# Water Quality Improvement Plans

## Progress Report

## 2008-09
## 2009-10

THE GOVERNMENT OF WESTERN AUSTRALIA

SWAN RIVER TRUST

*Caring for the Swan Canning Riverpark*

Welcome to the Swan River Trust
*Wandju wandju nitja Derbal Yerrigan beelier mart*

Level 1, 20 Terrace Road
East Perth WA 6004
PO Box 6829
East Perth WA 6892

**Phone:** (08) 9278 0900
**Fax:** (08) 9325 7149
**Email:** info@swanrivertrust.wa.gov.au
**Website:** www.swanrivertrust.wa.gov.au

After hours 0419 192 845

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## Healthy Rivers Action Plan

The Swan Canning Riverpark is a wonderful resource for all West Australians and our visitors. The Swan River Trust (Trust) is committed to ensuring the Riverpark continues to be a sustainable ecosystem providing clean water for swimming, boating, fishing and other activities.

However, the rivers are showing the same signs of environmental stress as other waterways around the world. Excess nutrients such as phosphorus and nitrogen enter the Swan and Canning rivers from the catchment. Algae feed on nutrients, allowing them to grow excessively and cause an algal bloom. The combination of algal blooms and low oxygen conditions in the rivers places stress on fish and other aquatic life. Non-nutrient contaminants such as heavy metals, pesticides, herbicides and pathogens put further stress on the rivers.

The Healthy Rivers Action Plan (HRAP) was released by the Trust in August 2008, as a five year plan to protect the environmental health and community benefit of the Riverpark by improving water quality.

The HRAP takes a 'catchment to coast' approach through eight programs:

1 Coordination
2 Community and Partners
3 Land Use Planning
4 Healthy Catchments
5 Drainage Nutrient Intervention
6 Riverbank
7 River Health
8 River Science

The eight programs aim to:

- reduce the input of contaminants at their sources in the catchments;
- intercept pollutants as they travel through the tributaries, drains and groundwater; and
- apply river intervention techniques to improve water quality in the Swan and Canning rivers.

## Swan Canning Water Quality Improvement Plan implementation

The HRAP is complemented by the Swan Canning Water Quality Improvement Plan (SCWQIP) released in December 2009. The SCWQIP was funded by the Australian Government and focuses on reducing nutrients entering the Swan and Canning rivers from the 30 sub-catchments. It uses sophisticated modelling to identify nutrient sources and nutrient reduction targets for each of the sub-catchments. This is the first time detailed information which takes into account specific sub-catchment data such as land uses and soil types has been available – allowing the Trust and its partners to target on-ground activities to ensure best results.

The SCWQIP has received funding from state and Federal governments to implement a range of priority actions from the WQIP to reduce nutrients entering the Swan and Canning rivers. This funding is listed in the table below.

The SCWQIP recognises that for effective nutrient management, the source and composition of nitrogen and phosphorus loads require management on a sub-catchment level. A key management recommendation of the SCWQIP is to develop local water quality improvement plans and other sub-catchment nutrient management plans based on catchment characteristics and feasibilities.

## State and Federal SCWQIP funding

| State NRM – $3.19m to June 2011 | |
|---|---|
| **Project title** | **Funding** |
| Ellen Brook wetland feasibility | $200,000 |
| Ellen Brook riparian management | $191,000 |
| Southern River wetlands and living streams | $867,000 |
| Anvil Way basin remediation | $1,150,000 |
| Light Industry Audit project | $250,000 |
| Swan River Trust and Alcoa Landcare Program | $100,000 |
| Phoslock in the Canning River | $180,000 |
| Project management | $95,000 |
| Water quality monitoring | $157,000 |
| **Caring for our Country – $2.5m to June 2013** | |
| In-stream nutrient intervention (Ellen Brook or Bayswater Brook) | $1,200,000 |
| Application of soil amendment (Ellen Brook) | $230,000 |
| Avon River modelling | $150,000 |
| Urban land manager engagement and participation in fertiliser efficiency | $110,000 |
| Monitoring, Evaluation, Reporting and Improvement, including water quality monitoring | $260,000 |
| Quantifying riparian Best Management Practices (BMPs) in Ellen Brook | $132,000 |
| Building community engagement and participation in Ellen Brook | $122,000 |
| Building community engagement and participation in NRM, training and volunteer opportunities | $70,000 |
| Project coordination | $220,000 |

## Local Water Quality Improvement Plans

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

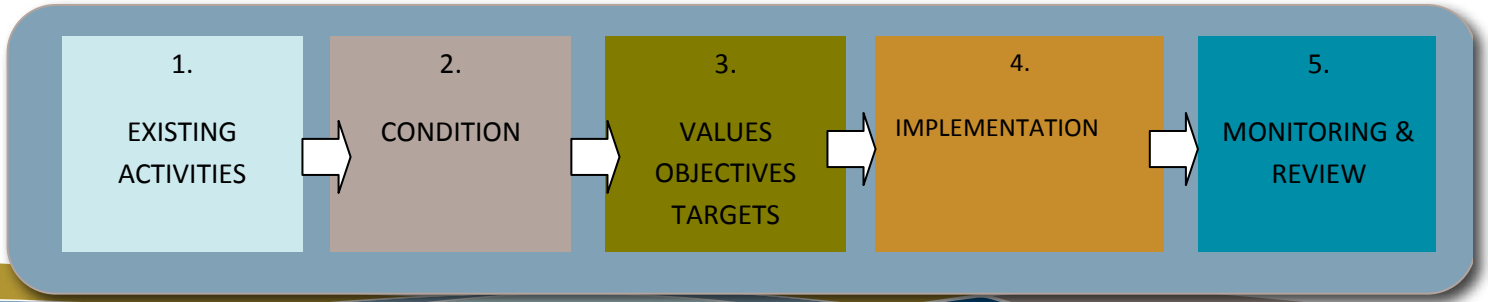
The Trust has developed and is investing in local Water Quality Improvement Plans (WQIPs). These provide local councils and communities with a mechanism to prioritise recommendations and resources and seek funding to improve water quality in catchments contributing the greatest amount of nutrients.

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

**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**



## Current status and implementation summary

WQIP development and implementation includes:

- key stakeholder consultation to develop first draft;
- providing draft for stakeholder comment;
- Trust Board approving final WQIP;
- establishing a working group;
- identifying opportunities for Trust investment; and
- commencing management actions and projects.

The WQIPs aim to reduce nutrient loads into the Riverpark through nutrient intervention and changed management practices. By using a treatment train approach, a combined set of management actions is applied along nutrient pathways to minimise nutrient losses to waterways.

The percent of management actions being implemented, and a summary status for each WQIP is outlined in the below table.

| WQIP catchment | Summary status | | | | | | % actions being implemented |
|---|---|---|---|---|---|---|---|
| | First draft developed | Stakeholder consultation complete | WQIP approved by Trust Board | Working group established | Project identified for Trust investment | Project/s commenced | |
| **Bayswater Brook** | X | X | X | X | X | X | 74% |
| **Ellen Brook** | X | X | X | X | X | X | 30% |
| **Southern River** | X | X | X | X | X | X | 50% |
| **Bickley Brook** | X | X | X | X | X | X | 60% |
| **Mounts Bay** | X | X | X | X | X | | 77% |
| **Canning Plain** | X | X | X | | | | 52% |
| **Bannister Creek** | X | X | X | | | | NA |
| **Bennett Brook** | X | | | | | | NA |
| **Saint Leonards Creek** | X | | | | | | NA |

## Bayswater Brook (previously Main Drain) Local WQIP

The Bayswater Brook is a permanently flowing drainage network with open and covered sections. At 27,000 hectares, it is the largest urban catchment in the Perth metropolitan area. The lower end of the drain, originally referred to as Bayswater Brook, was a natural watercourse linking numerous creeks and swamps throughout the catchment and flowing into the Swan River. In the 1920s the brook was modified for use as a drainage system to enable development of the area.

### 2008-10 ACHIEVEMENTS

- First draft completed
- Public consultation on first draft completed
- Final WQIP completed and approved by Trust Board
- Working group established
- Project identified for Trust investment
- Eric Singleton Nutrient Stripping Wetlands and water quality monitoring projects developed and commenced

### 2010-11 PRIORITIES

- Completion of a water quality and sediment snapshot
- Implementation of 12 month water quality monitoring program

| Treatment Train Approach | Total number of actions | Number of actions being implemented | Percentage of actions being implemented |
|---|---|---|---|
| Prevention – land use planning | 2 | 2 | 100% |
| Minimisation – efficiency in nutrient use | 3 | 2 | 67% |
| Reduction – source control | 10 | 7 | 70% |
| Amelioration – conveyance and transmission | 3 | 2 | 67% |
| Treatment – Reuse – Disposal | 1 | 1 | 100% |

## Eric Singleton Nutrient Stripping Wetlands and Water Quality Monitoring

The Eric Singleton Bird Sanctuary (ESBS) is an important wetland located close to the Swan River foreshore in the City of Bayswater. The Bayswater Brook WQIP identified the need to restore the ESBS wetland as a nutrient stripping wetland. A final concept plan was completed in 2010 with the objective of developing the nutrient stripping wetland to:

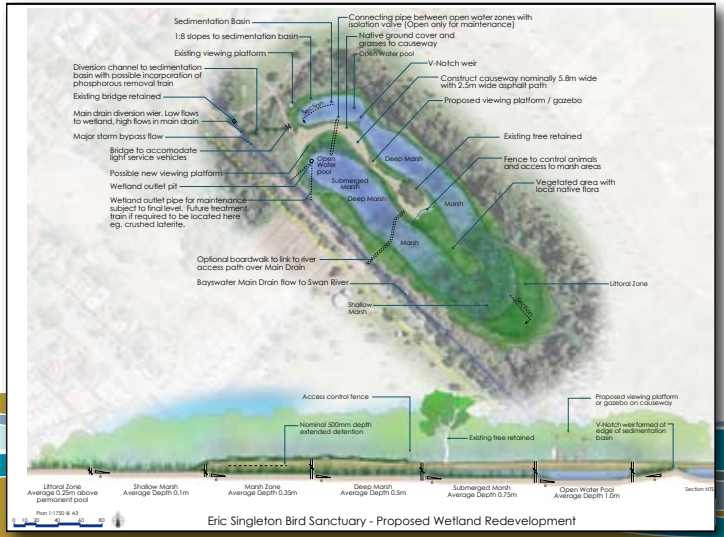
- improve water quality in the existing ESBS wetland;
- improve the quality of flows in Bayswater Brook prior to discharge to the Swan River; and
- improve the habitat and recreational amenity value of the ESBS.

The development of the concept plan indicated that a comprehensive understanding of the surface, groundwater and sediment characteristics was required to complete the detailed engineering design.

A monthly monitoring program, comprised of groundwater level measurements and groundwater sampling at four sites along the north-eastern side of the ESBS wetland, was completed between August 2008 and June 2009.

The results from this program found that groundwater:

- level is generally stable, with a seasonal fluctuation;
- flow gradient is towards the wetland;
- is generally brackish;
- pH and alkalinity are within ANZECC guidelines;
- aluminium amd cadmium exceeded ANZECC guidelines at some sites; and
- total nitrogen and total phosphorus generally exceeded ANZECC guidelines.



## Mounts Bay Main Drain Local WQIP

The Mounts Bay Catchment covers about 1300 hectares of the City of Perth and northern suburbs. It drains to the middle reaches of the Swan River at Mounts Bay. Water quality in the catchment is poor with pollutants flowing into the Swan River often trapped in the poorly-flushed Mounts Bay. The upper catchment drains residential areas of the cities of Subiaco and Nedlands and towns of Cambridge and Vincent 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.

### 2008-10 ACHIEVEMENTS

- First draft completed
- Public consultation on first draft completed
- Final WQIP completed and approved by Trust Board
- Working Group established
- Project identified for Trust investment

### 2010-11 PRIORITIES

- Establish Key Performance Indicators (KPIs) for WQIP management actions
- Develop working group Memorandum of Understanding (MoU)
- Implement water quality monitoring program
- Report on water quality monitoring program

| Treatment Train Approach | Total number of actions | Number of actions being implemented | Percentage of actions being implemented |
|---|---|---|---|
| Prevention – land use planning | 4 | 4 | 100% |
| Minimisation – efficiency in nutrient use | 1 | 1 | 100% |
| Reduction – source control | 9 | 8 | 89% |
| Amelioration – conveyance and transmission | 7 | 3 | 43% |
| Treatment – Reuse – Disposal | 1 | 1 | 100% |

## Bickley Brook Local WQIP

Bickley Brook is a tributary of the Canning River with its headwaters at the Darling Scarp. It is a combination of a natural system and deeply incised drain that enters the Canning River about 6 kilometres upstream of the Kent Street Weir. The Bickley Brook Catchment begins at the Bickley Reservoir and covers an area of 2100 hectares. Most of the catchment has been cleared and land use is a mix of remnant vegetation, semi-rural, residential and light industry. Bickley Brook has severe erosion and weed infestation problems which are exacerbated by a lack of native vegetation and illegal storage and disposal of materials. There are also many stormwater outfalls that discharge directly into the brook.

### 2008-10 ACHIEVEMENTS

- First draft completed
- Public consultation on first draft completed
- Final WQIP completed and approved by Trust Board
- Working group established
- Project identified for Trust investment
- Commenced project management of Urban Waterways Renewal (UWR) projects

### 2010-11 PRIORITIES

- Commence design and construction of three nutrient stripping wetlands and living streams
- Establish KPIs for WQIP management actions
- Develop working group MoU

| Treatment Train Approach | Total number of actions | Number of actions being implemented | Percentage of actions being implemented |
|---|---|---|---|
| Prevention – land use planning | 4 | 2 | 50% |
| Minimisation – efficiency in nutrient use | 7 | 4 | 57% |
| Reduction – source control | 3 | 3 | 100% |
| Amelioration – conveyance and transmission | 4 | 2 | 50% |
| Treatment – Reuse – Disposal | 2 | 1 | 50% |

## Southern River Local WQIP

The Southern River Catchment incorporates Southern River and its tributaries, Wungong River, Neerigen Brook and Forrestdale main drain. Wungong River is currently dammed within its hill catchment and managed as a drain by the Water Corporation in the low lying area. The catchment covers an area of 14,900 hectares. The catchment is characterised by low lying areas and high groundwater levels. It contributes more water to the Canning River than any other monitored catchment. Many wetlands in the catchment have been filled and large areas of semi-rural land approved for urban development. The clearing of native vegetation has already caused weed infestations, erosion and degradation by siltation and flow restrictions.

### 2008-10 ACHIEVEMENTS

- First draft completed
- Public consultation on first draft completed
- Final WQIP completed and approved by Trust Board
- Working group established
- Project identified for Trust investment
- Sediment and Erosion Project begins

### 2010-11 PRIORITIES

- Establish KPIs for WQIP management actions
- Develop working group MoU
- Implement Stage 2 of Sediment and Erosion Project
- Begin implementation of State NRM SCWQIP and UWR projects including:
  - six wetlands/living streams commenced
  - three wetlands/living streams completed

| Treatment Train Approach | Total number of actions | Number of actions being implemented | Percentage of actions being implemented |
|---|---|---|---|
| Prevention – land use planning | 8 | 6 | 75% |
| Minimisation – efficiency in nutrient use | 2 | 1 | 50% |
| Reduction – source control | 12 | 5 | 42% |
| Amelioration – conveyance and transmission | 2 | 1 | 50% |
| Treatment – Reuse – Disposal | 2 | 0 | 0% |

## Sediment and Erosion Project

The Southern River WQIP stakeholders were very keen to address sediment and erosion issues occurring throughout the catchment. A project brief was developed implementing two stages.

**Stage 1:**

- Investigate existing planning, statutory and policy mechanisms for controlling and enforcing the management of erosion and sedimentation from subdivision, residential dwelling construction and public works, with a view to improving the management of erosion and the control of sediment from development activities.

**Stage 2:**

- Employ an officer to assess the effectiveness of current mechanisms and implement where feasible the recommendations of the Stage 1 investigation.
- Gather anecdotal evidence to clarify the causes and stages of erosion in the clearing, development and building process.

The Sediment and Erosion Officer is a shared position between the cities of Armadale and Gosnells. The officer will review the mechanisms at both local governments and provide a final report recommending best management practices to address sediment and erosion through the planning process and on-ground practices.

## Ellen Brook Local WQIP

Ellen Brook Catchment was identified as a priority catchment for development of a local WQIP through the SCWQIP. Implementation of management actions from the local WQIP are therefore managed through the SCWQIP. Ellen Brook is a natural, ephemeral waterway with its headwaters just south of Gingin. At 71,500 hectares it is the largest sub-catchment of the Swan Canning Catchment. Much of the Ellen Brook Catchment has been cleared for agriculture and urban use. Land use is predominantly cattle grazing and horticulture in the north and urban settlements and small scale light industry in the south. Some remaining areas of vegetation have high conservation value, containing several threatened ecological communities, priority flora and the critically endangered western swamp tortoise.

### 2008-10 ACHIEVEMENTS

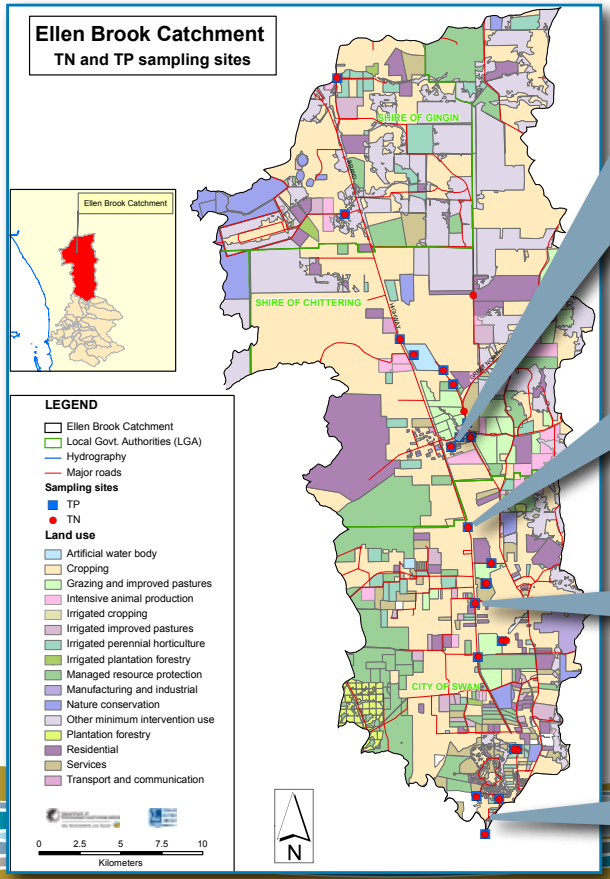
- First draft completed
- Public consultation on first draft completed
- Final WQIP completed and approved by Trust Board
- Working Group established (SCWQIP Implementation Steering Committee)
- Project/s identified for Trust and other investment
- Drainage Nutrient Intervention (DNIP) projects commenced

### 2010-11 PRIORITIES

- Riparian restoration and fencing along the Ellen Brook
- End of Catchment Wetland Feasibility Study
- Soil amendment trial
- Quantifying riparian Best Management Practice (BMP) research
- Swan Canning Catchment Schools Initiative
- Property planning workshops

| Treatment Train Approach | Total number of actions | Number of actions being implemented | Percentage of actions being implemented |
|---|---|---|---|
| Prevention – land use planning | 8 | 1 | 12.5% |
| Minimisation – efficiency in nutrient use | 5 | 1 | 20% |
| Reduction – source control | 4 | 0 | 0 |
| Amelioration – conveyance and transmission | 2 | 2 (incuding five individual projects) | 100% |
| Treatment – Reuse – Disposal | 1 | 0 | 0 |

# Ellen Brook DNIP Projects




### Brand Highway Nutrient Filter

- filter consists of cracked laterite (pea gravel) and zeolite laid in the main channel of the Ellen Brook, with geofabric and limestone rocks holding filter media in place
- filter designed to treat low flows with laterite trialled to adsorb phosphate and zeolite trialled to adsorb ammonium (a form of soluble nitrogen)
- two diversion weirs ~400m upstream provide an initial sedimentation zone
- four rock groynes ~50m upstream trap organic debris and promote sedimentation

### Muchea North Drain Wetland and Nutrient Filter

- shallow ephemeral wetland and nutrient filter on a minor tributary of the Ellen Brook containing laterite and zeolite
- vegetated with ~2500 local native species
- within railway reserve, trialling drainage improvements in a constrained area

### Bingham Road Creek Wetland

- located on a major tributary of the Ellen Brook the wetland is created from construction of a bund and spillway which retains flows in a 0.8ha ephemeral wetland area
- wetland incorporates an existing ‘storm-max’ treatment pond into its design as a sedimentation area
- vegetated with ~42,000 local native species

### End of Catchment Wetland Feasibility Study

- determining the feasibility of an end catchment treatment system using wetlands and a treatment system which incorporates nutrient adsorbent materials

## Canning Plain Local WQIP

The 2400 hectare Canning Plain Catchment is mostly cleared for industrial, commercial and residential use. Historical land use and inappropriate practices are likely to have affected water quality and riparian vegetation in the catchment and the Canning River. The catchment contains a range of soil types, high groundwater table and an extensive drainage system of open and piped drains and a number of compensation basins. There are four main drains, Cockram Street, Liege Street, Mills Street and Wharf Street managed by the Water Corporation.

### 2008-10 ACHIEVEMENTS

- First draft completed
- Public consultation on first draft completed
- Final WQIP completed and approved by Trust Board

### 2010-11 PRIORITIES

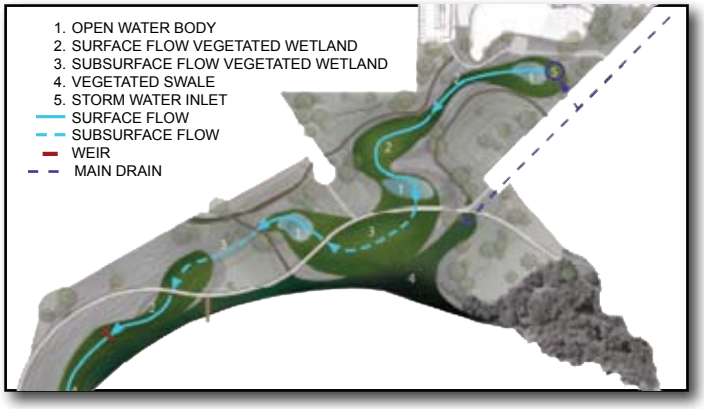
- Establish working group
- Identify project/s for Trust investment

| Treatment Train Approach | Total number of actions | Number of actions being implemented | Percentage of actions being implemented |
|---|---|---|---|
| Prevention – land use planning | 9 | 3 | 33% |
| Minimisation – efficiency in nutrient use | 3 | 3 | 100% |
| Reduction – source control | 5 | 2 | 40% |
| Amelioration – conveyance and transmission | 3 | 2 | 67% |
| Treatment – Reuse – Disposal | 5 | 3 | 60% |

## Wharf Street Wetland and Civic Parkland

Constructed in partnership with the City of Canning and South East Regional Centre for Urban Landcare, the Wharf Street Wetland and Civic Parkland is located in Cannington. The project links the City's council offices to the Canning River Regional Park with public open space and extensive planting of native vegetation. Objectives for the Wharf Street project include:

- detention and treatment of stormwater flows discharging into the Canning River to improve water quality;
- creation of a demonstration stormwater treatment wetland designed specifically for the site and Swan Coastal Plain conditions that can be used to raise awareness of the importance of stormwater management for the health of the rivers;
- provision of an ecological and recreational link between the City of Canning civic gardens and the Canning River Regional Park;
- amenity enhancement of the area to encourage local community use;
- improvement of biological and habitat diversity through reintroduction of local native species and habitat types; and
- building and maintaining partnerships with key project stakeholders.



## Bennett Brook Local WQIP

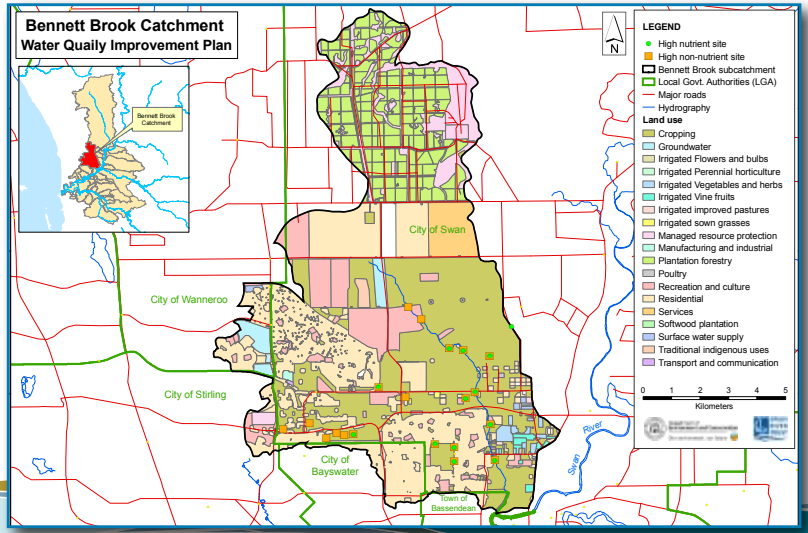
The Bennett Brook Catchment is located in the north east of the Perth metropolitan area and comprises the local government authorities of the cities of Swan and Bayswater and Town of Bassendean. The catchment has an area of 21,700 hectares. Just over half is covered by the Gnangara pine plantation and Whiteman Park. Bennett Brook was once a natural creek system; however its tributaries to the west have been modified to deeply incised drains to allow development. The brook is fed primarily by groundwater seepage from the Gnangara Mound and also receives stormwater from the surrounding industrial, residential and rural areas. The water from these drains is discharged into the Swan River, upstream of Success Hill in Bassendean. Increased groundwater pumping in the northern part of the catchment has lowered groundwater levels, consequently reducing flow into the brook. Conversely, the southern part of the catchment has elevated flow due to the construction of drainage networks and increased runoff from hard surfaces.

### 2008-10 ACHIEVEMENTS

- First draft completed

### 2010-11 PRIORITIES

- Complete public consultation on first draft
- Complete final WQIP and gain approval from Trust Board
- Establish working group
- Identify project/s for Trust investment



## Saint Leonards Creek Local WQIP

Saint Leonards Creek is located in the north-east Perth metropolitan area and is a seasonal tributary to the Swan River. It typically flows between April and September and is dependant on rainfall and an associated rise in the local groundwater table. It is fed by a semi-rural catchment with a predominant land use of horticultural production. Saint Leonards Creek has a catchment area of approximately 1160 hectares and is located in the City of Swan. Damming and the creation of water retention features such as sumps along the creek may have reduced the amount of water reaching the Swan River from this source. Reduced flow from human actions may also be compounded by reduced rainfall and lower groundwater levels. The Saint Leonards Creek Catchment is in the Urban North Growth Corridor.

### 2008-10 ACHIEVEMENTS

- First draft completed
- Project identified for Trust investment

### 2010-11 PRIORITIES

- Complete public consultation on first draft
- Complete final WQIP and gain approval from Trust Board
- Implement water quality monitoring program
- Report on water quality monitoring program

## Bannister Creek Local WQIP

The 2335 hectare Bannister Creek Catchment is a highly modified natural system converted to a drainage network that winds through parts of the City of Gosnells and the City of Canning 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. Bannister Creek, enhanced through revegetation projects and weed removal, functions as a living stream. One of the major issues in the catchment is nutrient input (nitrogen and phosphorus) and non nutrient contaminants (e.g. heavy metals) into the drainage network. Each landuse requires different nutrient and non-nutrient invention management. Environmental weeds (e.g. blackberry and Hyrdocotyl) and algal blooms are also a concern in the catchment.

### 2008-10 ACHIEVEMENTS

- First draft completed
- Public consultation on first draft completed

### 2010-11 PRIORITIES

- Final WQIP completed and approved by Trust Board
- Establish working group
- Identify project/s for Trust investment

## Abbreviations used within document:

| | |
|---|---|
| BMP | Best Management Practice |
| DNIP | Drainage Nutrient Implementation Program |
| ESBS | Eric Singleton Bird Sanctuary |
| HRAP | Healthy Rivers Action Plan |
| KPI | Key Performance Indicators |
| MBMD | Mounts Bay Main Drain |
| MoU | Memorandum of Understanding |
| UWR | Urban Waterways Renewal |
| WQIP | Water Quality Improvement Plan |

## Partners

Australian Government

Government of Western Australia

Department of **Education and Training**
Department of **Environment and Conservation**
Department of **Health**
Department of **Planning**
Department of **Water**
Department of **Agriculture and Food**
Main Roads Western Australia

WATER CORPORATION

CITY OF Armadale

TOWN OF BASSENDEAN

CITY OF BAYSWATER

Town of Cambridge

City of CANNING

SHIRE OF CHITTERING

GINGIN

CITY OF GOSNELLS

CITY of PERTH

CITY OF SUBIACO

city of swan

TOWN OF VINCENT

Perth Region NRM

SERCUL
South East Regional Centre for Urban Landcare

Integrated Catchment Group

Gosnells Landcare Group

Bannister Creek

CLAISE BROOK CATCHMENT GROUP

CSIRO

WHITEMAN PARK

Armadale Redevelopment Authority

LANDCORP