STATE OF THE DERWENT

Year **2016** 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.

Approximately 43% of Tasmania's population - 221,000 people - live around the estuary's margins. The Derwent is widely used for recreation, boating, fishing, marine transport and industry. Further upstream, the River Derwent 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
- poor recreational water quality at some bays and beaches
- low oxygen levels in the upper estuary during summer
- elevated nutrient concentrations
- environmental flows and barriers
- introduced marine pests and weeds
- loss of habitats and species
- impacts of climate change, e.g. sea-level rise, erosion and habitat loss

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 successful in bringing together a wide range of stakeholders – firstly to build a common understanding, vision and management framework – and secondly to progressively implement this vision through partnership agreements and practical actions.

The program was initially designed to address environmental quality issues such as industrial and urban water pollution, contaminated sediments, invasive species and loss of estuarine ecosystems. More recently, our scope has broadened to include the catchment and channel influences, as well as education and amenity. Key program areas include environmental monitoring and reporting, coordination of regional activities, stormwater management, heavy metal investigations, wetland and seagrass conservation, and promotion of walking tracks.

The DEP is supported by the Tasmanian Government, six councils that border on the estuary (Brighton, Clarence, Derwent Valley, Glenorchy, Hobart and Kingborough Councils) and five business partners (Nyrstar Hobart, Norske Skog Boyer, TasWater, TasPorts and Hydro Tasmania). Other project partners include the Institute of Marine and Antarctic Studies, University of Tasmania, CSIRO, NRM South and BirdLife Tasmania.

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 forms the basis of the DEP's cooperative monitoring program between the state government, councils, industries and research institutes. Formerly independent monitoring programs are now coordinated so as to provide better information on the estuary as a whole, and to report annually on environmental conditions and trends in the Derwent.

This 'Report Card' summarises monitoring data collected by the DEP and our partners, as well as other relevant information collected during 2015 and early 2016, including:

- weekly recreational water quality testing during summer months
- monthly whole-of-estuary and catchment water quality monitoring
- surveys of heavy metal levels in fish and shellfish
- biological surveys (seagrass, spotted handfish)
- weed surveys and control actions (rice grass, karamu)

More detailed information is published in five-yearly State of the Derwent Estuary reports, available on our website: **www.derwentestuary.org.au**

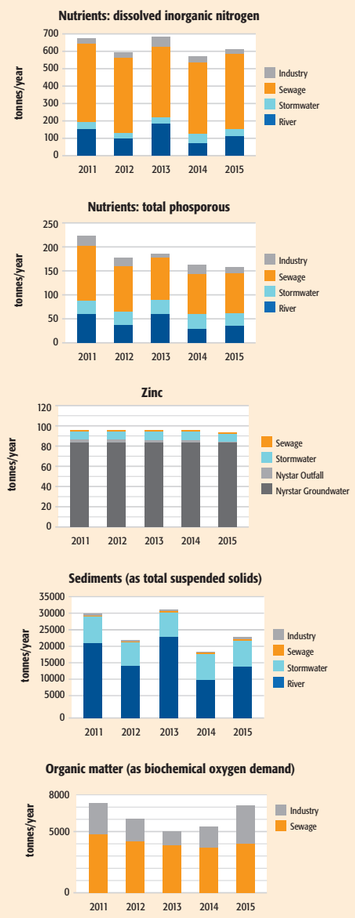
INTERNATIONAL RIVERFOUNDATION RIVERPRIZE 2010 NATIONAL RIVERPRIZE WINNER

POLLUTION SOURCES, LOADS AND TRENDS

Pollutants of particular concern in the Derwent estuary include:

- heavy metals, as these may be toxic to aquatic plants and animals, and accumulate in seafood – a potential health risk for local anglers.
- excessive nutrients, as these can trigger algal blooms that reduce water clarity, smother fish habitat and deplete oxygen. Low oxygen may result in fish kills, rotten egg odours and release of nutrients and heavy metals from sediments.
- pathogens from human sewage that are a human health risk
- sediments, as these reduce light available to aquatic plants
- litter – particularly floating plastics

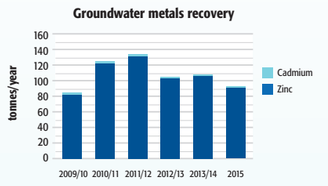
ESTIMATED COMBINED LOADS



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 zinc smelter at Lutana.

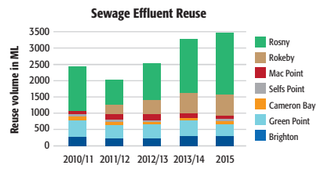
Diffuse sources include stormwater runoff from urban areas as well as the larger catchment inputs carried by the Derwent and Jordan rivers. Other diffuse pollutant sources include air pollution, landfills, aquaculture operations, and wastes associated with ports and marinas. Sediments within the estuary itself may also release pollutants into the overlying waters under certain conditions.

Industries have historically been the main source of ***heavy metal pollution*** to the Derwent, however loads have declined significantly in recent years. Contaminated groundwater at Nyrstar is now the largest remaining source, and is being captured and treated using a series of innovative projects. In 2015, over 90 tonnes of zinc and other metals were captured, together with nearly all stormwater run-off.



Sewage treatment plants are the largest source of bioavailable ***nutrients***, followed by the catchment, stormwater and the Norske Skog paper mill.

Effluent reuse turns a waste product into valuable, nutrient-enriched irrigation water, removing nutrients that would otherwise enter the Derwent estuary. In 2015, the volume of sewage effluent reused increased again, and now accounts for 20% of the regional sewage generated.



Pathogens – usually measured indirectly using faecal indicator bacteria – can be derived from overflows or leaks from the sewerage network, as well as animal faeces associated with stormwater and rural run-off. Urban stormwater accounts for the majority of ***sediment*** and ***litter*** that enter the Derwent, with unmanaged erosion from construction sites a particular concern.

Catchment and Channel: During 2014 and 2015, a series of taste and odour issues in drinking water, together with fish kills, and excessive algae growth in the upper estuary prompted a collaborative catchment monitoring program (see box below). In the Channel, the D'Entrecasteaux and Huon Collaboration, (supported by the DEP), has released their first report card that includes information on marine farming, sewage and other nutrient sources. For details, see **www.nrmsouth.org.au/dentrecasteaux-huon-report-card/**

Keeping tabs on River Derwent water quality

In 2015 a monitoring program was initiated by the DEP, with support from Hydro Tasmania, NRM-South and TasWater to monitor nutrients, sediments and other water quality indicators in the fresh water portion of the River Derwent above New Norfolk. Water samples are collected monthly at 14 sites, including at a number of sites last monitored in 1998. The sites include locations along the River Derwent, between New Norfolk and Wayatinah, as well as at the end of major tributaries, such as the Plenty, Styx, Tyenna, Clyde, Broad, Dee, Ouse and Florentine Rivers. The water quality of the River Derwent in 1998 was excellent however an observed increase in nutrients in the Derwent estuary near New Norfolk, plus the findings of the 2011 River Derwent catchment review, prompted the DEP and other organisations to revisit the monitoring program. This monitoring program will provide baseline information for managing water quality now and in the future, and may also help explain why we have seen an increase in nutrients in the upper estuary.

DERWENT WATER AND SEDIMENT QUALITY

CLIMATIC CONDITIONS

Rainfall in Hobart during 2015 (and the summer of 2015/16) was lower than average, particularly during the spring and summer of 2015/16. River Derwent flows in 2015 were also low, averaging 19% less than the long-term (1974-2015) average.

SWIMMING IN THE DERWENT

Each summer recreational water quality is monitored at about 30 beaches and bays around the estuary through a collaborative State and Local Government program. Sampling is conducted weekly from December through March at the locations shown on the map overleaf. To describe the risk level to swimmers a colour coded system is used based on five years of monitoring data: green indicates good, yellow indicates fair, and red indicates poor water quality.

Eleven of the Derwent's 18 swimming sites are currently classified as having good water quality, six are fair and one is poor. The best water quality sites are at Hinsby, New Norfolk, Blackmans Bay (middle), and Little Howrah. The western end of Nutgrove Beach received a poor rating. Of the 21 bays, coves and other sites monitored, nine have good water quality, six are fair and six are poor (in particular the mouth of Hobart Rivulet and Browns River, Cornelian Bay and Marieville Esplanade).

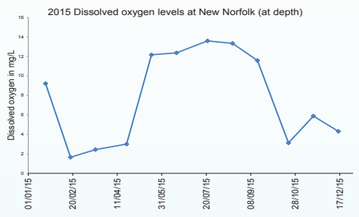
Water quality improved at a number of sites in 2015-16. This is encouraging, but should be taken in the context of the very low rainfall experienced over the past two summers; a wet summer could easily reverse these improvements. It is recommended that sanitary investigations continue to identify and correct sources of faecal contamination.

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 whole-of-estuary monitoring program that integrates sampling carried out by the DEP and EPA Division, Nyrstar Hobart, Norske Skog and TasWater. Water quality is monitored each month at 27 sites for indicators such as temperature, salinity, dissolved oxygen, suspended solids, nutrients, organic carbon, chlorophyll *a* and heavy metals. This information is used to document conditions and trends over time and to provide data for estuarine modelling and process studies.

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 and some species of fish. Low oxygen levels can also result in the release of nutrients and heavy metals from underlying sediments.



Thousands of juvenile barracouta washed up on the banks of the Derwent estuary in February 2015 at a time when dissolved oxygen in the salty bottom waters was below 20% saturation, compared to a healthy level of greater than 70%. A dissolved oxygen sampling program was initiated to better understand this situation and will continue in 2016/17 to identify the drivers of seasonal oxygen levels, with a focus on river flow dynamics, nutrient concentrations and algal cover.

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, copper, mercury, lead, cadmium and arsenic. The most recent survey (2012) confirmed that metal levels are highest in the mid estuary and at depth, with some slight improvements observed in a few areas.

Nutrient risks to aquatic plants

The extensive meadows of aquatic plants in the upper Derwent estuary are vulnerable to rapid environmental changes resulting from human population pressure. These plants provide key ecological services including nutrient removal, sediment stabilisation, as well as food and habitat for birds, fish and crabs. Aquatic plants are indicators of how ecosystems are tolerating changes in anthropogenic influences and extensive losses are occurring both in Australia and throughout the world. The principal factors restricting the health of this habitat are light, temperature, nutrients and salinity.

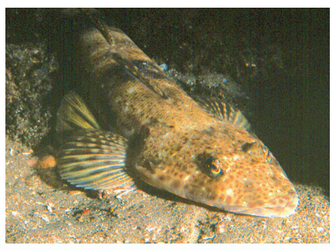
Although all plants require some amount of nutrients, algae is quicker to respond to elevated nutrients than the longer-lived and slower growing aquatic plants, and can grow so densely that the underlying seagrass cannot get enough light to survive or reproduce. In many estuaries this process has resulted in losses of thousands of hectares of highly productive habitat. Dense algal blooms have recently occurred in the upper Derwent estuary and work is continuing in 2016 to better understand the tolerance of aquatic plants to algal smothering in the hope that we can determine the conditions needed to protect and enhance this critical habitat into the future.

DERWENT HABITAT AND SPECIES

HEAVY METALS IN SEAFOOD, BIRDS

Oysters and mussels from the Derwent contain high levels of heavy metals, particularly zinc, lead and cadmium. While levels appear to have declined since 2003 in some areas (i.e. above the Tasman Bridge), they are still far in excess of national food standards.

Mercury levels exceed national food standards in several species of Derwent-caught fish – particularly black bream – and to a lesser degree flathead and trout. Limited sampling suggests that levels are lower in other recreationally-targeted fish (e.g. whiting, Australian salmon, mullet, cod and flounder).



Based on the most recent (2014) monitoring results for flathead, oysters and mussels, there has been no change in current health advice, which is as follows:

- ***Don't eat shellfish collected from the Derwent (including Ralphs Bay)***
- ***Don't eat any bream from the Derwent (including Browns River)***
- ***Limit consumption of other Derwent-caught fish to no more than 2 meals/week, or 1 meal/week for pregnant and breastfeeding women, women planning to become pregnant and young children***

ESTUARINE HABITAT & SPECIES

Surveys of the Derwent estuary indicate that unvegetated, soft-bottom habitats are by far the most abundant habitats in the estuary (86%), followed by seagrass and macrophytes (7%; primarily in the upper estuary), tidal sandflats (6%; primarily in Ralphs Bay) and rocky reefs (1%; primarily in the lower estuary).

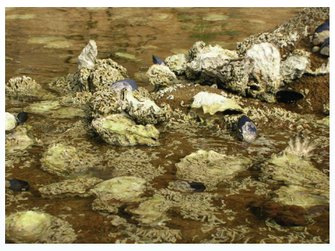
Detailed surveys of nine Derwent estuary spotted handfish colonies were carried out in 2015, with varied results (Wong, 2015). In particular, the number of handfish at the Battery Point site appeared to be stable or increasing, while numbers at Sandy Bay may have declined. Numbers of juvenile fish at all sites are critically low, and over 2000 artificial spawning substrates have been planted out at key sites to improve breeding success. Further surveys are being carried out in 2016 by CSIRO to better understand population dynamics and target management actions accordingly.

A pilot study of heavy metal levels Derwent estuary birds revealed high mercury levels in the feathers of sea eagles and cormorants, elevated levels in penguins and oystercatchers, and relatively low levels in swans, ducks and gulls. More research is needed across a broader range of species to fully understand the extent of contamination and the species at risk.

MARINE PESTS, WEEDS AND DISEASE

The Derwent estuary is extensively colonised by introduced marine species. At least 79 invasive species have been recorded, including four species of particular national concern: northern Pacific seastar, European green crab, Japanese seaweed, and European clam. A number of other species (e.g. New Zealand half crab, New Zealand seastar, and New Zealand screw shell) also pose a significant threat to the ecology of the estuary.

Rice grass – an invasive intertidal weed – has been successfully managed in the Derwent through annual surveys and control actions, and the area of infestation had been reduced from two hectares in 1995 to zero in 2009 and 2010. However recent surveys found several small patches in the middle estuary region. These will continue to be monitored and treated.



Pacific Oyster Mortality Syndrome (POMS) was reported in Tasmania in January 2016, with devastating effects on the shellfish industry. The DEP, in collaboration with IMAS, surveyed the condition of oyster beds around the Derwent in early March, with a particular focus on the proportion of dead oysters at each site. The sites with the highest numbers of dead oysters were generally in the middle estuary (10 to 30% mortality), with lower mortality rates at lower estuary sites. It appears that POMS may have persisted through the winter, and additional surveys are planned.

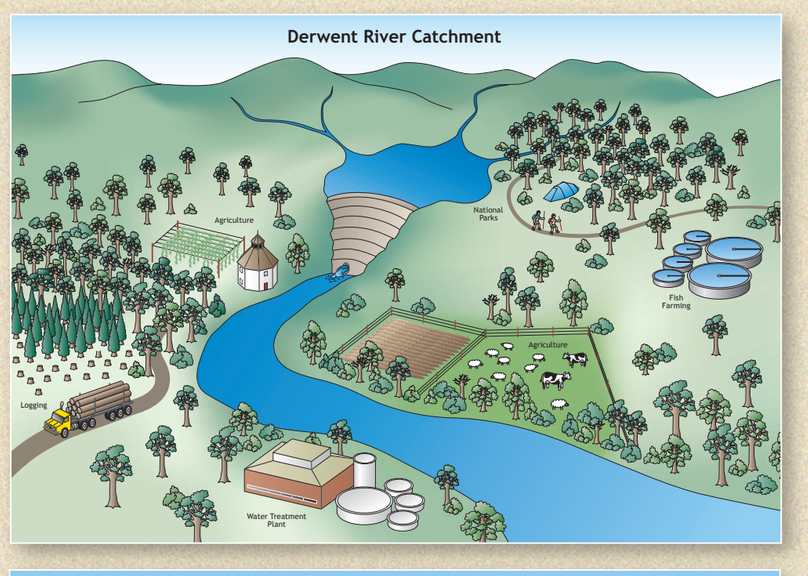
RECENT MANAGEMENT ACTIONS, SAMPLING SITES AND DISCHARGE POINTS

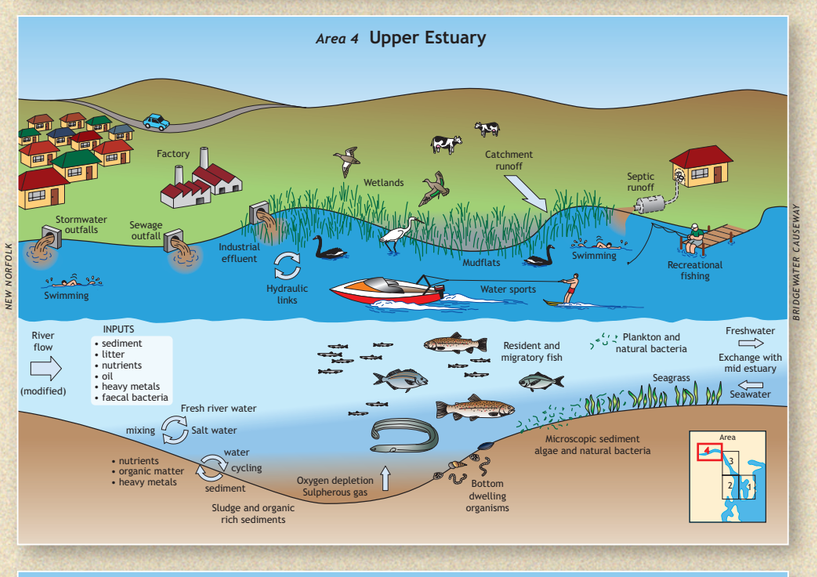
Program partners:

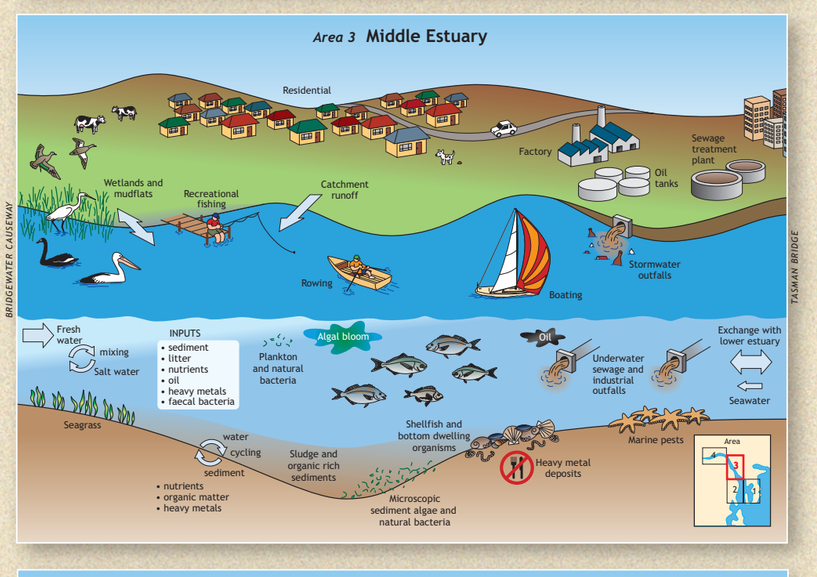
Clarence... a brighter place · Glenorchy City Where ideas happen. · Derwent Valley Council · Huon Coast · City of Hobart · Kingborough · taswater · TasPorts · Hydro Tasmania The power of natural thinking · nyrstar · Norske Skog Boyer · Tasmanian Government

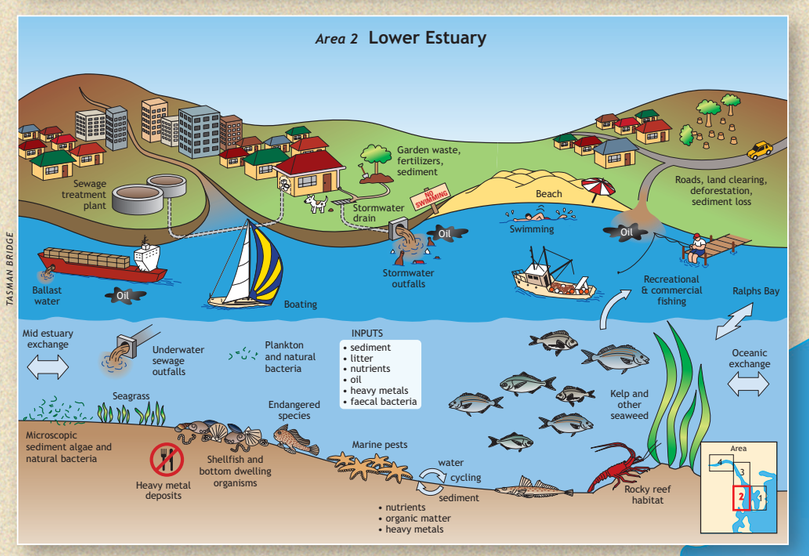
KARAMU CONTROL IN UPPER WETLANDS

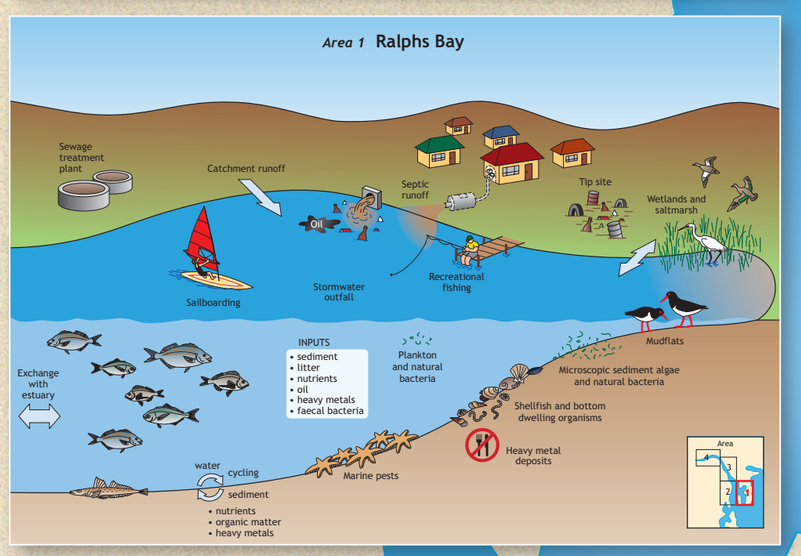
Karamu, a small tree originating from New Zealand, has invaded the river banks and wetland areas of the upper Derwent near New Norfolk. Over the past five years the DEP in cooperation with other stakeholders have reduced the distribution of this highly invasive weed by poisoning plants at the edge of the infestation and squeezing it towards a central patch from Lawitta to New Norfolk. The management of karamu has been successful because of the cooperation of so many people and organisations. The DEP, Crown Land Services and the Department of State Growth employed contractors to tackle outlying infestations and conduct treatment trials aimed at defining the best method of controlling karamu. Derwent Catchment NRM, NRM South and Derwent Valley Council supported Green Army teams to remove karamu and revegetate council parks with native species. By 'bookending' the karamu it is hoped that its management will be reduced to the maintenance of regrowth in the not so distant future.





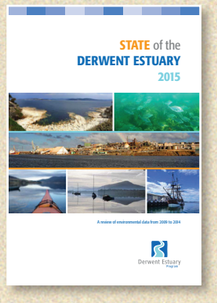






STORMWATER CAPTURE AND WASTEWATER REUSE AT NYRSTAR

In 2014, the final stages of the Loogana-Inshallah contaminated site rehabilitation were completed, with commissioning of the Nyrstar Hobart Stormwater Harvesting and Reuse Project. This included construction of a 40 ML stormwater detention dam, additional groundwater interception, capping and revegetation. The project was awarded the 2014 Tasmanian Engineering Excellence Award (Environment Category). In 2015, Nyrstar completed the design and construction of a reverse osmosis (RO) plant, with funding support from the Australian government. The RO process provides an additional treatment step for the wastewater that is currently treated by the site's Effluent Treatment Plant. The current process treats the site's wastewater to a standard that allows the treated water to be released to the Derwent. However, the extra treatment step provided by the RO Plant will allow the water to be reused on site. Hence the project also involved identification of on-site uses for the treated water and the installation of a treated water pipe system across the site. The benefits of this project to the environment are clear – reduced volume of treated wastewater to the river, as well as reduced potable water use on site.



STATE OF THE DERWENT REPORT 2015

Hobart is a capital city that boasts swimmable beaches, an extensive network of walking and cycling tracks and great opportunities for boating and fishing. A major report looking at the health of the Derwent over the past five years has found the condition of the estuary has improved in some areas and declined in others. This report highlights areas we can work on to maintain the health of this highly valued waterway. The State of the Derwent report summarises trends in industrial, sewage and stormwater discharges, monitoring results for swimming beaches, heavy metal levels in sediments and seafood, and the condition of key habitats and species. The report also highlights actions taken to clean-up the Derwent during this time. Find it at **www.derwentestuary.org.au** or contact us for a hard copy.

New Norfolk · New Norfolk · Norske Skog Paper · Bridgewater · Bridgewater Causeway · Bridgewater · Jordan River · Brighton · Austins Ferry · Old Beach · Claremont · Dogshear Point · Cameron Bay · RIVER · Bowen Bridge · GLENORCHY · East Risdon · Prince Of Wales Bay · Nyrstar Hobart Smelter · Moonah · Selfs Point (outfall at Sandy Bay) · New Town · Lindisfarne · Cornelian Bay · HOBART · Tasman Bridge · Macquarie Point · Rosny · Bellerive · Sandy Bay · Howrah · DERWENT · Sandy Bay (outfall from Selfs Point) · Tranmere · Rokeby · Rokeby · Taroona · Lauderdale · Kingston · Blackmans Bay · Blackmans Bay · Opossum Bay · RALPHS BAY · Tinderbox · South Arm · Iron Pot · Betsey Island

HEAVY METAL AT MONA

In 2012, Kirsha Kaechele, curator at MONA launched Derwent Heavy Metal – a collaboration between artists, architects and scientists to identify ways of raising awareness and seeking possible solutions to ridding the river of its heavy metals. To date, Heavy Metal has engaged with more than 60 scientists, artists and architects from Tasmanian, Australia and the wider world. Partners with MONA include the DEP, University of Tasmania (Institute of Marine and Antarctic Science and Tasmanian College of the Arts), CSIRO and Monash Art Design and Architecture. Projects have included symposia, art and architectural installations, swimming events, death metal and summer market stalls. This year MONA awarded six scholarships to science and arts students for Derwent-related projects. The science students were matched with art students to look at ways of presenting and interpreting their work. Projects include heavy metal uptake in oysters, a GIS project on Pacific Oyster Mortality Syndrome (POMS), innovative treatment trials of mining wastes, metals in penguin feathers, biological settlement plates and a Derwent jazz suite.

DEP SPONSORS CIRQUE TO SEA EXPEDITION CLASS

The Bookend Trust and the DEP joined forces to share their love of science and environmental education with classrooms everywhere through Bookend's Expedition Class. The major Expedition Class project for K-6 students in 2016 was a high country and river adventure. In August Andrew Hughes, expedition leader, set out into the Tasmanian wilderness near Lake St Clair. Andrew made his way by foot to one of Tasmania's highest mountain peaks and then followed the Derwent by pack raft then kayak, once the trickle turned into the powerful River Derwent. He traversed the length of the river as it made its way down to Hobart and then out into the salt water of the Southern Ocean. Over 3000 students were engaged with Expedition Class and teachers had free access to the Australian Curriculum based lessons created for this project. The DEP team and a number of our partners were also available during the expedition to answer children's questions about the issues and challenges facing river catchments. **www.expeditionclass.com.au**

WATER QUALITY MONITORING SITES IN 2015

Beach monitoring site (*enterococci*)

- Good water quality
- Fair water quality
- Poor water quality

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

SEWAGE TREATMENT PLANT DISCHARGES IN 2015

- < 1000 kL/d
- 1000 - 5000 kL/d
- > 5000 kL/d

INDUSTRIAL DISCHARGES IN 2015

- > 50 000 kL/d

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kilometres

TASMAP
www.tasmap.tas.gov.au

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