State of the Derwent
Year 2007 Report Card

The Derwent estuary

The Derwent estuary lies at the heart of the Hobart metropolitan area and is a waterway of great natural beauty and diversity. Named after the Celtic word 'clear water' in 1794, the Derwent is an integral part of Tasmania's cultural, economic and natural heritage. The estuary is an important and productive ecosystem and supports a wide range of habitats and species.

The Derwent estuary

Approximately 40% of Tasmania's population - 200,000 people - live around the estuary's margins. The Derwent is widely used for recreation, boating, fishing, marine transport and industry. Further upstream, the Derwent River supplies the majority of the region's drinking water supply and is a major source of hydroelectric power.

A number of environmental issues affect the Derwent estuary, in particular:

- heavy metal contamination;
- introduced marine pests;
- loss of estuarine habitat and species;
- intermittent faecal contamination of recreational waters;
- depressed oxygen levels and organically enriched sediments;
- elevated nutrient concentrations;
- environmental flows and barriers.

Although there have been significant improvements in the treatment of sewage and industrial wastes over the past decade, the Derwent still faces a number of environmental challenges. A strategic and coordinated planning approach across all levels of government, industry and the community is our best hope for a clean and healthy estuary in the future.

Management and restoration

The Derwent Estuary Program (DEP) was established in 1999 as a partnership to restore and protect the Derwent estuary. The program has been highly successful in bringing together a wide range of stakeholders – first to build a common understanding, vision and management framework – and second to progressively implement this vision through formal partnership agreements and practical actions.

The program was initially designed to address environmental quality issues such as industrial and urban water pollution, contaminated sediments, introduced species and loss of estuarine ecosystems. More recently, foreshore issues have also been included within the program.

The first DEP Environmental Management Plan was created in 2001 and endorsed by Tasmania's Premier, the Mayors of Brighton, Clarence, Derwent Valley, Glenorchy, Hobart and Kingborough Councils, and the Commonwealth Government. In addition to the three levels of government, many other stakeholders participate in and support the DEP, including major industries and utilities, community groups and research institutions. The plan is currently being reviewed and updated and will be released for public comment in 2007/8.

Key aspects of implementation include environmental monitoring and reporting, coordination of regional activities, and implementation of priority projects such as effluent reuse, stormwater management and wetland conservation.

Derwent Estuary Program

Environmental monitoring and reporting

A fundamental requirement for effective natural resource management is an on-going and reliable source of environmental data.

This principle formed the basis of the Derwent Estuary Monitoring Agreement, signed in August 2000 by the state government, six local councils and three commercial partners – Norske Skog Boyer, Nyrstar Hobart (previously Zinifex) and Hobart Water. In 2004, Tasmanian Ports Corporation also joined the program. The signatories agreed to coordinate their independent monitoring programs to provide better information on the estuary as a whole, and to report annually on environmental conditions and trends in the Derwent.

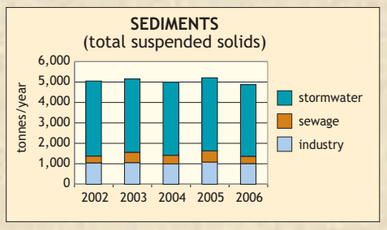
Monitoring water quality

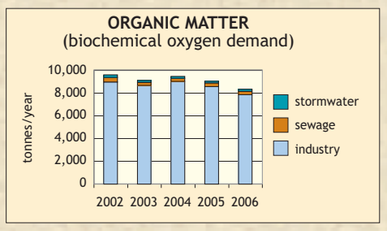
This is our annual 'Report Card' to the community and summarises monitoring data and other relevant information collected during 2006-07. More detailed information is published in five-yearly State of the Derwent reports, available on our website www.derwentestuary.org.au

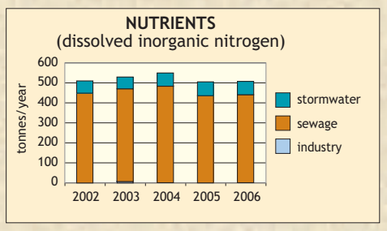
Monitoring activities carried out during 2006/07 included the following:

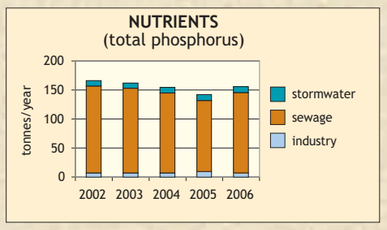
- weekly recreational water quality testing during summer months;
- monthly whole-of-estuary water quality monitoring ;
- regular surveys of mercury in flathead and heavy metals in shellfish;
- surveys and mapping of foreshore vegetation;
- annual rice grass survey.

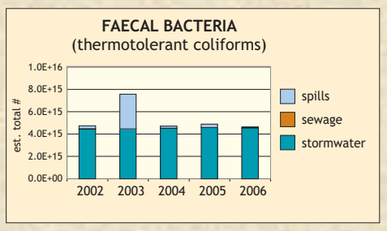
Pollution Sources, Loads and Trends

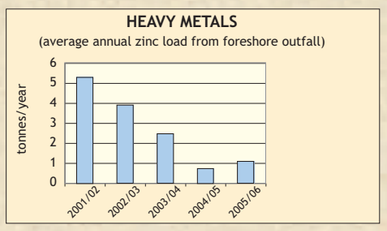












Pollution enters the Derwent estuary from many sources, commonly referred to as 'point sources' and 'diffuse sources'. Point sources include sewage treatment plants and large industries, such as the Norske Skog paper mill at Boyer and Nyrstar Hobart smelter at Lutana (previously Zinifex).

Diffuse sources include rainwater runoff from urban areas (stormwater) and the larger catchment inputs carried by the Derwent and Jordan rivers. Other diffuse pollutant sources include tips and contaminated sites, air pollution, and wastes associated with shipping, ports and marinas. Sediments within the estuary itself may also release pollutants into the overlying waters.

Contaminants released or transported into the Derwent from these various sources include pathogens, nutrients, organic matter, wood extractives such as resin acids, silt, litter and a range of toxicants including heavy metals and hydrocarbons.

Sewage treatment plants contribute the majority of nutrients to the estuary. In 2006, dissolved nitrogen loads from sewage treatment plants remained relatively steady, while phosphorus loads increased by 10%. Of the 12 plants around the Derwent, the Selfs Point and Rokeby plants treat wastes to a tertiary level and the two Brighton Council plants have achieved full effluent reuse.
In 2006 a third major reuse scheme started up at Rosny with the potential to reduce nutrient loads to the Derwent by 10%.

Industrial sources contribute most of the organic matter and heavy metal loads to the estuary. During 2006, organic loads from the Norske Skog paper mill fell by 9%, and are expected to decline further in 2007/8 following a major upgrade of the treatment plant. The majority of metal emissions at the Nyrstar Hobart smelter are from groundwater and stormwater sources, and several major projects were progressed in 2006/7 to further reduce these. Zinc loads from the smelter outfall increased in 2006 due to processing issues which have subsequently been addressed.

Urban stormwater contributes over 90% of faecal bacteria to the estuary derived from animal droppings, aging infrastructure, sewage overflows, and cross connections between the sewage and stormwater systems. Stormwater is the main source of sediments and litter.

In summary:

- Sewage treatment plants discharged the majority of nutrients;
- Stormwater runoff accounted for the majority of faecal bacteria, sediments and litter;
- Nyrstar discharged the majority of heavy metals (primarily as groundwater emissions);
- Norske Skog discharged the majority of organic matter and resin acid

Managing soil erosion on construction sites

Construction sites are a major source of soil erosion as a result of vegetation clearance and disturbance to the soil and water drainage. When it rains the loose soil is washed along street gutters, into underground stormwater pipes and deposited in rivulets and the Derwent estuary. Approximately 3500 tonnes of sediment (soil) is deposited in the Derwent each year from urban stormwater runoff. Soil erosion from construction sites also blocks stormwater pipes - causing flooding - and smothers aquatic habitats. The muddy water also reduces light reaching aquatic plants. Many pollutants are attached to soil (e.g. nutrients, hydrocarbons and heavy metals) which may be released into rivulets and the estuary – some of these pollutants pose a human health risk.

In 2006 the DEP initiated a 2 year project to improve soil and water management practices on construction sites around Hobart, with support from NRM South. The DEP is working with municipal councils and the building industry on soil erosion solutions, including a series of 'Soil and Water Management' fact sheets that describe how to reduce soil erosion on construction sites. The fact sheets are soon to be publicly released and will also be used in Masters Builders Association training sessions.

Derwent Water and Sediment Quality

Swimming in the Derwent

Each summer, councils and the State Government monitor recreational water quality at about 35 beaches and bays around the estuary. Sampling is conducted weekly from November through March, at the locations shown on the map overleaf. The indicator used to detect faecal contamination is Enterococci, in line with recently revised national guidelines. To describe the risk level to swimmers a colour coded 'traffic light' system is used: green indicates good, orange indicates intermediate and red indicates poor water quality.

During the 2006-07 season, most of the Derwent's popular swimming beaches received either good or intermediate ratings, with the best water quality measured at Taroona, Hinsby and Blackmans Bay beaches followed by Opposum Bay and Little Sandy Bay. Howrah Beach and the eastern end of Nutgrove Beach were upgraded from poor to intermediate water quality, however Nutgrove West and Browns River are not still not suitable for swimming.

Most of the bays in the heavily urbanised middle estuary had poor or intermediate water quality, except for Montagu, Kangaroo and Lindisfarne bays and Sullivans Cove – which received high marks.

Most urban areas experience poor water quality after heavy rain.

Swimming is not recommended in the Derwent for several days after heavy rain and never in the vicinity of stormwater drains or urban rivulets.

Water Quality Indicators

The DEP coordinates a comprehensive whole-of-estuary monitoring program that integrates sampling carried out by the DEP, Nyrstar Hobart, Norske Skog and Hobart Water. Water samples are collected each month at 28 sites between New Norfolk and the Iron Pot over a two-year period. These are monitored for indicators such as temperature, salinity, dissolved oxygen, suspended solids, nutrients, organic carbon, chlorophyll a and heavy metals.

Dissolved oxygen levels in the Derwent are generally high except periodically in the area between Bridgewater and New Norfolk. During summer months when water temperatures are high and river flows are low, the deeper channels in this area tend to be oxygen poor, with adverse impacts on bottom-dwelling organisms. Low oxygen levels may also cause sediment-bound nutrients and metals to be released.

Although *nutrient enrichment and nuisance algal blooms* have not been a major concern in the Derwent to date, increasing catchment development is likely to result in higher nutrient loads and associated algal growth. High chlorophyll a levels are regularly observed in Prince of Wales Bay, and toxic blue-green algal blooms were reported in the Derwent catchment in 2006/7 (e.g. Ouse River).

During the next three years, the DEP is working in partnership with the University of Tasmania and CSIRO Marine Research to investigate nutrient processes, develop predictive models and recommend nutrient targets to maintain the long-term health of the Derwent estuary. These studies are being funded through Australian Government grants.

Contaminated sediments

Levels of heavy metals in Derwent estuary sediments are among the highest in Australia. Derwent sediments tend to be fine-grained and organic-rich and significantly exceed national sediment quality guidelines for zinc, mercury, lead, cadmium and arsenic. Recent surveys suggest that heavy metal levels are starting to decline – particularly within the most heavily contaminated middle estuary – in response to improved industrial practices.

In 2006, the DEP completed a three-year Water Quality Improvement Plan to investigate and manage heavy metal contamination in the Derwent (see Box below). This project included a number of sediment investigations, including an intertidal survey of heavy metal levels at 14 publicly accessible bays and beaches. Metal levels were lower at sandy sites and higher at muddy sites, but were within the human health guidelines for parks, playing fields and open space at all sites.

An Action Plan for Heavy Metals

The *Derwent Estuary Water Quality Improvement Plan for Heavy Metals* (WQIP) was finalised in 2007, funded through a $270,000 Australian Government Coastal Catchments Initiative grant as well as matching support from the State Government and DEP partners. The Plan focuses on heavy metal contamination of Derwent estuary water, sediments and biota.

Working with CSIRO, the University of Tasmania and consultants, the WQIP investigated heavy metal sources and the role of sediments in metal cycling. Water quality targets were set for zinc and detailed hydrodynamic, sediment transport and toxicant models were developed. These models were used to derive load-based targets, focusing particularly on industrial sources. A full copy of the report can be viewed at **www.derwentestuary.org.au**.

Recommended actions include further management of contaminated groundwater and stormwater at the Nyrstar Hobart Smelter, careful management of contaminated sediments and better public information about seafood safety. The WQIP also recommended that nutrients be carefully managed to avoid low oxygen conditions that could cause metals to be released from contaminated sediments.

Derwent Habitat and Species

Contaminant levels in seafood

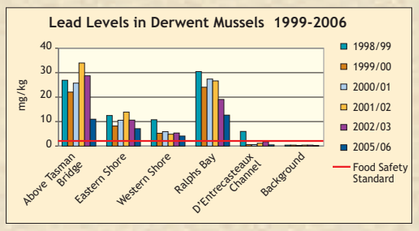
Heavy metal levels in Derwent estuary oysters, mussels and flathead have been monitored for over a decade by Nyrstar Hobart (previously Zinifex).

In 2007, the DEP released a public information pamphlet *'Should I eat Shellfish and Flathead from the Derwent?'* that compares heavy metal levels in Derwent flathead and shellfish to national food safety guidelines. Levels of lead, cadmium and zinc in Derwent oysters and mussels remain well above national guidelines, while mercury levels in Derwent-caught flathead are at, or slightly above, the national guidelines.

The key messages from this brochure are:

- ***Don't eat shellfish collected from the Derwent (including Ralphs Bay)***
- ***Limit Derwent flathead meals to no more than 2-3 meals /week, or 1 meal/week for pregnant women and young children***

It is encouraging to note that in recent years, there has been a 40 - 60% reduction in lead levels in mussels in the area above the Tasman Bridge and in Ralphs Bay. During this same time period, zinc levels in oysters have also dropped by nearly 50% in the area above the Tasman Bridge.



Marine and Coastal Habitat

In 2006, coastal vegetation along the Derwent estuary foreshore (100m inland from high water mark) was mapped by North-Barker, as part of a regional project supported by NRM South. The mapping covers most of the estuary with the exception of the Clarence shoreline (Old Beach to Fort Direction). Detailed information is provided about vegetation type, condition, significance and viability, and can be accessed on the LIST internet site (http://www.thelist.tas.gov.au).

Seafloor habitats within the Derwent estuary (greater than 3 m in water depth) were remapped by the Tasmanian Aquaculture and Fisheries Institute in 2007. The vast majority (93%) of the Derwent seafloor is made up of unvegetated, sand and silt. However the Derwent also supports important macrophyte beds (underwater grasses) in the upper estuary, rocky reef habitats in the lower estuary, and scattered seagrass beds in the middle and lower estuary. Large areas of intertidal flats, with associated salt marshes and wetlands also border the estuary, particularly in Ralphs Bay and above Dogshear Point. The seafloor mapping report can be downloaded from: http://www.utas.edu.au/tafi/seamap/index.

The DEP has recently received an Envirofund grant to prepare a *Derwent Estuary Habitat Atlas* that will integrate and enhance the information collected through these habitat mapping projects.

Marine Pests in the Derwent

The first marine pest survey in the Derwent (2002) documented up to 43 species of introduced marine plants and animals. Species of particular concern include the northern Pacific seastar, Pacific oyster, toxic dinoflagellates, European green crab and New Zealand screw shell. Subsequent surveys of benthic invertebrate communities (TAFI, 2006) confirmed high densities of introduced species, particularly in the heavily impacted middle estuary. A national monitoring system is currently being developed for routine surveys, and it is anticipated that the Derwent will be re-surveyed within the next 12 months.

Rice grass (*Spartina anglica*) is an introduced perennial grass that typically invades tidal mud and sand flats. It was introduced to Australia in the 1920s for its potential uses in coastal engineering and agriculture, but is now one of Tasmania's most aggressive aquatic weeds. A *Rice Grass Management Plan* for the Derwent was produced by DPIW in 2006 with the objective of eradicating rice grass from the estuary. The March 2006 survey found and treated 10 small infestations of rice grass on the western foreshore of the Derwent between Bilton Bay and Elwick Bay. Surveys will continue annually for at least six years (approximate seed longevity) until no rice grass is found.

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Recent Management Actions, Sampling Sites and Discharge Points

A NEW WASTEWATER TREATMENT PLANT AT NORSKE SKOG BOYER

Several process improvements valued at $20 million have been made during 2006 and 2007 at Norske Skog's Boyer Mill which will result in more efficient water and chemical usage, and a significant reduction in the organic load discharged to the Derwent. A new mechanical pulp bleach plant has been built and commissioned and a secondary effluent treatment plant is under construction, with commissioning scheduled for late 2007. The new effluent treatment process will consist of two stages of aerobic biological treatment, a biofilm reactor followed by an activated sludge reactor. One of the mill's existing primary clarifiers will be converted to a secondary clarifier where the final clarification stage will separate and return biological sludge to the aerobic stage before returning effluent to the river. A reduction in biochemical oxygen demand of at least 60% is expected by this significant initiative.

New Norfolk

New Norfolk

Norske Skog Paper

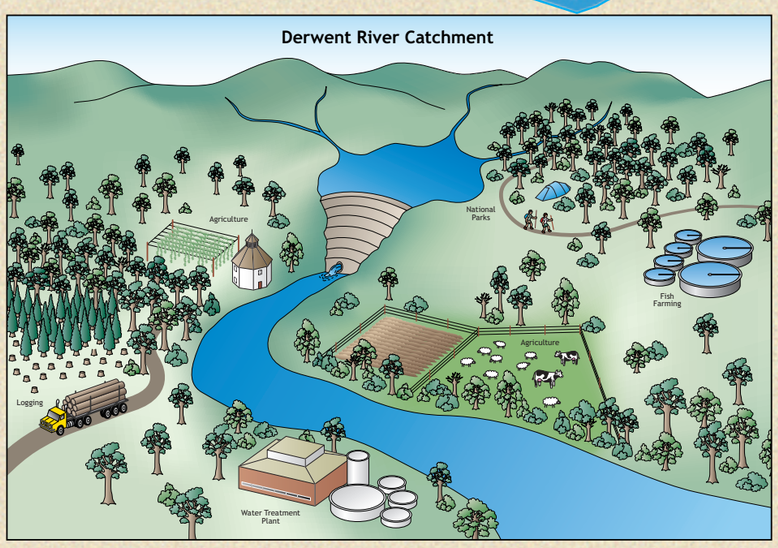
Bridgewater

Bridgewater Causeway

River Jordan

DERWENT RIVER RECOVERY - GREENING AUSTRALIA

River Recovery is a national program initiated by Greening Australia to improve the health of iconic rivers across Australia. In Tasmania, the Derwent River is the main focus of the program. The Derwent River Recovery program is being undertaken in partnership with the Derwent Catchment Natural Resource Management Committee, Central Highlands and Derwent Valley Councils, Hydro Tasmania and the Australian Government's National Landcare Program. On-ground activities were carried out across the Clyde, Ouse and Tyenna catchments during 2006 and 2007. They included working with land managers to protect and restore riparian and priority remnant vegetation, control weeds and stabilise river banks. Workshops and other educational activities were also held to help land managers improve the sustainability of their management practices through water use efficiency, nutrient management, salinity management, and increasing biodiversity on farms. Conservation action planning is underway to help guide future activities in the Derwent Catchment and continue the River Recovery goal of linking rivers, landscapes and people.



DERWENT DRINKING WATER CATCHMENT MANGEMENT PLAN - HOBART WATER

Around sixty percent of Hobart's drinking water is sourced by Hobart Water from the Derwent River and treated at the Bryn Estyn Treatment Plant near New Norfolk. In April 2007, Hobart Water released the *Derwent River Drinking Water Catchment Management Plan* to ensure that the existing high quality water supply is maintained into the future. The plan seeks to manage potential risks within the 6500km2 drinking water catchment area, in collaboration with key stakeholders and the community. Potential hazards to drinking water quality include pathogens, turbidity, toxic algae, nutrients and chemicals. Priority risks identified in the plan include high rainfall, animal access to stream banks, degraded riparian zones, intensive animal husbandry, sewage disposal, locally degraded streams, bushfires, and inappropriate development or land use activities. The plan identifies management actions to reduce these risks, and a number of projects are already underway.

ZINC WORKS TACKLES STORMWATER CONTAMINATION AND FORESHORE REVEGETATION

The Nyrstar Zinc Works invested $2 million to increase the stormwater collection capacity with the construction of a 12 mega-litre stormwater retention pond and a bio-treatment system. This will prevent contaminated stormwater overflows into the estuary. In addition, the smelter has made progress in extending its contaminated groundwater recovery program, with the completion of drilling test bores. The industrial site's foreshore was transformed with the planting of more than 30,000 native seedlings and grasses. The aim of the revegetation program is to provide screening to assist with noise attenuation and dust emissions and to create a "green corridor' linking New Town Bay and Prince of Wales Bay with surrounding areas.

TRACKING NUTRIENTS THROUGH THE DERWENT - TASMANIAN AQUACULTURE AND FISHERIES INSTITUTE

During 2006, scientists at the Tasmanian Aquaculture and Fisheries Institute of the University of Tasmania were awarded an ARC-Linkage grant to investigate how nutrients are processed in the Derwent estuary. This 1.7 million dollar four-year project will focus on the role of sediments in nutrient processing and will also use stable isotopes to trace how nitrogen and carbon are cycled through the system. The project will document how conditions in the upper estuary respond to a major reduction in organic loading from the Boyer paper mill – a unique opportunity to study ecosystem recovery. The project also includes scientists from the University of Melbourne and Southern Cross University, and is supported by the Derwent Estuary Program and Norske Skog Boyer.

Claremont

Dogshear Point

Cameron Bay

RIVER

Bowen Bridge

GLENORCHY

East Risdon

Prince Of Wales Bay

Zinifex Hobart Smelter

Moonah

Selfs Point (outfall at Sandy Bay)

New Town

Lindisfarne

Cornelian Bay

Tasman Bridge

HOBART

Macquarie Point

Rosny

Bellerive

DERWENT

Sandy Bay

Howrah

Sandy Bay (outfall from Selfs Point)

Tranmere

Rokeby

Rokeby

Taroona

Taroona

Lauderdale

Kingston

Blackmans Bay

Opossum Bay

Blackmans Bay

RALPHS BAY

Tinderbox

South Arm

Iron Pot

Betsey Island

0 5

kilometres

N

MAJOR BOOST TO EFFLUENT REUSE - THE CLARENCE RECYCLED WATER SCHEME

Treated sewage effluent is being recognized as a valuable resource, and is increasingly being used to irrigate farms, golf courses and sports grounds throughout the greater Hobart region. Effluent reuse has multiple benefits, providing pre-fertilised irrigation water for crops while at the same time reducing the nutrient loads entering the Derwent. The volume of treated effluent reuse continues to increase, with two major reuse schemes now completed in Brighton and Clarence and a range of smaller initiatives in other council areas.

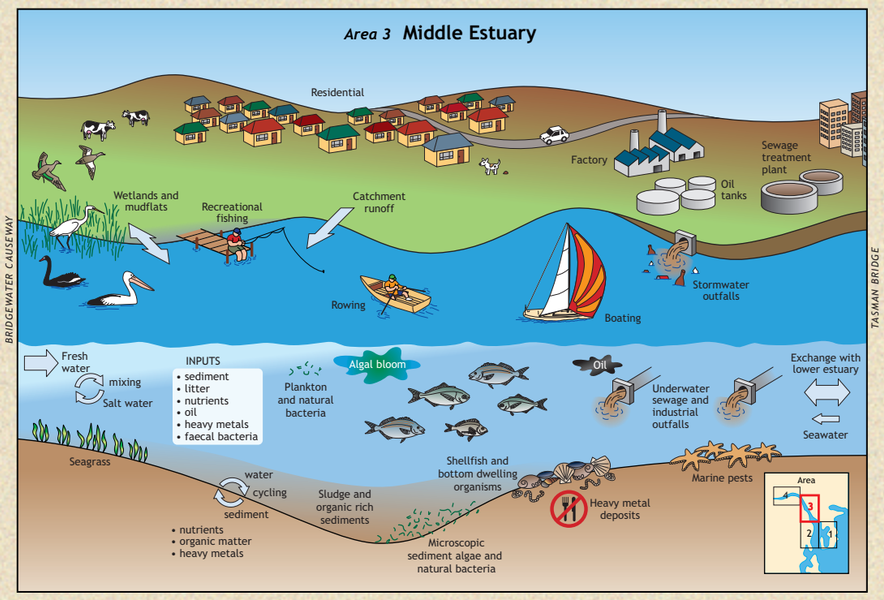
The region's largest reuse initiative – the Clarence Recycled Water Scheme - was commissioned in October 2006 and pumps treated effluent from the Rosny Wastewater Treatment Plant to irrigators in the Coal River Valley. This $16 million project between the Australian Government, Clarence City Council and landowners in the Coal River Valley will deliver up to 2500 megalitres/year of treated effluent to farm properties and golf courses. In the period from October 2006 through June 2007 approximately 650 megalitres was diverted from the Derwent to beneficial reuse in the Coal Valley. Currently the Scheme is being extended with the construction of a pipeline from Cambridge to the Seven Mile Beach area to supply recycled water to the Tasmania, Royal Hobart and Llanherne Golf Clubs as well as Westlands Nursery. The extension is scheduled for completion in September 2007.

LITTER TRAPS AND RIVULET RESTORATION – HOBART CITY COUNCIL

During 2006 and 2007 Hobart City Council has pursued two major projects to improve the quality of stormwater flowing into the Derwent. The first project is the installation of litter traps in stormwater pits throughout the major retail areas of North Hobart, Sandy Bay and the CBD. The final round of traps will be installed in 2007-08, providing complete coverage of the CBD, resulting in over 300 litter traps being installed in stormwater pits across the City. The second major project is implementation of the New Town Rivulet revegetation and stormwater improvement project, supported by NRM South. This project includes removal of riparian weeds along two sections of the rivulet – replacing these with local native species – and the rebuilding of stormwater outlets to reduce the scouring of the rivulet banks. It is anticipated that these actions will significantly reduce the amount of sediment being deposited into New Town Bay.

WATER SENSITIVE URBAN DESIGN IN KINGBOROUGH

Through the *Kingston Integrated Stormwater Strategy*, Kingborough Council is creating one of Tasmania's best examples of distributed stormwater management using the principles of water sensitive urban design. In 2000 the council constructed an artificial wetland to treat stormwater from the Kingston shopping precinct before it flows into Browns Rivulet and out to Kingston Beach. This system is now being enhanced and complemented with support from the Australian Government's Community Water Grants ($250,000). The project will integrate a variety of stormwater treatment systems throughout the 1150 hectare catchment, including a stormwater detention basin (to enable a larger volume of water to stored and treated), vegetated drainage swales along the main street of Kingston (to treat road runoff), a gross pollutant trap (to capture litter and sediment from the central commercial district) and significant in-stream works at Whitewater Creek, an urban tributary of Browns River.



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Water Quality Monitoring Sites in 2007

Note: beach rankings are for the past 3 years data

Beach monitoring site *(enterococci)*

- *Good water quality*
- *Intermediate water quality*
- *Poor water quality*

Ambient monitoring site *(temperature, salinity, pH, dissolved oxygen, nutrients, chlorophyll a, metals)*

Sewage Treatment Plant Discharges in 2007

- <2500 kL/d
- 2500—5000 kL/d
- >5000 kL/d

Industrial Discharges in 2007

- >50 000 kL/d

Clarence... a brighter place · Glenorchy City Where ideas happen. · Derwent Valley Council · Brighton Council · Hobart City Council · Kingborough Council · TasPorts · Hobart Water · Norske Skog Boyer · Natural Heritage Trust Helping Communities Helping Australia A Commonwealth Government Initiative · nyrstar · Tasmania Explore the possibilities

TASMAP PRODUCTION

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