STATE of the DERWENT ESTUARY 2015






A review of environmental data from 2009 to 2014

Derwent Estuary Program

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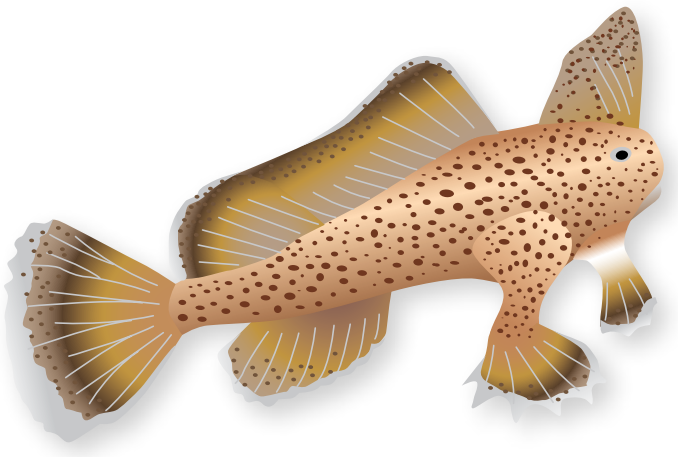

This report should be cited as follows:
Coughanowr C, Whitehead S, Whitehead J, Einoder L, Taylor U and Weeding, B, 2015. State of the Derwent estuary: a review of environmental data from 2009 to 2014. Derwent Estuary Program

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The Derwent Estuary Program (DEP) is a regional partnership between local governments, the Tasmanian state government, businesses, scientists and the community to restore and promote our estuary.

The DEP was established in 1999 and has been nationally recognised for excellence in coordinating initiatives to reduce water pollution, conserve habitats and species, monitor river health and promote greater use and enjoyment of the foreshore. Our major sponsors include: Brighton, Clarence, Derwent Valley, Glenorchy, Hobart and Kingborough councils, the Tasmanian State Government, TasWater, Tasmanian Ports Corporation, Norske Skog Boyer, Hydro Tasmania and Nyrstar Hobart. We also work collaboratively on projects with the CSIRO Marine and Atmospheric Research, University of Tasmania, Institute of Marine and Antarctic Studies and NRM South.

2010 National RIVER*PRIZE* Winner.

Cover photography: all photos by DEP, except bastard trumpeter (*Latridopsis forsteri*)and spotted handfish (*Brachinichthys hirsutus*), both by N Barrett, IMAS

EXECUTIVE SUMMARY

The Derwent Estuary Program (DEP) was established in 1999 as a partnership between state and local governments, industries, scientists and the community to restore and promote the Derwent estuary. A key role of the DEP is to coordinate and support monitoring activities and scientific investigations, and to compile and distribute the resulting information in regular reports. This report updates the previous *State of the Derwent Estuary* report published in 2009. The report reviews environmental quality data for the Derwent estuary to give a representation of current estuary health, highlights environmental trends and provides an overview of recent management actions that have been undertaken to improve environmental conditions.

The Derwent estuary is the largest estuary in south eastern Tasmania, covering an area of nearly 200 square kilometres. The estuary extends from New Norfolk (maximum extent of salt water) to the mouth, which lies between Tinderbox and the Iron Pot light. The Derwent is relatively deep, and is highly stratified in its narrow upper reaches, and well-mixed in its broad, lower reaches. Tides are generally small, with an average tidal range of one metre. The average flushing period of the estuary is estimated to be about 12 days.

The Derwent estuary lies at the heart of the Hobart metropolitan area and is an integral part of Tasmania's natural, cultural and economic heritage. The estuary is an important and productive ecosystem, supporting large areas of wetlands, seagrasses, tidal flats and rocky reefs. A number of protected species, including the endangered spotted handfish, inhabit the Derwent estuary. Approximately 40% of Tasmania's population – 210,000 people – live around the estuary's margins and the Derwent is widely used for recreation, boating, fishing and marine transportation. The estuary supports several large industries, including paper production, zinc smelting and boat building, and is Tasmania's fourth busiest port.

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

- heavy metal contamination of sediments and biota by mercury, zinc, cadmium, lead, copper and arsenic;
- elevated nutrient concentrations, localised algal blooms and, in the upper estuary, seasonally depressed oxygen levels;
- loss and degradation of estuarine habitat and species;
- altered environmental flows and physical barriers to fish migration;
- intermittent faecal contamination of recreational waters;
- severe infestation by marine pests and coastal weeds.

Contaminants enter the Derwent estuary from a variety of sources. Point sources include ten wastewater treatment plants (WWTPs) and two large industries (the Norske Skog paper mill and Nyrstar Hobart zinc smelter). Non-point or diffuse sources include urban runoff, catchment inputs carried by the Derwent and Jordan rivers, marine and aquaculture inputs, rubbish tips and contaminated sites, atmospheric deposition, and wastes associated with shipping operations, port facilities and marinas. Additionally, under certain conditions, pollutants may be remobilised from contaminated sediments within the estuary. Contaminants associated with these various sources include pathogens, nutrients, organic matter, silt, litter and gross solids, and a range of toxicants including heavy metals and hydrocarbons.

Pollutant loads

From 2009 through 2013 there has been considerable inter-annual variation in estimated pollutant loads to the Derwent estuary, however cumulative loads have not changed substantially, with the exception of a further reduction in organic matter loads, associated with process changes at the Norske Skog Boyer paper mill. There has, however,

been an apparent spatial shift, with higher nutrient loading in the upper estuary (associated with increased catchment, industry and WWTP loads) and decreased loading to the lower estuary (associated with lower WWTP loads). The interannual variability in suspended solids and total nitrogen loads largely reflects riverine inputs, with higher than average flows in 2009, 2011 and 2013, and lower than average flows in 2010 and 2012. Zinc loads to the estuary are difficult to quantify, as the primary sources are non-point emissions of groundwater, and it is assumed that discharges have been relatively constant during the reporting period. Cumulative inputs of faecal bacteria and litter are also difficult to quantify, but monitoring suggests that urban stormwater is the primary source. Thus, over the reporting period:

- the River Derwent contributes the majority of suspended solids and total nitrogen;
- the majority of bioavailable nutrients are derived from WWTPs, and there has been an increase in catchment inputs;
- the majority of zinc is derived from contaminated groundwater at the zinc smelter site;
- stormwater accounts for the majority of faecal bacteria and litter.

Water quality

Water quality in the Derwent estuary has been assessed based on results from the recreational water quality monitoring program which monitors faecal bacterial indicators weekly at over 35 beaches and bays during summer months and the ambient monitoring program which measures physico-chemical parameters each month at over 20 sites between New Norfolk and the Iron Pot.

Ninety percent of the Derwent's swimming areas are classified as having good or fair water quality, with little change over the past five years. Opossum Bay, Hinsby Beach and the River Derwent at New Norfolk had the best water quality, while poor water quality persists at the western end of Nutgrove and mid-Howrah beach, probably due to stormwater/sewage cross-connections. Most estuary beaches are susceptible to stormwater pollution, and swimming is not recommended in the Derwent for several days following heavy rain. Recreational water quality of Derwent's bays and coves is more variable. Over 60% of these sites have good or fair water quality, with a marked improvement over the past five years (probably due to very low summer rainfall during this period). Several sites (e.g. Sullivans Cove, Montagu Bay and Dorans Road) typically have excellent water quality, while others (e.g. Marieville Esplanade and Geilston Bay) are poor. The DEP regularly informs the community about recreational water quality via media releases, weekly water quality reports on the DEP website, and signage at beaches.

Ambient water quality indicators, such as temperature, salinity, dissolved oxygen, suspended solids and nutrients, have shown similar spatial and temporal patterns as previously reported, but have been influenced by the higher than average rainfall and river flows experienced during the past five years, together with the shift in nutrient loading towards the upper estuary. Concentrations of suspended solids and chlorophyll a have increased across the estuary as a whole, with highest values at mid estuary sites, and water clarity has also declined. Bioavailable nutrients are elevated in surface waters of the middle estuary and at depth in the mid to upper estuary, and have increased significantly over the past decade. While ambient water quality is still relatively good across much of the estuary, the recent increases in bioavailable nutrients and chlorophyll a, combined with persistently low summer oxygen levels and recent filamentous algal blooms in the upper estuary, suggest that the estuary is becoming more eutrophic, with the upper estuary at greatest risk.

Zinc levels remain elevated in the surface waters of the middle estuary and at depth in the upper estuary, but there are some indications that levels have declined across the estuary as a whole.

Sediment quality

The majority of the Derwent's sediments do not meet national sediment quality guidelines for heavy metals, particularly for mercury, lead, zinc, cadmium and arsenic. The middle reaches of the estuary are particularly contaminated and heavy metals in this area can be ten or more times the recommended levels, particularly for mercury and zinc.

Derwent estuary sediments are also organically-enriched, particularly in the middle and upper estuary. A 2011 estuary-wide survey of metals in surface sediments indicates that there has been a decline in some of the extreme values previously recorded at middle estuary sites, and that there have been slight shifts in contaminant distributions, with some reductions at upper and lower estuary sites, but an apparent increase in Elwick Bay. Several recent coring investigations have shown that the contamination is largely restricted to the top one metre of sediments, with peak metal concentrations typically at a depth of 20 to 60 cm below the surface. Previous studies have shown that the majority of heavy metals in Derwent estuary sediments are strongly bound and do not tend to be released to the water column under normal conditions. However, during low oxygen events, heavy metals may disassociate from sediments, becoming more bioavailable. Thus managing nutrient loading to prevent associated oxygen depletion is an inportant challenge.

Seafood safety

Heavy metals in Derwent estuary oysters and mussels continue to be monitored on a regular basis, and remain well above national food safety guidelines, with no clear trend over time. Mercury levels in a broader range of recreationally targeted fish were tested during this reporting period, confirming that levels in black bream are well above national guidelines, flathead and trout are close to or slightly above, and other species are generally below the guidelines. A detailed investigation of Derwent flathead did not find a long-term trend in mercury levels and emphasized the need to consider fish size and age when interpreting monitoring results. This study also identified selenium as an important influence on mercury uptake and toxicity. There has been no change in the health advice previously issued by the Director of Public Health, which is:

- do not consume shellfish or black bream caught from the Derwent estuary and;
- limit consumption of flathead and other Derwent caught fish to no more than one meal per week, for pregnant/ breastfeeding women and young children, and no more than two meals per week for the wider community.

Habitat and species

The Derwent estuary supports a wide variety of habitats, of which subtidal soft sediments are by far the most abundant (86%), followed by tidal flats (6%), seagrasses and macrophytes (3%), wetlands and saltmarshes (2%) and rocky reefs (1%). The Derwent foreshore retains 49% of its native vegetation, including 12 state-listed threatened vegetation communities and two EPBC-listed communities. There has been good progress during this reporting period in mapping the extent and condition of key habitats, including the wetlands and macrophyte beds of the upper estuary, the Lauderdale saltmarshes, and the rocky reefs of the middle and lower estuary. A Derwent Estuary Conservation Action Plan has also been prepared to better prioritise conservation actions and investments, which has highlighted the vulnerability of high value wetlands and seagrass/ macrophyte communities to reclamation, water quality decline and sea-level rise.

The estuary supports a wide range of fauna, including over 150 species of fish and 120 species of birds. There is little quantitative data on which to ascertain long-term trends in Derwent estuary fauna, hence, population and species diversity trends for most species of birds, fish and macro-invertebrates are not well known. The long-term decline in migratory shorebirds in the Derwent estuary/Pittwater area persists, and the number of ducks in the upper estuary has also fallen, however gull numbers have increased in recent years. Monitoring and conservation actions have continued for little penguins and spotted handfish, which continue to breed at a number of sites in the lower estuary. Pilot surveys have also been undertaken of Derwent estuary dolphins, endangered saltmarsh moths, and the endangered Australasian bittern. Southern right whales, and occasional humpbacks and orcas, continue to visit the Derwent, including a southern right whale and newborn calf in 2010.

Marine pests and weeds

The Derwent estuary has been extensively colonised by introduced marine species. At least 79 species have been recorded, including four high priority species for which National Control Plans have been developed: the northern Pacific seastar

(*Asterias amurensis*), European green crab (*Carcinus maenas*); Japanese seaweed (*Undaria pinnatifida*); and European clam (*Varicorbula gibba*). A number of other introduced 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. There have been no system-wide surveys of marine pests in the Derwent since 2002.

A total of 71 weed species have been documented along the Derwent foreshore, including 15 weeds of national significance, with boneseed and African boxthorn the most abundant. Annual rice grass surveys have continued, with four small patches found and treated over the five year period, all in the middle estuary. A major new control program for the New Zealand weed karamu commenced in 2010, with a focus on protecting the high value wetlands in the upper estuary. This weed has been successfully reduced from 11 to 4 km of the foreshore, with further work underway.

Recent and ongoing management

A number of major initiatives have been implemented by industries and councils to further improve water quality in the Derwent since the last State of the Derwent report was published in 2009. These include:

- Continuing site works at the Nyrstar Hobart zinc smelter to reduce heavy metal discharges, including extension of groundwater remediation systems (currently extracting over 100 tonnes of zinc per year) and completion of a major stormwater harvesting and reuse project, including a 40 ML stormwater detention dam (no significant overflows since 2012);
- Conversion to pine only processing at the Norske Skog paper mill in 2009, resulting in clearer effluent and a further 50% reduction in organic matter loads;
- Decommissioning of the Taroona wastewater treatment plant in 2014 (effluent now treated to tertiary level at Selfs Point) and construction of the 1000 ML Duckhole storage dam in 2013 to improve effluent reuse (now at about 18%);
- Construction of over 20 stormwater management projects by councils, including water sensitive urban design systems, litter and gross pollutant traps and stormwater harvesting.

Major DEP initiatives since 2009 have included the revision and endorsement of the *Derwent Estuary Environmental Management Plan* (2009), signing of a new partnership agreement in 2014, and completion of an Australian Government-supported *Water Quality Improvement Plan* to better inform management of heavy metals and nutrients. Other key projects have included:

- continued monitoring and reporting on recreational and ambient water quality, rivulets, seafood safety, including signage;
- continued development of estuarine models and decision support tools;
- initiatives to capture and treat contaminated groundwater at the zinc works site;
- initiatives to improve regional stormwater management (e.g. design and construction of four water sensitive urban design projects; guidelines and technical support for sediment and erosion control on building sites);
- planning, monitoring and investigations of key habitats (e.g. Derwent Conservation Action Plan, baseline surveys of wetlands, saltmarshes, macrophytes and seagrasses, and rocky reefs);
- monitoring and management of iconic and protected species (e.g. little penguins, spotted handfish, dolphins, saltmarsh moths and Australasian bitterns) ;
- development of a foreshore weed strategy and implementation of priority projects (e.g. rice grass and karamu control), and;
- initiatives to better understand community values, raise awareness and increase enjoyment (e.g. community survey, signage, educational projects and foreshore tracks website).

Many of these projects were implemented with support from Australian Government grants, and in collaboration with our partners. The DEP has also developed a range of communication tools, including a comprehensive website (www.derwentestuary.org.au), regular newsletters and Derwent estuary report cards.

ACKNOWLEDGEMENTS

This report was produced with financial and technical support from the Derwent Estuary Program's major partners – as listed below.

- Tasmanian State Government (including the Department of Primary Industries, Parks, Water, and Environment and the Department of Health and Human Services)
- Brighton Council
- Clarence City Council
- Derwent Valley Council
- Glenorchy City Council
- Hobart City Council
- Kingborough Council
- Nyrstar Hobart
- Norske Skog Boyer
- TasWater
- Tasmanian Ports Corporation
- Hydro Tasmania

In addition to the partners listed above, many people provided information, editorial review and other input to this document. Specific references are provided in the text of the report, so rather than listing individuals here, we wish to acknowledge their respective organisations, which include the following:

- University of Tasmania, including the Institute of Marine and Antarctic Studies
- CSIRO Marine and Atmospheric Research
- NRM South
- Birdlife Tasmania
- Aquenal
- Technical Advice on Water
- North Barker Ecosystem Services
- Aquatic Science

A special thanks to our colleagues at the EPA Division, Norske Skog, Nyrstar, local governments, Analytical Services Tasmania and the Public Health Laboratory, who assisted in the collection and analysis of the thousands of samples that form the basis of much of this report.

Many thanks also to Rani Milne (Rani Writes) for editorial assistance and Brett Littleton (Land Tasmania Design Unit, DPIPWE) for report design and layout.