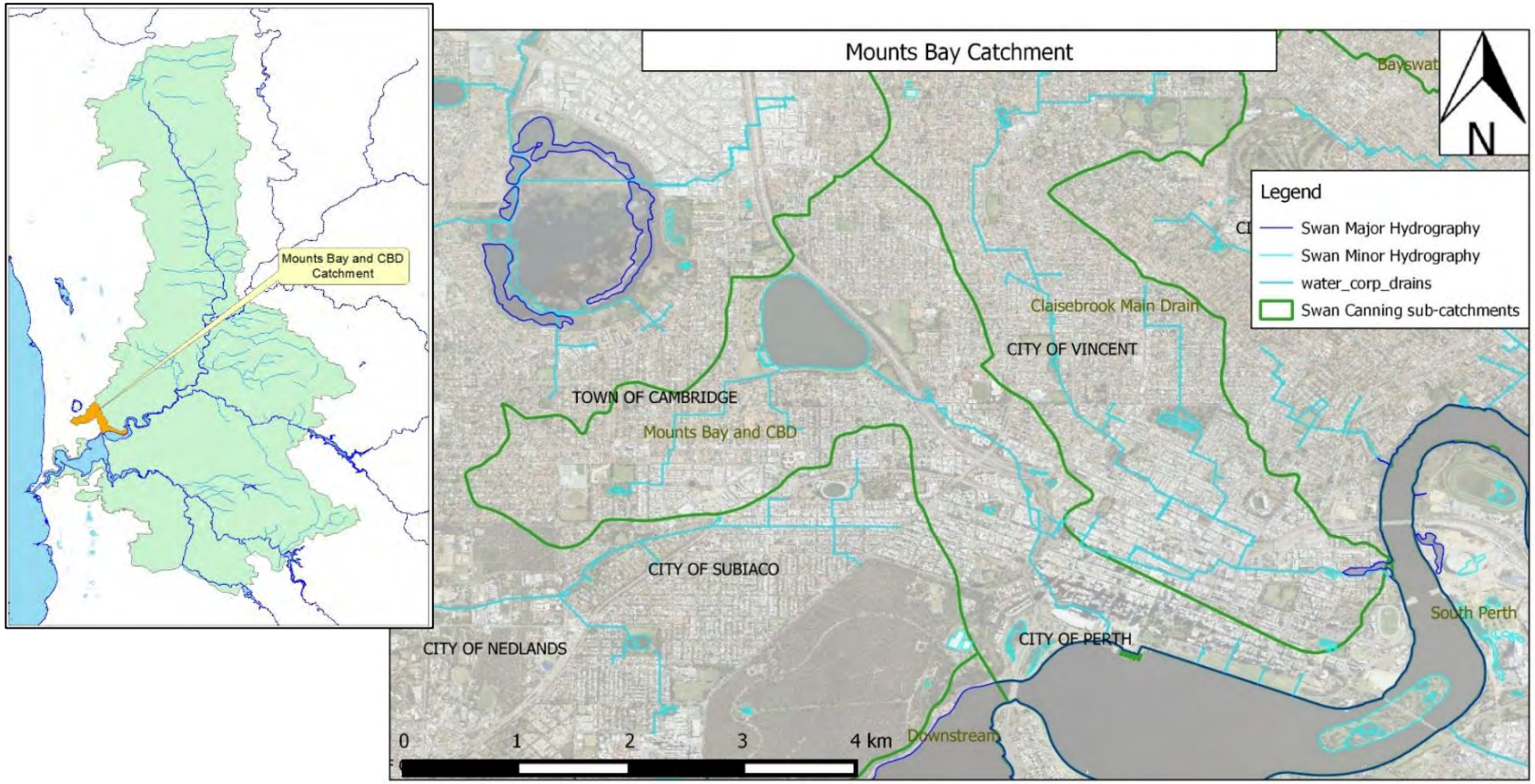
The Swan Canning River Protection Strategy supports the development and implementation of the Swan Canning and local WQIPs as an action to achieve nutrient load reduction targets and provides the framework for DBCA to update local WQIPs. This review will determine the local WQIPs to be updated based on the level of support from key stakeholders and the 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

Mounts Bay Main Drain Catchment

The Mounts Bay Catchment covers about 13 square kilometres of land, made up of parts of the Cities of Perth, Subiaco, Vincent and Nedlands, and the Town of Cambridge. It drains into Perth Water at Elizabeth Quay, Mounts Bay. The upper catchment drains residential areas into Lake Monger which connects to the Swan River via Mounts Bay Main Drain (MBMD). The MBMD also receives stormwater runoff from areas in the City of Perth and connects to a freeway drainage system with lakes in the Hamilton Interchange. Water from the Hamilton Interchange is pumped to the Narrows Interchange to maintain water levels in ornamental lakes and irrigate parkland.

The foreshore at Mounts Bay has changed significantly since the WQIP development with the construction of Elizabeth Quay. An end-of-catchment sampling point has been established, located in the Perth Convention Centre carpark. Previous attempts to regularly collect data for the discharge from the MBMD into the Swan Estuary have been difficult due to lack of access to a suitable sampling point for the outflow water without the influence of estuarine backflow. Regular access to the new sampling point within the Convention Centre carpark is still not guaranteed as it is located within a car bay.



Mounts Bay WQIP Review Summary

The Mounts Bay WQIP has a total of 22 actions, 82 percent of those have been addressed: including two that have been completed; seven that are ongoing actions; and nine that have been implemented to some degree but will require further investment for catchment-wide implementation. There are four actions that have had little or no progress (see Appendix 1 for details).

Completed projects:

- Western Suburbs Regional Organisation of Councils (WESROC) released the Sediment Control for Building Sites guidelines brochure
- Mabel Talbot Lake Improvements – Gross Pollutant Traps partnership projects and increased fringing vegetation by City of Subiaco

Water efficiency requirements of programs such as the Water Corporation's Waterwise Council endorsements have prompted councils in the catchment to implement eco-zoning and hydro-zoning to create more water efficient landscaping, which also requires less nutrient inputs.

All local governments surveyed are taking some measures to reduce their own operational nutrient losses, including supporting ground staff to complete Fertilise Wise training and completing the Annual Nutrient Surveys run by the South East Regional Centre for Urban Landcare (SERCUL), however continued support for nutrient reduction measures is required.

Community awareness raising activities and behaviour change programs are available in the catchment, including the Phosphorus Awareness Program (delivered in partnership by DBCA and SERCUL) which operates throughout the Swan Canning Catchment. Local governments are providing incentives and competitions for residents to increase uptake of local native plants for gardens and verges and occasional workshops to help interested residents become more sustainable. The Claise Brook Catchment Group is an active community group in the area that provides opportunities for locals to participate in planting days and community activities within the catchment.

Community education and participation programs require ongoing commitment and increased capacity to ensure all community members are conscious of catchment issues and given the knowledge and opportunities to be part of the solution.

The City of Perth has adopted a new Environment Strategy which identifies transitioning to a Water Sensitive City (WSC) as a key focus area. A key objective of the Strategy is to "Improve efficiency in water use and quality of water runoff". And while the City of Subiaco's Sustainability Plan is mainly focused on water efficiency it also contains statements related to protecting water quality. Subiaco's Wildlife Enhancement Plan includes actions to improve the habitat quality of wetlands in the City of Subiaco by reducing nutrients and other pollutants at source.

In general water quality improvement objectives are not imbedded into the local government planning systems as well as could be, however there are examples of positive change such as the City of Vincent's Draft Built Form Policy which includes sustainable landscaping as a condition for development.

The Town of Cambridge enforces its updated Private Property Local Law to prevent sand drift from development and building sites entering drains and waterways in the catchment. This combined with the development and distribution of the Sediment Control for Building Sites guidelines by the Western Suburbs Regional Organisation of Councils (WESROC) is addressing the problem of sedimentation in waterways and stormwater drains.

Since the WQIP development, local governments in the catchment have installed Water Sensitive Urban Design (WSUD) features to some areas for improved stormwater management, however widespread implementation and retrofitting of WSUD across the catchment requires more work.

The local governments in this catchment have varying levels of interest in updating the WQIP, mainly due to some local governments only having a very small portion of land in the catchment. It was clear from feedback received that any updated WQIP would require regular ongoing stakeholder engagement including meetings, accountability for actions, and cross-boundary collaboration.

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
Mounts Bay	Sep 2009	22	2	16	4	**82**

Future priorities and actions – Mounts Bay Catchment

- Implement the Swan Canning River Protection Strategy.
- Ensure all new development and infill/retrofit 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.
- Increase community awareness, education and involvement in catchment management to reduce nutrient and contaminant outputs.
- Continue to take opportunities to retrofit existing drainage systems in line with Water Sensitive Urban Design (WSUD) principles.
- Continue to look for, and take opportunities to improve water quality, habitat, and community benefit of wetlands and vegetated areas in the catchment.
- Reduce council'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.
- Discourage the planting of deciduous trees near drainage infrastructure to reduce organic loads and excessive nutrients entering stormwater in Autumn when the rivers are susceptible to algal blooms.
- Promote cross boundary partnerships for catchment-wide approach to water quality improvements.
- Investigate likely effects of a drying climate on local waterways and wetlands.
- Investigate options to introduce light industry audits and education to reduce the pollution risk posed by small to medium sized business premises in the catchment.

Mounts Bay Catchment Case Study: Lake Mabel Talbot: Cross-boundary stormwater management

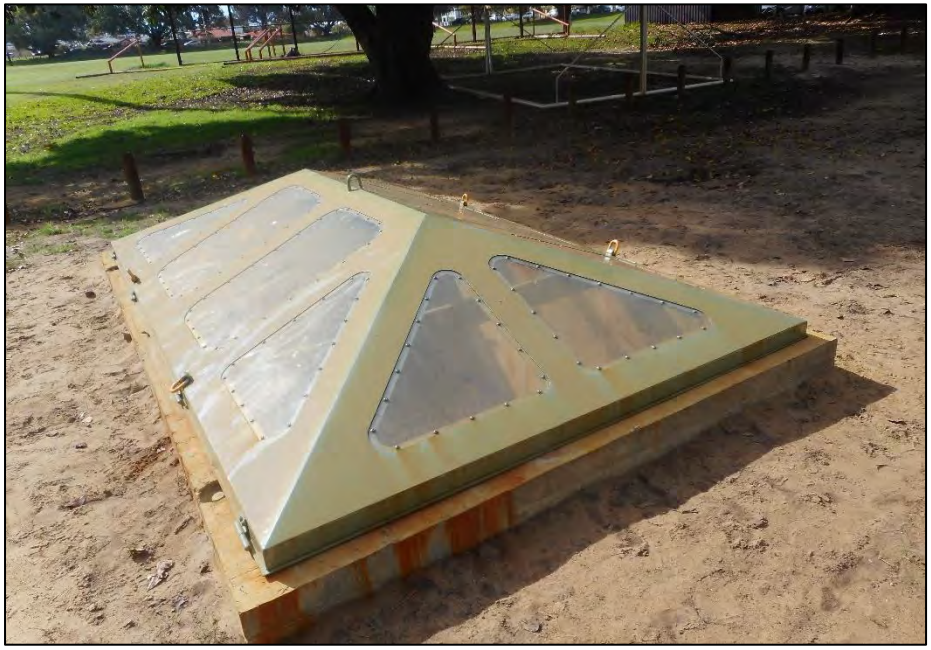
Lake Mabel Talbot lies within the City of Subiaco. The lake's 300ha catchment also covers parts of the Town of Cambridge and City of Nedlands. The lake functions as a Water Corporation compensating basin to prevent local flooding. The lake's outlet is piped to Lake Monger in the City of Cambridge, which overflows to the Swan River via the Mounts Bay Main Drain in high flow years.

Aerial view of Lake Mabel Talbot

The City of Subiaco has worked with its neighbouring councils along with other funding partners Main Roads WA, the Water Corporation and Australian Government to install Gross Pollutant Traps (GPTs) at three of the four major inlets to the lake. The GPTs remove litter and reduce sediment and sediment-associated contaminants from water flowing into the lake from the surrounding urban catchment. In 2017, a "SPEL baffle box" GPT was installed at the reserve which allows visitors to view the pollutants that have been trapped by the system through a transparent top. This is the first installation of its kind within Western Australia.


Installation of the second GPT at Mabel Talbot Lake. Photo courtesy of City of Subiaco.

The City of Subiaco has also removed large areas of turf around the reserve and is replacing them with more suitable local wetland species and trees, to improve water quality in the lake and provide habitat for local wildlife. Lawn has been left in the areas best suited to recreational activities. This practise is referred to as eco-zoning. Some of the plantings have been undertaken in conjunction with Bird Life Australia to provide more food sources for endangered species such as the Carnaby's Cockatoo, known to visit the reserve. The City's newest wildlife enhancement initiative is the installation of its first 'Insect Hotel' sculpture at the Mabel Talbot Reserve. The Insect Hotel, along with several new native gardens, nest boxes and sedge beds will provide additional food sources, educational opportunities and habitat at the wetland. Micro bat boxes are also being installed around the reserve to encourage native bats that feed on mosquitos and midges.



Transparent lid of the newest GPT at Mabel Talbot Lake (photo courtesy of City of Subiaco)

One of the signs installed at Mabel Talbot Lake to increase community understanding of the local environment (photo courtesy of City of Subiaco)

The inflows to the wetland are often high in nutrient concentrations, leading to issues such as algal blooms. The City's officers inspect the lake weekly and regularly monitor water quality to ensure any blooms or other problems are detected early and responded to quickly, saving the City financially in the longer term and maintaining the wetland's appeal for residents.

Signs have been installed around the reserve providing the public with information on water bird species they can expect to see, the lakes natural drying cycle, the role of the GPTs, and to discourage people from feeding wetland birds. Improving the understanding of the wetland environment within the local community increases the level of support for protecting the lake as habitat for local wildlife, and improves water quality flowing to downstream receiving environments.

Appendix 1: Mounts Bay Catchment WQIP – Action Review

Tally and explanation of action review categories – Mounts Bay Catchment			
Total number of actions	**22**	**Percentage**	**Explanation**
Action achieved	2	9.09	The action has been completely fulfilled.
Action on track	0	0.00	Significant progress has been made and the action is likely to be completed in the near future.
Ongoing action	7	31.82	This action will require ongoing commitment or maintenance.
Projects/Programs implemented	9	40.91	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	2	9.09	Little or no progress has been made on this action. This can be for various reasons.
No longer relevant or viable	2	9.09	Can be for various reasons.
Summary categories			
Total number of actions	**22**	**Percentage**	**Explanation**
Action fully achieved or on track to being achieved	2	9.09	First two categories above combined.
Action implemented but ongoing commitment required	16	72.73	Second two categories above combined.
Little or no progress	4	18.18	Last two categories above combined.

Mounts Bays 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** Prioritise water quality in decision support systems	**1.1.1** State and local government prioritise water quality actions in programs and decision-making systems such as International Council for Local Environmental Initiatives (ICLEI), environmental management systems (EMS) and sustainable management systems.	MOU stakeholders - City of Perth (CoP), Town of Cambridge (ToC), City of Vincent (CoV), City of Subiaco (CoS), Main Roads WA (MR), Claise Brook Catchment Group (CBCG), Perth NRM, Department of Biodiversity, Conservation and Attractions (DBCA)	Western Australian Local Government Association (WALGA)	• The ICLEI is defunct and mostly replaced by Waterwise Council endorsements, however this currently does not cover water quality. • CoV - All bores are fitted with meters and monthly readings are compiled. Draft Water Efficiency Action Plan completed to retain Waterwise Council Status. • CoP - adopted a new Environment Strategy in March 2016 which identifies transitioning to a Water Sensitive City (WSC) as a key focus area. A key objective of the Strategy is to "Improve efficiency in water use and quality of water runoff". • CoP - implemented a surface water and sediment monitoring programme for all lakes and wetlands in the local government area. • CoS - The new sustainability plan contains statements about protecting water quality, however is mostly focussed on water efficiency and water saving measures. CoS's Environmental Officer sits on the Regional Advisory Committee of the CRC for Water Sensitive Cities (WSC) and trialled the WSC index tool to highlight actions to improve water quality. Subiaco's Wildlife Enhancement Plan 2014-19 includes actions to improve the habitat quality of wetlands by at-source management of nutrients and pollutants, and litter removal. • ToC - All bores are fitted with flow meters and monthly reports are compiled to monitor water consumption. License has not been breached. A Water Conservation Plan was compiled in 2007-08. Hydrozoning, ecozoning and zero scaping practices were implemented in parks and median strips. Ongoing water conservation strategies are implemented using new more effective irrigation techniques and technology such as a weather station. Bore water analysis performed annually, slight increase in sodium and EC levels. • DBCA prioritises water quality in existing programs, including the Healthy Catchments Program and through statutory planning policies. Improving water quality is one of the main objectives of the River Protection Strategy (RPS) and the Swan Canning Water Quality Improvement Plan. Local governments are one of the lead agencies for the RPS actions '2.6 Improve planning schemes and policies to achieve a net decrease in nutrient inputs from future land development' and '19.2	

					Apply water sensitive urban design principles and other existing policies and guidelines' • LandCorp - A review of the urban water management policy is underway, incorporating information from the CRC for WSCs research project B2.4 Statutory planning for Water Sensitive Cities (soon to be published).	
	1.2 Implement local planning policies, strategies and planning conditions incorporating best management practices	**1.2.1** Review policies and strategies to prioritise improved water quality	MOU stakeholders	Department of Planning, Lands and Heritage (DPLH), WALGA, Department of Water and Environmental Regulation (DWER)	• Improving water quality is one of the main objectives of the River Protection Strategy, and local governments have the lead responsibility for the actions '2.3 Prescribe and apply intervention techniques to either trap nutrients, organic material and sediments in drains and tributaries, or to achieve source control of these contaminants' and '2.6 Improve planning schemes and policies to achieve a net decrease in nutrient inputs from future land development' • Some of the local governments admit that water quality objectives are not imbedded in the local government planning systems as well as could be.	
		1.2.2 Local government implement and ensure appropriate enforcement of State Government codes of practice and legislation at the local level			• The River Protection Strategy identifies responsibilities of local governments in river management. • ToC – enforces Town of Cambridge Private Property Local Law which includes sections on sand drift, storm water and wastewater management. • Sediment Control for Building Sites Guidelines completed and released in WESROC councils. • CoS - includes the Sediment Control brochure in approvals for development. Enforces the *Environmental Protection (Unauthorised Discharge) Regulations 2004* and has issued fines under those regulations. • A light industry audit program (to audit and enforce compliance with the *Environmental Protection (Unauthorised Discharge) Regulations 2004)* was investigated for the western suburbs, however with only around 100 light industrial premises identified in the WESROC area at the time it did not go ahead.	
		1.2.3 State Government implement and ensure appropriate enforcement of departmental codes			• This is an ongoing action. DBCA administer the *Swan and Canning Rivers Management Act 2006* and associated Regulations, planning policies, and departmental codes of practice.	

		of practice and legislation				
2. Minimisation Ecoefficiency	**2.1** Water conservation plans	**2.1.1** Local government authorities develop and implement water conservation plans	CoP, ToC, CoV, CoS	DWER	• CoV - awarded Waterwise Council status Sep 2013. In 2017, the CoV received platinum recognition – the highest award in the program - for demonstrating innovation and best practice techniques in sustainable water management, as well as their commitment to community education and behavioural change amongst their ratepayers. • CoP continues to implement groundwater allocation management plan. Projects to identify alternative sources of water for irrigation are currently being implemented. Waterwise Council Grant to reduce scheme water consumption by installing an iron removal filter for bore water in 2015. •CoP developed an Interim Water Efficiency Action Plan as part of its commitment to the Waterwise Councils Program. In 2017, CoP was awarded gold recognition in the Waterwise Councils Program for demonstrating significant progress towards best practice sustainable water management, or achievement above and beyond the actions required for endorsement. CoP is developing a Water Sensitive City Transition Study which will identify opportunities and strategies for reducing water use. • CoS - resubmitted their water conservation plan as part of the Waterwise Council Program, which incorporates best practice and highlights water quality and the total water cycle. In 2017, CoS was awarded gold recognition in the Waterwise Councils Program for demonstrating significant progress towards best practice sustainable water management, or achievement above and beyond the actions required for endorsement. • ToC - All bores are fitted with flow meters and monthly reports are compiled to monitor water consumption. License has not been breached. A Water Conservation Plan was compiled in 2007-08 and is still being used with approval and agreement from the DWER. Hydrozoning, ecozoning and zero scaping practices were implemented in parks and median strips. Ongoing water conservation strategies are implemented through the use of new more effective irrigation techniques and technology such as a weather station.	

3. Reduction Source control	**3.1** Reduce council output	**3.1.1** Implement best management practices for management of public open space.	CoP, ToC, CoV, CoS, City of Nedlands (CoN)	DWER, Phosphorus Awareness Program, Perth NRM	• DBCA sponsors Fertilise Wise Training Workshops to increase uptake of best management practices for fertiliser use by local government grounds keeping staff. • An annual survey of local governments fertiliser practices is run by SERCUL and sponsored by DBCA through the Phosphorus Awareness Program. • CoP - Staff attended refresher Fertilise Wise training and have implemented a new log system for tracking fertiliser applications with a focus on water quality. Soil and leaf tissue analysis is undertaken to inform fertiliser strategy in parks and reserves. Green Army project in 2017 aims to increase sedge cover surrounding the lakes at Narrows Interchange to increase bank stabilisation, infiltration of runoff and improve water quality. Lake maintenance contract for Claise Brook to remove organic matter, debris and algae, to improve water quality. • ToC - Committed to completing the annual nutrient survey from 2011 run by SERCUL. Ongoing water quality monitoring by the UWA to determine nutrient levels and assist with identifying appropriate amelioration measures. Contaminated Site Investigation being undertaken at Lake Monger (historical landfill site). Detailed site investigation Phase 2 finalised, further investigation to be undertaken. • CoS - Participate in the annual nutrient survey run by SERCUL. Reducing water use by introducing hydrozoning to public areas. Weekly environmental inspections of the city's lakes are undertaken to monitor water quality and manage problem algae. New biofilters installed in Jersey Street and Forrest Street. 20 CoS staff attended Fertilise Wise training in 2012. • CoV conduct quarterly environmental assessments on all wetlands.	
		3.1.2 Review management practices for street sweeping, litter and sediment management			• CoS - Regular street sweeping continues and soil and sand erosion from development sites are followed up by officers. Enforcement action has been taken on some occasions. CoS has installed three gross pollutant traps (GPT) at the inlets of Mabel Talbot Reserve. The GPTs improve water quality by capturing leaves and rubbish, hydrocarbons and sediments from stormwater before it enters the wetland. Mabel Talbot GPT cleanout and research project including water quality and composition of pollutants with Central TAFE students was completed and recommendations considered.	

		3.1.3 Develop and implement a nutrient and irrigation management plan (NIMP) for streetscapes (verges, median strips and roundabouts)			• CoV - Ecozoning - Kyilla Park, Mick Michael, Britannia Road Reserve, Woodville and Elzmere Reserves. • CoP – plan to develop a NIMP in 2017-18. • CoS - No NIMP, however practices that are embedded in the City's operations include: soil and leaf tissue analysis and monitoring of bore water and parks. Biofilters are being installed in carparks as opportunities arise - two have been installed so far. • ToC – A fertiliser management program has been implemented based on leaf testing at the Town's open spaces in 2016-17.	
	3.2 Reduce community output	**3.2.1** Create community-wide awareness of the catchment's connection to the Swan River	MOU Stakeholders		• DBCA - financially supports delivery of the Phosphorus Awareness Program (community education program) by SERCUL for all areas within the Swan Canning Catchment. Community RiverWise Gardening workshops sponsored by DBCA. The River Guardians Program is open to the public to join, members are offered opportunities to participate in restoration projects and help with river research. • CBCG - provide opportunities for people to participate in revegetation sites and provide informative stalls or activities at events - for example CBCG had an information stall in Forrest Place as part of the CoP's Sustainable Spring event. The City provided a hundred plants (local seedlings) to give away and these proved popular. CBCG promoted 'Stormwater Awareness' and the role of good household practices in the reduction of stormwater pollution via messages on reusable shopping bags. CBCG led another event inviting people to attend the May GOLLY Walk as part of the Conservation Council of Western Australia (CCWA) EcoMay Programme, following parts of the City of Vincent's Wetlands Heritage Trail through North Perth. • CoV – runs an annual Garden Competition with a catchment friendly category. • CoS - runs Environmental Volunteers Group that undertake activities such as litter and algae removal at wetlands. CoS has a Sustainable Garden and Verge Award Program. The City's officers host local school excursions to the wetlands in the City. Rosaly Primary School runs its own excursions to wetlands. Subiaco Primary runs a program where year 4s are taught to be the teachers and explain the wetland environment to year 2s. • CoP - hosts riverside planting events with local schools and businesses and explains the relationship of stormwater with receiving ecosystems. Technical	

					wetland tours with university students to discuss stormwater treatment options, impacts of stormwater on receiving waterways, treatment mechanisms of urban wetlands. Annual Sustainable Spring community events, Spring Eco Fest by the Conservation Council of WA community events and education campaigns. • The Central Institute of Technology (now North Metro TAFE) approached the then Swan River Trust (now DBCA) and other Mounts Bay WQIP Working Group partners including CBCG, CoP, CoS, CoV and ToC for potential collaborative projects with students completing a Diploma (pilot) or Certificate IV in Environmental Monitoring and Technology. Projects were developed by the Mounts Bay WQIP Working Group and students selected the projects to work on over the semester. The pilot program led to 5 student reports being completed in 2012: 1. Water and Sediment at Lake Monger 2. Monitoring Sediments and Water Quality at Robertson Park 3. Lake Mabel Talbot Macroinvertebrates 4. Hamilton Lakes Indicators of Wetland Health 5. Hyde Park Lakes Groundwater and Surface Water Quality The pilot program led to a continuing link with North Metro TAFE and in subsequent years the project sites and partners were expanded to other priority sub-catchments in the Swan Canning Catchment.	
		3.2.2 Promote community behaviour change through education programs			• CoV - Adopt a Verge Program assists residents in converting turfed verges into water wise native gardens - sponsored by Water Corporation. • CoS - Living Smart Program workshops. Beyond Gardens Program (WC sponsored) workshops and a Bush Food Garden Workshop have all been held and supported by the City of Subiaco. • CoP and DBCA - Clean Drains River Gains promotion – curb markers along Saint Georges Terrace. Behaviour change program targeted smoke butts linking to Clean Drains River Gains message. CoP – developing a residential verge policy to encourage the use of water wise native plants. • CBCG - designed and developed stormwater awareness campaign shopping bags with tips on them and have distributed them throughout the LG areas. • ToC - has spring and autumn workshops with Great Gardens and Beyond Gardens. A new Verge Policy and Guidelines were approved in March 2012. Three verges received a "makeover". The Town worked with the Beyond Gardens team on this project. The Guidelines promote the use of water wise and native plants	

					reducing the amount of water and fertilisers used. The WESROC Native Plant Subsidy Scheme also takes place in May annually. The project is run through Apace Nursery where residents can receive up to 80 plants at a $1.50 each. The uptake for the ToC was nearly a 100% with 2788 plants sold.	
		3.2.3 Work with local industry to reduce potential contamination of receiving waters			• DBCA and DWER are partnering with local governments in major light industrial areas in the Swan Canning Catchment for the National Landcare Programme funded 2015-17 Light Industry Program - although not in the Mounts Bay Catchment, resources generated are available to all local governments on the DWER website. • The then Swan River Trust and Department of Water completed a project to define the quantity and impact of continuous dewatering in the Perth CBD. With the assistance of the CoP, building managers across the CBD were surveyed and a number of site inspections carried out. Results indicated that ongoing dewatering from below ground structures in the CBD was not significant in volume and was unlikely to be contributing significant loads of nutrients or contaminants to the river. • CoP - CarrotMob http://carrotmobperth.org/ - 4 restaurants / bars in City of Perth - Oliver on James, The Secret Garden, Frisk Small Bar and 138. Carrotmobs work by getting a business to commit a portion of its profits for a set time on a set day, to making environmental improvements to their activity. Businesses come up with ideas to make their gig friendlier, more sustainable, better. Each business gets some face time on YouTube and an Interweb spot. The one with the most votes wins. In return, on the day, a huge mob of people rock up and spend as much cash as they can to support the winner. All profits over and above the average taking for the day gets invested into the business improvements. CoP – Through the Waterwise Office Program, training is available to commercial offices. Information is provided on correct discharge procedures to ensure cooling water bleed enters the sewer system rather than the stormwater system. ToC – A Contaminated Site Investigation is currently being undertaken with the DSI, stage 2 finalised, follow up investigations required and completed over the next 3 years. • CoS - Sediment Control for Building Sites Guidelines are provided to developers. No auditing program but respond to complaints. Some positive interaction with	

					business community by organising events such as Clean Up Australia events.	
	3.3 Sustainable landscaping	**3.3.1** Adopt sustainable landscaping practices through policy and management	CoP, ToC, CoV, CoS, MR	CBCG, Perth NRM	• CoV - Ongoing implementation of sustainable landscape practices through management in Parks and Gardens. • CoP - Adopted an Urban Forest Plan in September 2016. Developing a Residential Verge Policy and Policy Guidelines to encourage water wise verge installation. The CoP has identified areas of road reserve for conversion to native plants. • ToC - The northern and western section of Lake Monger has been revegetated with native species since 2012.	
		3.3.2 Require sustainable landscaping as a condition of development approval			• CoV - Included in draft Built Form Policy which is out for community consultation/comment • CoS - No, this doesn't occur.	
		3.3.3 Identify exotic vegetation impacting surface water quality and replace with indigenous vegetation (where not in conflict with cultural values)			• CoS - Planting more natives than previously. There will still be little support for removal of the problem deciduous street trees as they are considered important aesthetic features (plane trees etc), however some gradual removal of Weeping Willows and Japanese Peppers has occurred at Mabel Talbot Reserve and replacement with more suitable natives. Some of the turf at Mabel Talbot has also been replaced with native plants including wetland plants. • DBCA - officers considered the need and resources required for this action and concluded that in this catchment the exotics that are contributing to poor water quality the most (the large deciduous trees) are unlikely to be removed due to the cultural and aesthetic value placed on them and therefore other WQIP actions should be pursued as a higher priority. This can be discussed further with partners as required • Priority should be given to planting suitable local natives as opportunities arise and through influencing street-tree policies rather than focussing on the removal of existing mature trees.	

4. Amelioration Conveyance and transmission	**4.1** Drainage nutrient intervention projects	**4.1.1** Maintain nutrient stripping systems at Lake Monger and Mabel Talbot Reserve	ToC, CoS, CoV, MR	ToV, WC, Parks & Wildlife, tertiary institutions	• The Draft Mabel Talbot Management Plan (April 2016) water quality in the wetland is a priority and meeting the targets of the WQIP are an objective. • Unclear what the specific nutrient stripping system referred to in this WQIP action is at Mabel Talbot Reserve. The three Gross Pollutant Traps (GPTs) installed at Mabel Talbot Lake remove nutrients that are bound to sediment that settles out of stormwater in the traps and these are maintained by the City of Subiaco. • At Lake Monger, a more suitable action would be to improve the nutrient stripping system on the eastern side of the Lake. The existing nutrient stripping channel was the subject of a university research project and was found to be having negligible effect (see comments for 4.1.2 for more detail). Historically, a "first flush" occurred each year from Lake Monger into the Mounts Bay drain however, this now only occurs in years with relatively high rainfall due to the height of the outlet. The consequence is that the quality of water released into Mounts Bay is generally diluted with a relative improved quality (compared with what is in the lake at other times). Rehabilitation of the western and northern sections involved the removal of exotic species and hard edges have been replaced with native species.	
		4.1.2 Investigate and trial a range of technologies to quantify water quality improvements	MOU stakeholders, CoN		• Gross pollutant traps (GPTs) have been installed at three of the four inlets to Lake Mabel Talbot in the CoS. Monitoring of the volume pollutants removed has been undertaken. • Lake Monger research projects by UWA, Dr Clelia Luisa Marti, initial findings were: 1. Water entering via groundwater is rich in silicate, total nitrogen and phosphorous, dwarfing what is coming in via drains; lake is eutrophic. 2. The 'nutrient stripping channel' (NSC) has no noticeable impact with respect to nutrient removal as drains contribute little and it removes few nutrients, but seeds lake with plankton. (Optimisation of the NSC will be investigated during monitoring phase.) 3. Macrophytes compete with phytoplankton: Chlorophyll dropped 27µg/l to 5µg/l from Sept -Dec 2011 even though nutrients remain roughly constant: light control. (Macrophytes block sunlight and prevents algal growth). 5. Sampling for sediment nutrient fluxes, groundwater quality, pathogen levels and endocrine disrupters should be discussed. Lake Monger: Conclusions & Recommendations 1. During summer Lake Monger is a eutrophic water body, susceptible to algal blooms, macrophyte growths, but safe for casual immersion. NSC has aesthetic	

					value only. 2. The 3D simulations have been successful with general biomass levels and algal species succession. Requires overall validation of 2012: Plankton-Macrophytes. 3. Real-time loggers have been installed in the two specified bore holes. 4. Lake water sampling should now be opportunistic, focus also on macrophytes. 5. Pathogen samples will be continued to be collected, model validated (DoH). Currently Maria de la Paz, a UWA PhD student is investigating the changes that have occurred at Lake Monger. The lake has moved from an algal dominant system to macrophyte dominance, causing oxygen stratification and increased anoxic levels especially during late summer. Amelioration measures are being investigated to reduce the macrophyte impacts and remove excessive nutrients. • A UWA turtle monitoring project at Mabel Talbot lake estimated a population of 35-55. • CoP - A water treatment facility for water captured from the street cleaning machines has been installed at the Depot. Technology still being assessed for effectiveness and efficiency. • Two presentations on new technology and local relevance to Mounts Bay Catchment presented at March 2012 meeting - Templug and Floating Island Technology. • Central Institute of TAFE (North Metro TAFE) Student project - Lake Mabel Talbot macroinvertebrates study. • Point Fraser Monitoring and Evaluation Program recommendations to improve WSUD of area. • CoP trialled the installation of MyCelx to remove oil and grease from water within stormwater pits at three trial sites across the City. After the success of the trial, CoP has implemented a permanent system within the Murray and Hay Street malls.	

		4.1.3 Develop and implement treatments to address contamination to Lake Monger via groundwater from landfill areas.	MOU stakeholders, CoN		• No action	
		4.1.4 Identify and prioritise sites to implement water sensitive urban design (WSUD) features to intercept pollutants and increase infiltration.	MOU stakeholders, CoN	CBCG,	• Most of the major wetland or compensating basin sites in the catchment have been worked on or explored. In addition to improving the wetlands and compensating basins, a whole of catchment approach to WSUD would require retrofitting street entry pits, kerbing, carparks etc as maintenance or replacement works are due to occur. • CoS - opportunistically retrofits carparks as they are due for work or upgrades, the City's environmental officers are working with the City's engineers in this regard. Biofiliters using specific soils mixes are used. • CoP Point Fraser update - There are no plans in place in relation to redesigning the wetland at this stage. Looking at how much of the East Perth catchment is connected to the Point Fraser drain: the monitoring is indicating that significantly less flows are entering the wetland than modelled. With a significant amount of redevelopment in East Perth it is possible that flows that were thought to be going through to Point Fraser wetlands are not. In relation to the flushing of the wetland, this is because the salinity levels in the wetland are increasing. As it was designed to be a relatively freshwater system this is causing the vegetation to be stressed. An 8 hour drain of the wetland was attempted, however not much water left the system. The consultant recommended adding chloride to the suite of parameters tested which could help monitor the salinity levels. Linking with TAFE's new environmental monitoring and technology unit to research and prioritise hotspots leading to other TAFE projects. Every year CoP receive a monitoring report that looks at the results of the year's water quality monitoring. The idea of redesign and flushing was in response to: high salinity concentrates because of evaporation and high tides coming up from the estuary into the wetlands, and backflow; and the catchment connection issue prior to the wetland. • The (then) Department of Water researched ways to improve water quality in	

					the Narrows Interchange Lakes in anticipation of funding, however the funding was not grated. (Narrows Interchange Lakes Committee) • Mounts Bay main drain improvements were not encompassed in Elizabeth Quay project.	
		4.1.5 Identify and prioritise sites to install nutrient intervention projects to treat low flow and first flush events	MOU stakeholders, CoN	CBCG	• CoP - Water capturing tree pits installed on St Georges Terrace and Museum Street. • CoS - No strategic approach to projects - however opportunistic projects implemented. • ToC – McCourt Street Infiltration Drain planned for 2017-18 installation, diverting stormwater from Lake Monger through direct onsite infiltration.	
		4.1.6 To complement source control treatments, develop a funding and implementation strategy to install an appropriate intervention system in MBMD prior to discharge into Mounts Bay	MOU stakeholders, LandCorp	MR, WC	• This action will no longer be possible. Elizabeth Quay plans included the realignment of the MBMD outlet with no other intervention technologies planned.	
		4.1.7 Project manage installation of intervention system in MBMD	MOU stakeholders, Landcorp		as above - 4.1.6	

5. Treatment - Reuse - Disposal	**5.1** Improve water quality in Hamilton lakes	**5.1.1** Investigate and implement water quality improvement methods at the Hamilton Interchange (before water is pumped to the Narrows Interchange for reuse)	MR	CoP, DPLH, LandCorp, Perth NRM, CBCG	• In 2011, recommended management options for the Interchange Lakes were provided to Government for consideration but were unsuccessful in gaining funding. • Some fringing vegetation was planted for nutrient stripping and erosion control. DWER (then DoW) applied Phoslock to the Western and Eastern Lakes, and the Solar Bee is still operating. • In 2012-13 CBCG undertook revegetation works at the Hamilton Interchange Lakes with MR and funding from a Swan Alcoa Landcare Program (SALP) grant for $5000. However most of the revegetation area has since been removed due to earthworks/roadworks to install the Charles Street Bus Bridge. MR has asked the contractor to replace the vegetation where possible after the construction is finished and install an oil and sediment separator for any spills that may come from the new bus bridge. • Central Institute of Technology Student project completed 2012 - Hamilton Lakes snap shot sampling and analysis - water quality, sediments, vegetation, macro-invertebrates, connectivity and disturbance. • Contractors de-sludge the Interchanges Lakes but the sludge is getting harder to deal with using the current process so alternative methods are being considered including using treatment bags like those that were used at the Liege St Wetlands. • MR investigated the potential of using Iron Man Gypsum (IMG) at Narrows Interchange to reduce nutrients, however this did not go ahead. • CoP - Green Army project in 2017 aims to increase sedge cover surrounding the lakes at Narrows Interchange to increase bank stabilisation, infiltration of runoff and improve water quality.	