

Parliament of the Commonwealth of Australia

Inquiry into Gulf St Vincent



**Report of the Senate Environment, Communications,
Information Technology and the Arts References Committee**

June 2000

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TERMS OF REFERENCE

On 26 August 1999 the Senate referred the following matters to the Environment, Communications, Information Technology and the Arts References Committee for inquiry and report by the first sitting day in April 2000:

- (a) The state of the environment of Gulf St Vincent;
- (b) The expected impacts on that environment; and
- (c) The possible enhancements to protection measures in relation to that environment.

FOREWORD

Water quality problems in the Gulf are well documented. Many of the problems are impacting on the Gulf and even the solutions are already well known.

Between 1991 and 1994 no less than 13 studies identified the clear correlation between sewage disposal and ecosystem degradation around the Gulf's wastewater treatment plants. Further studies indicate the Gulf has already lost more than 6000 hectares of its seagrass beds. These studies mapped the decline in detail and correlated it with well-documented, water quality degradation.

The Commonwealth has approved \$1.9 million in funding for rehabilitation projects in the Gulf region over the past three years. Ultimately, it is fundamental for the State Government to be driving the process and committing to specific tangible outcomes, such as coordinated public education, statutory planning, agency agreements, capital works and enforcement programs.

The Commonwealth should continue to support on-ground works in Gulf St Vincent and see that Coasts and Clean Seas, Living Cities, the Urban Stormwater Initiative and other Commonwealth programs are available to specifically support capital works.

LIST OF RECOMMENDATIONS

The Committee recommends that all levels of government increase the level of resources currently available for raising awareness of the environmental threats to the Gulf and for community education programs about possible solutions to some of the pollution and degradation problems. (**Recommendation 15**, paragraph 4.88)

The Committee recommends that the Commonwealth provide funding through the Coastal and Marine Planning Program for the Environment Protection Agency of South Australia to develop a planning strategy for Gulf St Vincent. (**Recommendation 8**, paragraph 4.10)

The Committee recommends that the Federal and South Australian governments provide increased funding for the monitoring and evaluation of programs aimed at cleaning up the waters and environment of the Gulf. (**Recommendation 14**, paragraph 4.80)

The Committee recommends that the South Australian Government give enhanced statutory powers and greater flexibility and independence to the South Australian Environment Protection Agency to take action to protect the environment more effectively. (**Recommendation 10**, paragraph 4.17)

The Committee recommends that the South Australian Government consider an overhaul of the current coastal protection legislation with the introduction of a new Coastal and Marine Planning Management Act. (**Recommendation 11**, paragraph 4.29)

The Committee recommends that the Australian Quarantine and Inspection Service (AQIS) take an active role in monitoring the possible introduction of marine pests from visiting vessels in the Gulf St Vincent area and that it take appropriate action to minimise the problem. (**Recommendation 4**, paragraph 3.92)

The Committee recommends that the Commonwealth provide additional funding for the Adelaide Coastal Waters Study. (**Recommendation 7**, paragraph 4.7)

The Committee recommends that both the Federal and State Governments give consideration to sponsoring an increased number of scholarships in the field of environmental science. (**Recommendation 9**, paragraph 4.13)

The Committee recommends improved mechanisms for liaison between State and local government agencies in relation to the management of Gulf waters and the coastal environment of the Gulf. (**Recommendation 12**, paragraph 4.76)

The Committee recommends that representatives of the Catchment Water Management Boards, local Councils and relevant State government agencies meet at regular intervals to discuss and implement an integrated approach to programs aimed at improving water quality and the general environment of the Gulf. (**Recommendation 13**, paragraph 4.76)

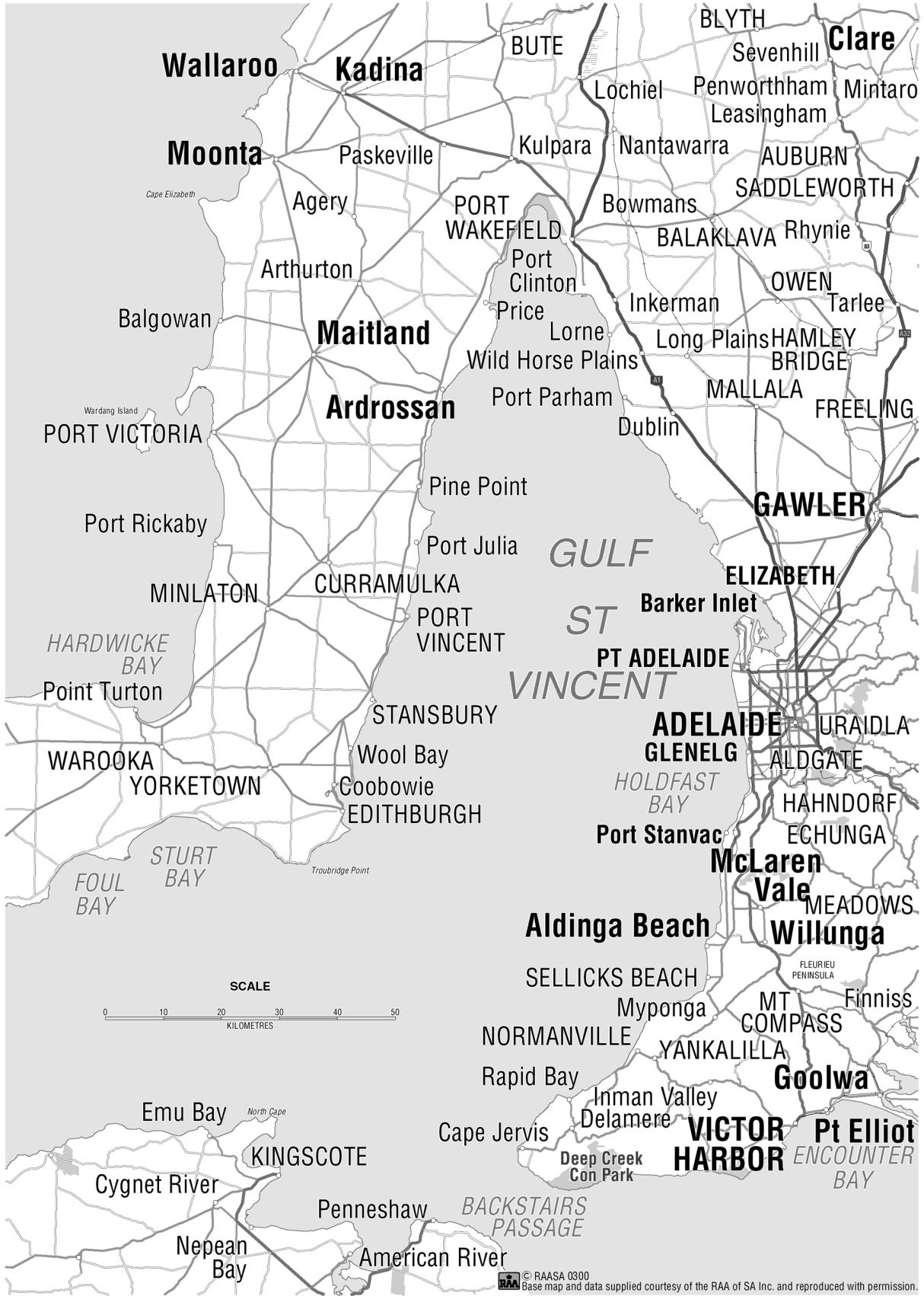
The Committee recommends an embargo on pumping from wells or bores on coastal dunes and adjacent regions until an investigation into the groundwater reservoirs has been undertaken. (**Recommendation 2**, paragraph 3.73)

The Committee recommends that the licence to be issued to the Pelican Point Power Station be made conditional on measures being taken to prevent thermal pollution. (**Recommendation 5**, paragraph 3.132)

The Committee recommends that the South Australian Government consider off-budget construction options for the upgrading of the Port Adelaide Waste Water Treatment Plant utilising land-based disposal of sewage effluent. (**Recommendation 6**, paragraph 3.143)

The Committee recommends that an independent assessment of the effects and future potential of prawn fishing in the Gulf St Vincent area should be carried out. (**Recommendation 3**, paragraph 3.84)

The Committee recommends that the South Australian Government prohibit the use of Tributyl tin (TBT) on small craft. (**Recommendation 1**, paragraph 3.39)



CHAPTER 1

INTRODUCTION

Reference to the Committee

1.1 On 26 August 1999, on the motion of Senator Bolkus, the Senate referred the state of the environment of Gulf St Vincent to the Environment, Communications, Information Technology and the Arts References Committee for inquiry and report by the first sitting day in April 2000. (The full terms of reference are set out at the beginning of this report.) The reporting date was subsequently extended to 5 June 2000.

Conduct of the inquiry

1.2 The Committee advertised the inquiry on 4 September 1999 in *The Weekend Australian*, the *Adelaide Advertiser* and relevant editions of the suburban Messenger Group in Adelaide, with a nominated closing date for submissions of 8 October 1999. The Committee also wrote to a number of organisations, seeking written submissions.

1.3 The Committee received 326 submissions, of which 281 were in the form of a standard letter. All submissions are listed in Appendix 1. Copies of non-confidential submissions are available on request.

1.4 The Committee held public hearings in Adelaide, on 3 February 2000 and Port Adelaide, on 4 February 2000. The Committee also inspected areas around Gulf St Vincent in the Port Adelaide River and Barker Inlet environs.

1.5 Senate Committee procedures provide that where evidence 'adversely reflects' on a person or an organisation (for example, by accusing them of deliberate lies or illegal acts), that person or organisation should have a reasonable right of reply. In a number of cases in this inquiry the Committee pointed out 'adverse reflections' to the affected parties and invited reply. The replies are part of the public evidence of the inquiry (unless the Committee accepted a request for confidentiality) and are noted in Appendix 3.

Acknowledgements

1.6 The Committee wishes to thank all those who contributed to the inquiry by preparing written submissions, by giving oral evidence, by providing additional information and material where requested or by assisting with arrangements for public hearings and inspections.

CHAPTER 2

BACKGROUND

Introduction

2.1 Gulf St Vincent is a valuable asset to South Australia. It supports an abundant aquatic system, provides an important sea link to other cities, produces fish and seafood and provides the basis for a wide range of recreational activities including attractive beaches and coastal scenery.

2.2 Gulf St Vincent is the smaller of the two gulfs in South Australia. Adelaide, a city of approximately 1 million people, is located on the eastern side of the Gulf and it is this proximity to major urban development which is responsible for many of the most pressing problems facing Gulf St Vincent today. The Gulf is a multi-use area and as such, there are increasing pressures between its various users for resources. The most significant marine areas under threat in South Australia are in Gulf St Vincent and, in particular, they are in the Adelaide Metropolitan Coastal Waters Zone.

2.3 Along with providing economic and recreational bounty, the Gulf gives less tangible benefits. Since European settlement it has been treated as a “free good” providing a dump for sewage effluent and sludge, industrial effluent, urban runoff, dredging material, and other unwanted material. No information is available on the cost of this pollution to the marine environment from loss of fisheries production, effects on biodiversity, nuisance and loss of amenity and access.¹ It is the taxpayers today however, who are paying for the “free good” of the past. It is obvious that if the degradation is not addressed today it will be future generations who will be paying for a loss of amenity, a loss of resources and for further remedial works.

Description

2.4 The Gulf is approximately 70 km wide from east to west and approximately 160 km long from north to south. It has approximately 350 km of coastline. It connects to the Southern Ocean by Investigator Strait to the south-west, and by Backstairs Passage to the south. It is bounded on the south-east by the Fleurieu Peninsula and on the west by Yorke Peninsula. Kangaroo Island lies at the mouth of the Gulf and acts as a barrier between Gulf waters and the open ocean. Kangaroo Island ensures that it takes 80-100 days to completely flush through.

2.5 As a result, this characteristic has implications for the Gulf in the dilution of pollutants as it takes longer for them to disperse. Twice a month the Gulf can

1 Our Seas and Coasts - A marine and estuarine strategy for South Australia, Government of South Australia, August 1998, p 12.

experience dudge tides where tidal movement almost ceases. When these occur there is less dilution and dispersion of pollutants.

2.6 The Gulf is highly saline with salinity increasing towards its head at the northern end. As a consequence it behaves as an inverse, or reverse, estuary which is rather uncommon. Inverse estuaries usually occur in arid areas that do not have sufficient fresh-water inflow, or sufficient sea-water flushing, to compensate for evaporation.²

2.7 There is a high degree of variability over various parameters across the Gulf. There can be up to a 12°C temperature difference throughout the Gulf waters and salinities vary from 35.5 parts per thousand (ppt) to 42.0 ppt.³ The Gulf is relatively shallow and its sheltered nature results in low to very low wave regimes. Tidal currents carry fine suspended sediments that settle out in the upper reaches creating large sediment basins. Windwaves rather than currents are the main modifying factor.⁴ The Gulf has a diversity of areas and adverse impacts vary across its entirety.

2.8 South Australian waters are naturally low in nutrients due to low levels of runoff from the land because of the arid nature of the region, as well as the aged, nutrient-poor soils. The impact of nutrient rich stormwater runoff as well as wastewater from sewage treatment plants has therefore had a marked impact on Gulf waters.

2.9 Outside of the Adelaide metropolitan area, small towns are situated around the Gulf. Many of these towns are popular tourist destinations and their populations can dramatically increase in the tourist season. Intensive farming activities occur around Dublin and broad acre farming with low populations around the Inkerman area.

2.10 The Yorke Peninsula borders the western side of the Gulf. This region comprises micro to small communities, some of which consist of mainly holiday and retirement shacks, and a sparsely populated farming community. Industry sectors include: tourism and hospitality, agribusiness, information technology, aquaculture and light industries. Salt production takes place at Price.

2.11 At Port Wakefield, at the northern end of the Gulf, is a Proof and Experimental Establishment. This facility tests locally and overseas manufactured ammunition, fuses, projectiles and gun components under simulated operational conditions. Shells and projectiles are extracted from the tidal offshore area at low tide after firing for testing and evaluation. Neither State nor Local Government has jurisdiction over the area as it is run by the Defence Estate Organisation – South Australia, which has a landlord function for the Federal Department of Defence.

2 State of the Environment Report, 1996 - Chapter 8, p 8-5.

3 Average salinity in sea water is 35 ppt but varies up to 5% throughout the world.

4 South Australian Fishing Industry Council Inc, Submission 33, pp 6-7.

2.12 The total land holding of the Establishment is currently 5000 hectares. A designated prohibited area also extends seaward to the low water mark, encompassing a further area of approximately 4600 hectares. As such, the area has not been subject to development pressures as have other areas bordering the Gulf. Because access is denied to it, it may provide valuable baseline data about the state of the Gulf.

2.13 Gulf St Vincent has a diverse range of habitats and globally significant regions for temperate biodiversity, exhibiting very high levels of endemism - or uniqueness of species - relative to the southern temperate coastline of Australia. The Southern temperate coastline of Australia itself has an endemism of over 85% compared with 15% in tropical areas such as the Great Barrier Reef.⁵

2.14 Gulf St Vincent contains some of the most extensive areas of temperate mangrove forests (20 000 hectares) and seagrass meadows in Australia. These habitats are of considerable ecological and economic importance. Other habitats include temperate reef systems, samphire, saltmarsh, tidal flats, stranded shell beach ridges and sand beach ridges. There are important breeding areas for waterbirds.

2.15 Dense seagrass areas exist in the Gulf from Aldinga Bay to Yankalilla, some distance off the metropolitan coast and on the eastern side of the upper Gulf. Only sparse seagrass exists on the western side of the upper Gulf. The inner Metropolitan Coast is typified by bare sand.⁶

2.16 A series of low profile platform reefs on the West Coast and lower Gulf and around Port Noarlunga to Aldinga Beach are important nursery areas for a variety of fish and are food sources for other marine life, including rock lobsters and abalone. There is also a number of placed artificial reefs and a series of shipwrecks.

Uses of the Gulf

Shipping and boating

2.17 The Gulf accommodates the Port of Adelaide which comprises an inner and an outer harbour with more than 20 wharves to cater for container ships. There are also three regional ports on the Gulf as well as an additional two situated on the north-eastern side of Kangaroo Island. Along with commercial shipping, the Gulf is used for recreational boating. More than 32 000 recreational boats, not including small motorless boats, use Gulf waters. The infrastructure required to house these craft, including sheltered harbours and jetties, as well as litter, toilets and antifoulant paints, have an impact on the Gulf.

5 Conservation Council of South Australia, Submission No. 47, paragraph 2.1.

6 South Australian Fishing Industry Council Inc, Submission 33, p 7.

Dredging

2.18 Periodic dredging of the Port Adelaide River shipping channel is necessary to maintain the channel. Spoil is dumped in the Gulf. As part of the Coast Protection Board's beach replenishment program, sand is taken from parts of the Gulf and used to replace sand eroded from metropolitan beaches.

Fishing and aquaculture

2.19 Gulf St Vincent supports commercial and recreational fishing. In fact, in some areas, notably metropolitan Adelaide, the recreational share of the total catch is higher than the commercial share, although the recreational catch rate is not monitored to the same extent as is the commercial catch rate. There are 216 species of fish recorded for the Gulf and of these, 14 are important commercial species. The Gulf supports a Western King Prawn fishery, a blue crab fishery as well as various scale fish fisheries and some rock lobster activity.

2.20 Some aquaculture, mainly oyster and abalone, also takes place in the Gulf. The waters on the western side of the Gulf are more conducive to aquaculture than those on the eastern side because the western side has relatively clean waters. The northern areas of the Gulf are considered suitable only for cultivation of some species of algae.⁷ There is also potential for aquaculture in the deeper waters of the Gulf.⁸

Salt Production

2.21 750 000 tonnes of salt is produced at Dry Creek per year and 200 000 tonnes is produced at Price per year.⁹

Tourism and recreation

2.22 Gulf waters are used by a significant proportion of the population for a range of activities such as swimming, boating, yachting, scuba diving, sailboarding windsurfing and relaxing.

Heritage

2.23 Gulf St Vincent has many maritime heritage sites including shipwrecks, jetties, wharves and historic buildings. There are also sites of great Aboriginal significance, including the middens and fish traps of the Narrunga people along the western coast of Gulf St Vincent.

7 *Proof Committee Hansard*, Port Adelaide, 4 February 2000, p 85.

8 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 40.

9 South Australian Fishing Industry Council Inc, Submission 33, p 6.

Barker Inlet/Port Adelaide River¹⁰

2.24 The Barker Inlet and Port River surrounds are part of the metropolitan area of the Gulf. The area forms the largest tidal inlet in Gulf St Vincent and is an important nursery and feeding area for commercial and recreational fish species. Despite being home to a commercial shipping terminal, various industries and two wastewater treatment plant outfalls, the area has been identified as being of the very highest significance in ecological and economic terms to the State.¹¹

2.25 The Barker Inlet shoreline has wide tidal mud flats and an extensive belt of mangroves fringing the samphire salt flats and low-lying dunes of the coastal plain. Torrens Island and Garden Island, split by Angas Inlet, lie within the Barker Inlet. Several creeks feed into the Inlet and extensive salt evaporation ponds occur adjacent to most of the mangrove and samphire areas.¹²

2.26 The Port River is subjected to a range of competing uses. It has provided Adelaide and South Australia with major port facilities since the early days of settlement. The North West region of Adelaide has intensive industrial and commercial land use with an estimated 8000 business premises. This is approximately half of metropolitan Adelaide's industry.¹³ There is a legacy of contaminated land and contaminated groundwater in some areas.

2.27 The Port River and the Barker and Angus Inlets are important feeding and nursery areas for many species of aquatic animals, including migratory birds, dolphins, black swans and many fish species. Industrial uses in the area have included coal handling facilities, the use of water for cooling in electricity generating plants, cement works, a sugar refinery, boat building facilities, major fuel storage depots, a major sewage treatment plant, chemical plants and rubbish dumps.¹⁴

10 The Port Adelaide River is referred to variously as the "Port River", the "Port River Estuary" and the "Port Adelaide River". This report will use the terms interchangeably to refer to the area.

11 Barker Inlet Port Estuary Committee (BIPEC), Submission 32, p 1.

12 A Directory of Important Wetlands - South Australia Chapter at <http://www.erin.gov.au/bg/environm/wetlands/directory/wetdir.htm>, 5. Barker Inlet & St Kilda - EYB002SA.

13 Torrens and Patawalonga Catchment Water Management Boards website at <http://www.cwmb.sa.gov.au/programs/ssrc/portriver.htm>, Street Smart River Clean, Port River and Environs Catchment.

14 Torrens and Patawalonga Catchment Water Management Boards website at <http://www.cwmb.sa.gov.au/programs/ssrc/portriver.htm>, Street Smart River Clean, Port River and Environs Catchment.

Reserves

2.28 In 1971, South Australia was the first Australian state to legislate for marine protected areas. By 1995, however, only 1.5% of the State's waters were listed¹⁵ although the proclamation of the Great Australian Bight Marine Park improved the situation in 1996.

2.29 Primary responsibility for the protection of aquatic habitats lies with the *Fisheries Act 1982* (SA) but marine protected areas may also be declared under the *National Parks and Wildlife Act 1972* (SA) and the *Historic Shipwrecks Act 1981* (SA). Listed marine reserves under the Fisheries Act in Gulf St Vincent are: Aldinga Reef, Barker Inlet, St Kilda, Port Noarlunga-Onkaparinga Estuary, St Kilda-Chapman Creek and Troubridge Hill.

2.30 Conservation Park listings are Port Gawler Marine Park and Troubridge Island Conservation Park. The Clinton Conservation Park is situated at the head of the Gulf and is listed on the Register of the National Estate. It represents the only significant natural mangrove/samphire community left in the region. The northern tip of Torrens Island is also a Conservation Park.

2.31 Gleasons Landing is the only marine sanctuary and is for pilchard protection. Thirteen netting closures exist in the Gulf region. They have not been formally recognised as Marine Protected Areas. They are: Edithburgh, Coobowie, Stansbury, Price, Port Wakefield, Port Adelaide, Outer Harbor and metropolitan beaches, Patawalonga Lake, Onkaparinga River, Parsons Beach, Waitpinga Beach, Hindmarsh and Inman Rivers.¹⁶

15 *Our Sea, Our Future*, Major findings of the State of the Marine Environment Report for Australia, compiled by Leon P Zann, 1995, p 84.

16 South Australian Fishing Industry Council Inc, Submission 33, p 8.

CHAPTER 3

THREATS TO THE ENVIRONMENT OF GULF ST VINCENT

3.1 The Conservation Council of South Australia identified 4 major ongoing impacts on the ecological sustainability of Gulf St Vincent.¹ These are:

- pollution;
- direct habitat damage and destruction;
- overharvesting of living marine organisms; and
- introduced marine pests.

3.2 Evidence was provided to the Committee of likely future impacts on the Gulf, including the remobilisation of existing pollutants, the management of fisheries, the effects of contentious developments and the scenario for regional areas around the Gulf.

Pollution

3.3 One of the highest-priority marine pollution issues in Gulf St Vincent is the discharge of excess nutrients into the marine environment from littering, sewage outfalls, stormwater and agricultural runoff

Sewage outfalls

3.4 Metropolitan Adelaide has 4 major sewage treatment works (Bolivar, Port Adelaide, Christies Beach and Glenelg) which provide secondary treatment and discharge 80 000 megalitres of wastewater per year to the sea. This wastewater contains, on average, 2 736 tonnes of nitrogen and 495 tonnes of phosphorus. There are other wastewater treatment plants such as Heathfield, but the volumes of wastewater discharged from these is a fraction of that discharged from the major plants (although the effects on the environment differ only in scale).

3.5 Until 1993 sewage sludge was also discharged to the sea from the Glenelg and Port Adelaide plants. It is now disposed of on land because of the severe effect it was having on the seagrasses. The sludge issue provides a good example of how the harmful practices of the past can be reconsidered and can provide positive effects. In the past, the dumping of sewage sludge devastated large tracts of seagrass. Now at Bolivar where sludge is processed, digester gas is produced from the raw sludge and

1 Conservation Council of South Australia, Submission 47.

provides 60% of the power requirements for the entire Bolivar site. The dried sludge is stockpiled on site and can be reused for agriculture.²

3.6 Sewage effluent contains high levels of nutrients - primarily nitrogen and phosphorous. South Australian waters are naturally low in nutrients and so the introduction of the effluent has a large impact on ecosystems.

Seagrass

3.7 Seagrass meadows are of fundamental importance to the Gulf ecosystems. They bind the sediments and provide nurseries and safe habitat for marine organisms. The State of the Environment Report for South Australia 1998 estimates that over 5000 hectares of seagrass have been lost since 1935 in the Adelaide metropolitan area. There is evidence, from a site survey in February 1998, of regrowth and recolonisation of seagrass in previously denuded areas near Glenelg. This regrowth is attributed to the closure of the Semaphore sludge outfall in 1993.³ In general, however, seagrass beds do not readily regenerate.

3.8 The overall loss of seagrasses is not centred around any single land-based discharge point except in the case of the Glenelg and Port Adelaide sludge outfalls. Possible factors causing this loss include algal epiphytism due to nutrient enrichment; toxic components of, and suspended solids in, land-based discharges; coastal processes such as sand erosion or deposition; and spoil dumping offshore of Outer Harbor and Barker Inlet.⁴

3.9 It is well known that sewage effluent has a detrimental effect on seagrass beds. According to the South Australian Environment Protection Agency the process is poorly understood but turbidity, nutrients and epiphytes, and sediment loss all play a role.

Turbidity⁵

3.10 Sewage discharges, stormwater, dredging, land reclamation works and changes in land use can cloud the water, allowing less light to reach seagrasses and decreasing photosynthesis. This increases the stress on the plants.

2 United Water, General Information, Treatment Process, Bolivar Wastewater Treatment Plant, http://www.uwi.com.au/general/bolivar_wwtp.html

3 State of the Environment Report for South Australia 1998, pp 148-149.

4 City of Salisbury, Submission 12, Attachment, Seagrasses, Mangroves and Samphires of the Barker Inlet Region, Dr David Blackburn.

5 *Changes in Seagrass Coverage*, Environment Protection Agency, Government of South Australia, September 1998, pp 2-3.

Nutrients and epiphytes

3.11 Nutrients discharged into the marine environment can increase algal growth. Algae can be free floating - and add to water turbidity - or can grow as epiphytes - which attach to leaves and stems. Epiphytic algae can reduce the diffusion of gasses and nutrients to seagrass leaves, shade leaves and thereby reduce photosynthetic activity, and can increase the weight on the seagrass leaves. This additional weight can cause seagrass leaves to break from the stem. Depending on the species, this can lead to irreversible damage or, if the species can regrow, valuable reserves of energy may be used up in the process.

Sediment loss

3.12 Loss of seagrass creates a cycle of further seagrass loss. As sediments become dislodged and resuspended, light penetration in other seagrass areas is further reduced. Once sand erosion begins seagrass is rapidly lost. Severe erosion can result in healthy plants being dislodged and washed ashore. Some of the sand erosion problems associated with metropolitan Adelaide beaches, are due to seagrass losses and the reduced ability of the meadows to bind sediment together. According to the Environment Protection Agency, there has been a total decline opposite Glenelg where the seagrasses have disappeared - the sediment has disappeared and only the underlying rock remains.⁶

3.13 Gulf St Vincent supports both commercial and recreational fisheries. Seagrass loss has a negative impact on these. Mr Jeff Wait from the South Australian Fishing Industry Council told the Committee:

Where I have concerns is the seagrass degradation which has caused the erosion of the soil, or should we say the mud or the sand or whatever it is – the shale that is in the Gulf. It is causing a northward movement. I see areas out there now that are basically deserts. I have been fishing there for 40 years and where I used to walk around on nice seagrass meadows it is now barren sand. Three years ago there was an area where I could not work my nets because of razor fish. There is nothing there now. It is barren. It is like Semaphore Beach; it has just gone. ...

My fishery, the marine scale fishery, is an inshore shallow water fishery. Those fish have to have habitat. It is a shallow water fishery; they need the habitat. Eventually when the habitat is all gone, the fishery is all gone. In terms of sustainability maybe the fish might still be sustainable – I do not know – but I would be very concerned now. I have vented feelings about my concerns many times over a period of 25 to 30 years now to government institutions.⁷

6 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 9.

7 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 39.

Stormwater runoff

3.14 Stormwater is the water that flows into drains and waterways during and after rainfall in urban areas. Stormwater pollution comes from both point and non-point sources. Point sources are those where water is discharged from a single location such as a factory, although the Environment Protection Agency in South Australia does not legally permit any discharge into the stormwater system.

3.15 Non-point, or diffuse sources of stormwater, are those where the polluted water is generated across a large area and flows into an outlet from multiple points. Many of Adelaide's creeks have been lined with concrete and diverted to act as conduits for stormwater to move more quickly to the sea and to reduce flooding. There are also numerous stormwater outlets of varying sizes which direct urban runoff untreated to the sea.

3.16 Pollutants in urban stormwater include sediments, nutrients, oxygen-demanding materials, metals, toxic organic wastes, pathogenic micro-organisms, hydrocarbons and litter.⁸

3.17 The Committee received evidence that indicated that stormwater and probably turbidity may have contributed to seagrass loss.⁹ Stormwater discharges are associated with high turbidity, as well as nutrients and other toxicants from the urban catchment. Such discharges have been reported to contribute to a dirty plume of water that persists along the coastline for several weeks following heavy rainfall events. Large discharges of stormwater are generally associated with the cooler months of the year.¹⁰

3.18 According to the South Australian Environment Protection Agency:

[The process of seagrass loss] seems to be an interactive system between nitrogen causing epiphytism, the stormwater effects which possibly are causing light reduction at critical times of the year which affects recruitment of these seagrass seedlings and, thirdly, an erosion effect caused by wave action, which is a natural effect, but the interaction of that natural effect with these other two effects is causing decline. We do not fully understand it. Until we do it is hard to know what action we can take, if any.¹¹

8 Cooperative Research Centre for Catchment Hydrology, *Urban Stormwater Pollution*, Industry Report, July 1997, pp 3-5.

9 Government of South Australia, Submission 45, pp 7 & 8.

10 Government of South Australia, Submission 45, p 8.

11 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 9.

Litter

3.19 Litter enters the Gulf through stormwater as well as from boats and ships. Plastics, rope, netting and fishing gear entangles seabirds, seals and dolphins and can be ingested by them.

Industrial pollution

Thermal pollution

3.20 Water is taken from the Port River and used for cooling in the Torrens Island Power Station. It is then discharged as heated effluent into the Angas Inlet. According to the Conservation Council of South Australia, approximately 3.9 million cubic metres of heated effluent is discharged per day and has changed the fish composition at Barker Inlet.¹²

Oil pollution

3.21 Mobil Australia operates the Port Stanvac Refinery which supplies much of South Australia's petrol and diesel needs. On 28 June 1999 there was a 270 000-litre oil spill which caused an oil slick of up to 3 km long, with some oil washing ashore at Silver Sands. On 24 September 1996 there was a 10 000-litre oil spill. Oil entered the Port Noarlunga aquatic reserve.

3.22 According to the Conservation Council of South Australia, there are on average 3 spills annually in the order of 1000 litres of oil.

The long-term, chronic effects of the frequent minor spills at the oil-handling facilities at Port Stanvac on the surrounding environment and nearby reef systems are unknown. The amount of oil entering the marine environment from unmonitored sources may also be significant.¹³

3.23 Monitoring by the South Australian Research and Development Institute (SARDI) of the effects of oil spills in 1991 and 1992 in the Port River and upper Spencer Gulf indicates that 23 hectares of mangroves were killed or totally defoliated in the heavily affected areas and show no signs of recovery.¹⁴

3.24 Gulf St Vincent is part of a geological formation known as the Gawler Craton. This area has attracted some interest for mineral and petroleum exploration. Two

12 Conservation Council of South Australia, Submission 47, paragraph 3.1.3.

13 Conservation Council of South Australia, Submission 47, paragraph 3.1.1.

14 State of the Environment Report for South Australia, 1998, p 151.

exploration wells have been drilled but since no petroleum has been detected, there has been no mining in the Gulf area.¹⁵

Heavy metals and organochlorines

3.25 According to the Conservation Council of South Australia, fish, squid and crustaceans show elevated levels of lead, copper and zinc in the Port River region while pesticide and organochlorine residues exceed national health standards for Blue Crabs and snook, and are elevated in dolphins. There are ecologically-significant levels of heavy metal contamination in sediments and biota, particularly in the upper part of the Gulf and the Port River area.¹⁶

3.26 In September 1999 test results showed that a dolphin found shot dead the previous year, recorded elevated levels of mercury. Dr Mike Bossley from the Australian Dolphin Foundation stated that the levels, 40 times higher than any other bottlenose dolphin tested in Australia, were the highest recorded in the world. The South Australian Environment Protection Agency, whilst acknowledging that any level in a dolphin is not a good level, did not agree that the levels were the highest in the world nor that South Australia has a unique problem as regards the accumulation of toxins in the food chain.¹⁷

Barker Inlet and Port River Estuary

3.27 Barker Inlet is a natural sink because of its low topography, very sheltered waters and its orientation which respects the prevailing winds. The Committee was told "... pretty well everything that floats past in the Gulf finishes up there, including old thongs, plastic bags and anything else that the boaties drop overboard".¹⁸ As a consequence of its sink status, it is facing serious deterioration in its ecosystems. The Chair of the Barker Inlet Port Estuary Committee, Mrs Pat Harbison, believes that this is of concern not just in relation to the immediate area but to Gulf St Vincent as a whole:

... I think that Barker Inlet is simply a microcosm of the northern half of Gulf St Vincent. Because it is so small and because the impacts have been more intense, it has been affected in a shorter period of time but I am quite sure that it is simply an early warning system of what will happen to the Gulf.¹⁹

15 Government of South Australia, Submission 45, p 24.

16 Conservation Council of South Australia, Submission 47, paragraph 3.1.3.

17 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 15.

18 *Proof Committee Hansard*, Port Adelaide, 4 February 2000, p 82.

19 *Proof Committee Hansard*, Port Adelaide, 4 February 2000, p 81.

3.28 There are four catchments which drain into the Port River and environs. Along with stormwater runoff, sewage effluent and the effects of development, the Port River Estuary has been subjected to pollutants from paint factories, chemical dumping, landfill sites, asbestos factories, sugar refineries, ship oil, thermal effluent, mercury, soda ash, chlorine, polychlorinated biphenyls (PCBs) and assorted heavy metals.²⁰ As a result, sediments at the margins of the estuary are polluted with metals and nutrient enriched waters support blooms of nuisance algae, and at times, toxic dinoflagellates.²¹

3.29 Much of the industry in the Port Adelaide area is not connected to the sewage system but uses septic systems. These are prone to overflow into the surrounding waterways. They can also have an impact on the groundwater, which is close to the surface in this area. There are thousands of industries in the Port River area. It is a very industrialised area. The Environment Protection Agency is currently investigating some of the industries for polluting practices and believes that some of its findings give cause for concern.²²

3.30 According to Mrs Harbison, the high content of nutrients released into the Barker Inlet from the Bolivar Waste Water Treatment Plant has promoted the growth of macroalgae such as cabbage weed or sea lettuce. It grows in vast quantities off the shore at St Kilda and is washed onto the mangroves and onshore where it piles up and rots. It contributes to very high levels of organic matter in sediments and the sediments in Barker Inlet have an organic content of around 90 per cent.²³

This very high organic content in turn results in generation of hydrogen sulphide by bacteria in the anaerobic muds and it leads to depletion of oxygen in the shallow waters of the Inlet during the night particularly. I have stood in the shallows in Barker Inlet all night measuring dissolved oxygen and when the dissolved oxygen concentration reaches its lowest level, which is usually just before dawn, you actually see by torchlight the large shoals of juvenile fish about this long drop their tails, put their mouths to the surface and start swimming around in a vertical position, gasping. Then they die and you are surrounded, for a short period, by dead juvenile fish in those shallow waters. Then, as soon as it is light, the seagulls come in and the evidence disappears. This is due to the high organic content of those sediments which is in turn due to the fertiliser that is poured into the Gulf, enhancing the growth of algae which then wash into the Inlet.²⁴

3.31 Mrs Harbison fears that in 50 years' time northern Gulf St Vincent, because it is an inverse estuary and acts as a trap for everything which goes into the Gulf, will be

20 Community Action for Pelican Point, Submission 21, p 1.

21 Barker Inlet Port Estuary Committee (BIPEC), Submission 32, p 4.

22 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 7.

23 *Proof Committee Hansard*, Port Adelaide, 4 February 2000, p 82.

24 *Proof Committee Hansard*, Port Adelaide, 4 February 2000, p 82.

like Barker Inlet is now - a eutrophic environment with very severe oxygen depletion at night.²⁵

3.32 The Port River is a major urban waterway that has suffered from inappropriate practices which have had a variety of impacts on the local environment. Of particular significance are the effects of nutrient rich discharges - sewage effluent and stormwater runoff. Red tides by the toxic dinoflagellate *Alexandrium minutum* were first recognised in the Port River area in October 1986. This species now produces annually recurrent red water blooms in the period September-November.

3.33 Wild mussels from the Port River area can be highly toxic to humans, but no commercial shellfish farms are located in the affected area. Plankton and cyst surveys in the Port River in 1983 failed to detect *A. minutum* in an area which now has recurrent blooms. This result has led to speculation that *A. minutum* could be an introduced species, and genetic studies using ribosomal DNA sequencing have confirmed a close affinity between Australian and Spanish isolates of this species complex.²⁶

3.34 The Barker Inlet and Port River area has a substantial population of resident dolphins. This alone appears to make the area internationally unique in maintaining dolphins so close to a city of a million people. The continued presence of the dolphins in these waters is uncertain however, and will almost certainly depend on the extent to which pollution is controlled in this environment.²⁷

Other

3.35 Algal blooms have been reported around Gulf St Vincent though they have been infrequent and at irregular intervals. Areas affected have included new oyster farming areas on the western shore of the Gulf and the eastern shore, north of the Adelaide metropolitan area.²⁸

Garden Island Landfill

3.36 Elevated levels of nutrients, particularly ammonia and oxidized nitrogen, are characteristic of the Port River Estuary. Interstitial waters in Angas Inlet have high concentrations of ammonia close to the margin of the landfill. The concentrations of ammonia found in clean, sandy sediments on the south eastern side of the landfill are

25 *Proof Committee Hansard*, Port Adelaide, 4 February 2000, p 82.

26 *Marine phytoplankton communities in the Australian region: current status and the future threats*, State of the Marine Environment Report for Australia, Technical Annex: 1, Gustaaf M. Hallegraeff, http://www.environment.gov.au/marine/publications/somer/somer_annex1/som_ann8.html

27 The Australian Dolphin Research Foundation, Submission 27.

28 Government of South Australia, Submission No. 45, p 11.

difficult to explain except by movement of groundwater from a source of ammonia, such as the landfill on Garden Island.²⁹

Antifoulants

3.37 Antifoulants are paints used to prevent marine organisms from attaching themselves to surfaces, such as boats and aquaculture farming equipment. They contain various compounds, many of which are highly toxic. These compounds, for example metals and organotin chemicals, leach slowly from the paint and bioaccumulate in organisms. This adversely affects the growth, reproduction and population numbers of marine organisms.

3.38 Tributyl tin (TBT) is a highly toxic chemical used in antifoulants. It accumulates in the food chain and contamination may be a health hazard for humans. It can concentrate in molluscs up to 250 000 times higher than surrounding sediment or seawater and can force a sex change (imposex) and infertility in female snails.³⁰ 100% of populations of the gastropod *Lepsiella venosa* show severe reproductive abnormalities (ie neogastropod imposex) in the Port River.³¹

3.39 In South Australia all vessels are allowed to use TBT containing paints. However, commercial boatyards and slips are licensed with the condition that they do not allow application of antifouling paints containing TBT with a release greater than 5 micrograms per centimetre per square per day.³² The Committee notes that many countries have prohibited the use of TBT on small craft since the early 1990s. In the Committee's view such a prohibition is necessary in South Australia.

Recommendation 1

The Committee recommends that the South Australian Government prohibit the use of Tributyl tin (TBT) on small craft.

Sedimentation

3.40 Sedimentation is an ongoing problem in Gulf St Vincent. It is due to particulates from stormwater, river catchment outflows and other land-based discharges associated with coastal development and soil mobilisation. The impacts of

29 *An investigation of the marine surface and interstitial waters around Garden Island to determine the impact of landfill activities on water quality*, Results of analysis and outcomes of investigation, pH environment for Rodenbury Davey and Associates Pty Ltd, September 1999, p 16.

30 *Minimising the Effects of Antifouling Paints such as TBT, The ANZECC Code of Practice*, Brochure, Environment Protection Agency, Government of South Australia.

31 Conservation Council of South Australia, Submission 47, paragraph 3.1.4.

32 *Minimising the Effects of Antifouling Paints such as TBT, The ANZECC Code of Practice*, Brochure, Environment Protection Agency, Government of South Australia.

sedimentation include decreased water quality, smothering of benthic organisms and potential degradation of macroalgal reefs. The Conservation Council of South Australia, in its submission, refers to evidence which suggests that turbidity has caused changes to the species composition of near-shore reefs in the metropolitan area.³³

3.41 A study of Adelaide's coastal reefs has shown that some have suffered severe degradation over the past three years. An indicator of reef health is its brown algae coverage. Noarlunga Reef and Horseshoe Reef have suffered degradation and Semaphore Reef and Broken Bottom Reef off Glenelg are under stress. The degradation is attributed to increasing urbanisation in the southern suburbs and the accompanying impact of stormwater runoff and effluent disposal.³⁴

3.42 Specifically, Reef Watch workers have noted problems with sedimentation and reef smothering in the mid-coast area, probably due to dredging at Port Stanvac. Also, benthic smothering occurred on Marino Rocks reef as a result of a housing development of vacant land where there was runoff following rain. The Conservation Council of South Australia suggests that this type of impact is probably a regular occurrence in parts of the Gulf but it goes largely unnoticed and unattended by regulatory authorities.³⁵

Habitat Damage and Destruction

3.43 Aside from the loss of seagrass beds, mangrove forests and reef habitats from eutrophication and sedimentation, there are other causes of habitat damage. Urban development of the foreshore has had a significant effect on coastal processes. The southern section of the coastline, from Marino to Outer Harbor was originally backed by sand dunes, punctuated only by the outlet of Sturt Creek.

3.44 Since the 1930s increased urbanisation has significantly altered coastal dynamics. Large proportions of sand dunes have been built on and breakwaters have been constructed. The River Torrens has been diverted to an artificial outlet at West Beach and numerous stormwater drains have been constructed which discharge directly to the sea. These changes have combined to alter the dynamics of the near-shore coastal environment, reducing its capacity to absorb wave energy and increasing erosion and sediment movement. As the Government of South Australia recognised in its submission, these processes determine the capacity of seagrass communities to colonise and persist.³⁶

33 Conservation Council of South Australia, Submission 47, paragraph 3.1.6.

34 Offshore reef's health plunges, *Adelaide Advertiser*, 25 January 2000.

35 Conservation Council of South Australia, Submission 47, paragraph 3.1.6.

36 Government of South Australia, Submission 45, p. 6.

3.45 Mangroves in the Barker Inlet region have been extensively cleared by port developments with the main areas being cleared after about 1962 in the Gillman to Wingfield regions. Samphire areas have declined due to the construction of the Penrice salt fields (particularly after 1950). A study of the Bolivar area reveals that samphire communities have declined from about 200 hectares in 1949 to about 70 hectares in 1997 due to their replacement by mangroves and the prevention of further landward colonisation by Penrice seawalls.³⁷

3.46 The Conservation Council of South Australia asserts that there have been several major developments, including marina and harbour constructions, which have not had environmental impact assessments. The Conservation Council provides the example of Marina St Vincent which caused the loss of a major squid breeding ground. Ongoing coastal development, including large scale foreshore condominium and boat harbour developments, are causing environmental damage through sand dune loss and dredging activities.

3.47 The West Lakes development is a waterfront residential development constructed on former reedbeds behind the coastal dunes. In the past the reedbeds filtered run-off prior to it reaching the Gulf. Now, after heavy rains, the water in West Lakes is unfit for swimming for several days and shellfish are contaminated with metals.

3.48 Construction of causeways associated with electricity transmission lines and embankments has caused disruptions to tidal movements and has led to mangrove dieback.

3.49 Since 1954, 25% of the original mangrove forests, 80% of saltmarshes and samphire, and 100% of the saltwater tea tree community have been lost from the Barker Inlet and Port Estuary area. According to the Environment Protection Agency:

The primary impacts on mangrove communities have been through land reclamation, land being cut off so that you do not get tidal drainage and simply land clearance. Most of that occurred prior to 1960 – 1950, possibly – and I could not tell you overall what percentage loss of mangroves there has been in Adelaide.³⁸

Mangroves

3.50 Mangroves have both conservation and economic value. They are generally highly productive and provide important habitats for both bait-fish and table fish.

3.51 Mangrove forests in South Australia are composed solely of one species, the grey mangrove (*Avicennia marina* var. *resinifera*). South Australia has the only case

37 City of Salisbury, Submission 12, Attachment, Seagrasses, Mangroves and Samphires of the Barker Inlet Region, Dr David Blackburn.

38 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 8.

of sewage-induced mangrove loss in Australia.³⁹ There has been significant mangrove dieback in the shallow tidal flats between St Kilda and Port Gawler adjacent to the Bolivar sewage outfall. Approximately 250 hectares of mangroves have been lost since 1956 and a much larger area is in poor health in the region immediately adjacent to the outfall.

3.52 Research indicates that increased nutrient levels have affected the mangroves. Large drifts of sea cabbage (*Ulva*), promoted by excess nutrients, prevent or retard the establishment and growth of young mangrove seedlings and choke established trees by smothering and eventually killing their aerial roots.⁴⁰ According to the Environment Protection Agency, however, there has not been the same level of decline attributable to pollution in mangroves as there has been in seagrasses.⁴¹

3.53 There are some signs that seagrass decline can contribute to mangrove decline:

... once the seagrass goes it destabilises the sediment and under storm conditions you get movement of sediment inshore which could suffocate the pneumatophores.⁴²

3.54 The loss of habitat is the most significant threat to biodiversity world-wide. Because of the inter-relationships of species in an ecosystem, habitat destruction can have surprising effects. One example is the generally unexplained exponential growth in the last 5 years of the mosquito population in the Barker Inlet Area. The Mayor of the City of Salisbury, Mr Zappia, told the Committee that this was due to the loss of mangroves and the subsequent deterioration of the breeding grounds for fish and other wildlife. The mosquito larvae are the basic unit of the food chain that exists in a mangrove ecosystem. A reduction in the number of fish in the area directly results in a proliferation of mosquitoes.⁴³

3.55 Research undertaken by the Mosquito Control Research Unit at the University of Adelaide established that 95 per cent of the mosquitoes that are breeding are saltwater mosquitoes. This means that they must be breeding along the coastline where the salt water is⁴⁴ and not in the freshwater wetlands which some believed were the source of the mosquito explosion.

3.56 Not only is there mangrove loss along the coastline, but the mangroves are growing further inland. The landward accretion is probably related to local subsidence which results in a reduction of the slope of the intertidal areas, allowing the widths of

39 Conservation Council of South Australia, Submission 47, para 3.1.2 (b).

40 State of the Environment Report for South Australia 1998, p 151.

41 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 8.

42 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 9.

43 *Proof Committee Hansard*, Port Adelaide, 4 February 2000, p 73.

44 *Proof Committee Hansard*, Port Adelaide, 4 February 2000, pp 76-77.

mangrove zones to increase.⁴⁵ The city of Adelaide is sinking, partly because of the pumping of water.⁴⁶ There needs to be land available for mangroves to move inland - especially with the prospect of sea level rise and subsidence of the Peninsula. The old Multi-Function Polis Corporation, in a far-sighted move, set aside land as mangrove retreat areas. The Committee was alarmed to hear one witness suggest that there will be a lot of pressure on those areas to be developed.⁴⁷ The Conservation Council of South Australia asserts that in the north of the Gulf industrial development is restricting the “landward march” of mangroves.

3.57 Mangroves are under threat from small scale coastal urban developments including boat ramps, marinas and land reclamation. Saltmarsh too is being degraded and removed due to agricultural, industrial and urban use and developments.

Beach erosion

3.58 The Committee heard that there is a perennial problem with beach erosion on metropolitan beaches. On the eastern side of the Gulf sand moves in a northerly direction. Sand needs to be carted from the north of the Gulf to replenish the southerly beaches. It has reached the stage however, where the replenishing sand is now too fine and an alternative supply is required.

3.59 The Environment Protection Agency informed the Committee that:

The beaches are only there because they are managed by the Coast Protection Board. If they did not manage them there would not be beaches. A lot of people do not understand that. It is an artificial, managed system. The seagrass decline will make it harder and harder to manage those beaches, for a variety of complex hydrodynamic reasons.⁴⁸

3.60 In 1997 the Coast Protection Board took 600 000 cubic metres of sand from the sea floor and dumped it at Brighton Beach at a cost of \$2.9 million. This sand would last approximately 6 years before requiring replenishment. Several submissions discussed the cost of beach replenishment programs:

The transport of sand places a huge economic strain on this State. Research should be urgently undertaken to examine the economic viability of this practice.⁴⁹

45 City of Salisbury, Submission 12, Attachment, Seagrasses, Mangroves and Samphires of the Barker Inlet Region, Dr David Blackburn.

46 Australia’s response to Global Warming Inquiry, Environment, Communications, Information Technology and the Arts References Committee, *Proof Committee Hansard*, Melbourne, 20 March 2000, p 118.

47 *Proof Committee Hansard*, Port Adelaide, 4 February 2000, p 92.

48 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 9.

49 Henley and Grange Residents Association Inc, Submission 39, p 4.

Sand carting is a costly option that treats the effects without really coming to grips with the causes.⁵⁰

3.61 An average of \$1.4 million is spent each year on minor sand replenishment programs such as trucking small quantities of sand from Semaphore to eroded beaches. Adelaide's worst eroded beaches include Tennyson, Semaphore Park, Somerton and Henley Beach, while a build-up of sand has to be removed each year at Glenelg, West Beach and areas north of Semaphore and the southern side of the Torrens outlet.⁵¹

3.62 Adelaide's main source of sand to replenish eroding beaches has been exhausted. Between 1989 and 1997 sand was taken from the seabed off Port Stanvac to replenish metropolitan beaches. Mr Rob Tucker from the Coast Protection Board is reported as saying that dredging from this area cannot continue without damaging the ecosystem.⁵²

3.63 The City of Onkaparinga is concerned about sand dredging off its coast. The Council is strongly opposed to investigations by the Coast Protection Board into possible sand sources off Moana, and any potential sand dredging activities in the area. Whilst the recent impacts of sand dredging are still being evaluated, some of the concerns raised by the Council include: the prevention of further damage to the reef and its inhabitants; a questioning of the expert opinion which assured the Council that there was no environmental risk in dredging the beaches; and action to be taken by the State Government to fix the problems.⁵³

3.64 Increased erosion of the beach face occurs partly because the buffering capacity of seagrass meadows has been reduced. Seagrass decline has altered the flux of sediment transported along the coast. Sand movement is modified by offshore seagrasses filtering water currents in the wave zone and onshore seagrass binding sediments and inhibiting the action of wind. Increased erosion now occurs along the metropolitan beaches because natural replenishment processes have been modified by urban development.⁵⁴

3.65 Another possible cause of increased beach erosion is increased stormwater flows piped to form point source discharges along the coast. Some of the smaller discharges deliver large volumes of stormwater during flood flows directly at the back of the living dune system. It was thought that these discharge points would be soakage areas where water could seep through relatively porous sand and recharge local aquifers. This does not occur during high storm flows however, where extensive

50 Henley & Grange Dunecare, Submission 22, p 1.

51 City beach sand stocks drying up, *The Advertiser* (Adelaide), 13 September 1999, pp 4-5.

52 City beach sand stocks drying up, *The Advertiser* (Adelaide), 13 September 1999, p 4.

53 City of Onkaparinga, Submission 36.

54 Henley & Grange Dunecare, Submission 22, p 1.

undermining of the dunes takes place, creating mass movement of sand along the coast.

3.66 The Committee heard of the demise of a dune revegetation project due to stormwater runoff:

There are parts of the dune that we cannot work on because we know that it will be washed away the next year or next storm ... A [dune rehabilitation] group had just started up and it was their first planting and we planted two, three, four hundred seedlings ... Several weeks later we came back to check on their progress and there was nothing there. You know the normal, everyday concrete-lidded street drain. It was only about three metres away from the front of the dune and it drained off about a hundred-metre section of the esplanade in that vicinity, so not a very big catchment at all, and it wiped out three or four metres of dune.⁵⁵

3.67 Witnesses voiced their concerns at the effects of dredging for sand replenishment programs and the use of rock groynes:

What we have is continuous dredging taking place in the Holdfast Shores development, at the mouth of the Patawalonga and at the West Beach boat harbour. This dredging has disastrous effects on our marine waters and coastline ... We are seriously concerned that a system of further groynes will be constructed along the coastline. This will create pocket beaching, a system where sand is collected and held between the groynes, making steep beaches and interrupting the natural flow of sand.⁵⁶

3.68 Mr Jack Moller, a former lecturer at the South Australian Institute of Technology, attributed the continuing erosion of the coastal sand dunes to fluctuations in the pressure and flow of groundwater. Interference with the flow causes an incursion of sea water which introduces pockets of salt and brackish water to the dunes resulting in a loss of vegetation. Without the vegetation to stabilise the dunes they disperse.

3.69 In the past, rain and surface runoff contributed to the groundwater of the coastal dunes. Dunes presented a barrier to surface outflow of permanent groundwater from natural aquifers at various depths. This process enabled the dunes to support extensive coastal vegetation as part of a natural cycle of regeneration. Springs, which were visible at low tide, carried surplus water to the sea.

3.70 In recent times these sources of fresh water deposits in the coastal and dune areas have been severely limited by diversion of stormwater directly to the sea from

55 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 59.

56 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 55.

widespread roadworks, housing construction, and general urban development, and also by pumping from bores for domestic and other purposes.⁵⁷

3.71 Mr Moller had several recommendations aimed at addressing these issues:

- a research program to determine the extent to which seawater has encroached on the fresh groundwater outflow of the Adelaide Plains through the estuarine plains to the coastal dunes;
- a complete embargo on pumping from wells or bores on coastal dunes and adjacent regions;
- strict controls on pumping of groundwater from endangered aquifers at all levels;
- containment of stormwater and surplus rainwater from houses, roads and paved areas by undergrounding on site; and
- replication and extension of existing programs for vegetation regrowth on the coastal dunes and sand conservation.⁵⁸

3.72 Henley & Grange Dunecare echoed some of these recommendations in its submission:

Refined techniques for engineering soakage pits and aquifer recharge are being developed elsewhere but this situation should be of immediate concern along the Adelaide Metropolitan coast.⁵⁹

3.73 According to the State of the Environment Report for South Australia, groundwater use in the Northern Adelaide Plains, Barossa Valley, Southern Vales and Angas-Bremer areas is either at or above resource capacity. In 1995 water use in the Northern Adelaide Plains was more than twice the estimated sustainable resource capacity. Groundwater quality is declining in some parts of the South East.⁶⁰ Adelaide itself is sinking partly because of the pumping of water. This is a matter of grave concern to the Committee and in our view a precautionary approach should be adopted. Accordingly,

57 Mr JM Moller, Submission 14, p 1.

58 Mr JM Moller, Submission 14a, p 7.

59 Henley & Grange Dunecare, Submission 22, p 1.

60 State of the Environment Report for South Australia 1998, Summary Report,

<http://www.dehaaa.sa.gov.au/ser/index.html>

Recommendation 2

The Committee recommends an embargo on pumping from wells or bores on coastal dunes and adjacent regions until an investigation into the groundwater reservoirs has been undertaken.

Prawn Trawling

3.74 Gulf St Vincent supports a Western King Prawn fishery which is worth approximately \$10M to the State. The vessels work grounds greater than 10 metres deep in Gulf St Vincent and Investigator Strait. The majority of the fishing effort is concentrated in a small number of productive areas in the Gulf. Approximately 10 to 15 per cent of the Gulf is accessible to the trawlers.

3.75 The main prawn nursery areas are in the shallow waters at the northern end of the Gulf. The largest concentrations of juveniles generally occur on the eastern side of the Gulf from Barker Inlet north to Port Wakefield, and around to Price and Ardrossan on the western side. Juveniles are also found in a number of areas north of Black Point, through to Port Vincent, Stansbury and Edithburgh. There are also several nursery areas in the bays on the northern side of Kangaroo Island, such as Eastern and Western Cove.⁶¹

3.76 Prawn trawling can have a marked effect on the benthic environment as trawls are dragged across the sea bed. Although no objective studies of trawling have been completed in South Australia, the Conservation Council of South Australia cited increasing evidence from other temperate ecosystems that benthic trawling can have significant negative impacts on habitat quality and benthic biodiversity. Sites which are undisturbed by trawling have higher biomass, species abundance, and species diversity than disturbed sites.

3.77 The Committee also heard that prawn trawling is like a kind of agriculture. It smooths out the sea bed and facilitates the growth of the target species. According to Mr Martin Smallridge from the Prawn Industry South Australia "... once you do start working in an area ... that area becomes more productive and that is why the fleet has remained in a relatively small area of the Gulf. Those areas are now productive on an ongoing basis."⁶²

Overharvesting of Living Marine Organisms

3.78 The State of the Environment Reports have recognised that most fisheries are operating at or above resource capacity. The status of knowledge for management is

61 South Australian Government, Submission 45, p 9.

62 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 42.

considered adequate for only 5 of 27 fisheries in South Australia. Ongoing expansion of recreational fishing is placing additional pressure on fish stocks.

3.79 There has been increasing recreational fishing effort, both in the number of fishers and in their efficiency and increased access to fisheries through technological advances. Collection of molluscs and worms for bait is extensive but unquantified.

3.80 Other commercial impacts on marine resources include the aquarium industry that targets a number of species including the protected leafy seadragon.

3.81 The selective extraction of species, whether targeted or as bycatch, can put selective pressure on fish populations to alter their genetic composition. This can be seen in the reduced size of maturity of King George Whiting as well as a lower annual growth rate of abalone populations.

3.82 A decline in the abundance of a species may reduce it to a non-viable population and can make it more vulnerable to environmental changes, particularly for sedentary or long living fish. Although a series of management and monitoring programs has been introduced to ensure sustainable use of the resource, catch figures suggest that most marine fisheries continue to operate at capacity.⁶³

3.83 By-catch is an issue in prawn trawling with some fisheries having a ratio of non-target discards to prawns as high as 8:1 by weight.⁶⁴ Mr Smallridge informed the Committee that the by-catch in the Gulf St Vincent prawn fishery is c 1:1 which is low by world standards. He attributed this to the lower diversity of species in temperate as opposed to tropical regions.⁶⁵

3.84 Despite the State of the Environment Report asserting that the exploitation rate for the Gulf St Vincent prawn fishery is currently higher than the target reference point proposed in the draft management plan, Mr Smallridge assured the Committee that the fishery was sustainable. Given the importance to South Australia, of the prawn fishing industry, the Committee believes that an independent assessment of the effects and future potential of prawn fishing should be carried out.

Recommendation 3

The Committee recommends that an independent assessment of the effects and future potential of prawn fishing in the Gulf St Vincent area should be carried out.

63 State of the Environment Report for South Australia 1998,

<http://www.dehaa.sa.gov.au/ser/estuaries.html>.

64 State of the Environment 1996, p 8-14.

65 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 41.

3.85 The selective harvesting of one or more components of a marine community also affects an animal's predators, competitors and prey, thus disrupting the food chain. Ecosystems can become unbalanced as a result. At present stock assessments to evaluate whether a fishery is sustainable are only done on the target species. This is not enough to fulfil ecologically sustainable development requirements. To fulfill these it is necessary to monitor the health of the environment as well.⁶⁶

3.86 Although the State of the Environment Report says that most marine fisheries continue to operate at capacity, stock assessment reports from SARDI indicate that most species harvested within the Gulf in a commercial sense are sustainably harvested. SARDI only recommends reducing the take of mud cockle adjacent to Outer Harbor.⁶⁷ Mr Jeff Wait from the South Australian Fishing Industry Council made the point, however, that it is not only fishing mortality from commercial fishing operations which needs to be considered. To ensure sustainability of the fishery, the entire ecosystem, including further inroads into the habitat of that ecosystem, needs to be taken into account.⁶⁸

3.87 Mr Wait believes that the major threat to sustainability of fisheries in the Gulf is sewage effluent. It has caused the loss of seagrass, the loss of mangroves and the build-up of mud areas.⁶⁹

Introduced Marine Pests

3.88 Disruptions to the natural ecology can provide conditions for introduced marine pests to become established. There have been 25 species of introduced marine species identified in South Australia. Most of these are located in the Port River-metropolitan Adelaide region where shipping activity has been high. They are introduced through the discharge of ships' ballast water and/or from the external surfaces of the hulls. Some marine pests have become established.

3.89 Exotic species can increase the occurrence of marine diseases. They can also flourish in their new homes, forming dense communities and forcing out native populations. Dinoflagellates can be introduced in ballast and form algal blooms in favourable conditions. Red tides have been implicated in fish kills. Coastal dune environments are inundated with exotic species. More than 40% of the species in the Normanville Dunes are exotic.

3.90 The Mediterranean fan worm was first detected in 1975 in Port Phillip Bay, Victoria and has gone on to occupy almost one-third of the Bay. It forms dense monospecific stands and effectively alienates all native species. In 1986 it was

66 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 23.

67 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 38.

68 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 38.

69 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 39.

confirmed as being established in the Port Adelaide River/West Lakes system. It is now found throughout much of the waters of the eastern Gulf St Vincent. The implications for the Gulf from the Port Phillip Bay experience are severe.

3.91 Control of ballast water discharge is a particularly difficult problem because most of the methods and chemicals suggested for control are also harmful to the environment. Solutions such as discharge only in ocean areas and heat treatment are being considered.⁷⁰

3.92 So far as existing surveillance, monitoring techniques and programs are concerned, South Australia has limited capability and relies on the Australian Quarantine and Inspection Service (AQIS) which, according to Mr Robert Thomas, the Executive Director of the Environment Protection Agency, “does not do a great deal” in this area.⁷¹ The Committee was concerned to hear this. Given the Gulf’s exposure to potential marine pests and the devastating effects they can have on the Gulf waters and its environment, the Committee believes that more should be done by AQIS to monitor and control the extent of the problem.

Recommendation 4

The Committee recommends that the Australian Quarantine and Inspection Service (AQIS) take an active role in monitoring the possible introduction of marine pests from visiting vessels in the Gulf St Vincent area and that it take appropriate action to minimise the problem.

Future Impacts

Dormant/suspended pollution

3.93 According to Mrs Pat Harbison from the Barker Inlet Port Estuary Committee, if all polluting practices to the Gulf ceased now the historic load of pollutants in the sediments of Barker Inlet is so great that the effects will persist for a long time.⁷² Councillor Barry Nottle too raised the issue of ongoing pollution:

I think some of the contaminants that I see, as in effluent or whatever from septic systems, will probably take – again I am only a lay person – 30 to 50 years to get from the septic tank which is positioned a considerable distance from the Gulf, to reach the Gulf. So by the time it gets to the Gulf you have another X amount of years of it coming through. I do not think the

70 South Australian Fishing Industry Council Inc, Submission 33, p 15.

71 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 13.

72 *Proof Committee Hansard*, Port Adelaide, 4 February 2000, p 82.

safeguards are there at the moment to stop a problem that is going to carry on for a long time after it is identified.⁷³

3.94 Mr Jeff Wait from the South Australian Fishing Industry Council, echoed these ideas:

Within the shallow waters, where we have the phosphates and the nitrogens, et cetera – nitrates – they are there. If we turn the tap off today, every time we have a storm they just get regenerated and redistributed throughout the Gulf. Eventually, if we keep going and keep allowing more and more – even though they are slowing it down, it is still there and is still happening – it will then spread throughout the whole Gulf. I notice it right now because I am in the thick of it but it is spreading and it has not stopped spreading since I first noticed it 30 or 40 years ago.⁷⁴

Fishing

3.95 Fisheries in South Australia are managed through various fishery management committees, such as the Prawn Fishery Management Committee and the Marine Scale Management Committee. These are government appointments and have a varying range of interests within the particular committees. They are charged with managing the resource.⁷⁵

3.96 The Committee heard that most fisheries in the Gulf are managed with input controls rather than output controls. Input controls regulate the number of fishing vessels, the number of licences, the amount of gear they can use, closed seasons and closed areas. Output controls would regulate the amount of fish allowed to be caught.⁷⁶

3.97 The recreational sector is managed through bag and boat limits and size limits. Slot limits in certain range for snapper also apply. Currently the recreational sector is developing a five-year management plan which is going out for public comment.⁷⁷

3.98 The fishing industry believes that it is operating in a sustainable way.⁷⁸ Its primary concerns for the future are the effects on fisheries from outside influences:

... our fundamental concern is one of looking for coordination, and greater effort being placed into implementing what are known technologies, known practices, to decrease the amount of pollution, to decrease the impact still

73 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 33.

74 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 40.

75 *Proof Committee Hansard*, Adelaide, 3 February 2000, pp 37-38.

76 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 39.

77 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 37.

78 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 38.

being felt through coastal development and discharge sewerage on the ecosystem and, in particular, the nursery areas for the prawn fishery.⁷⁹

What we are saying [in our submission] is not only fishing mortality from commercial fishing operations needs to be looked at, but the whole of the ecosystem needs to be looked at for that sustainability to remain at its present level. If we make any further degradation or any further inroads into the habitat of that ecosystem we are therefore jeopardising the sustainability of the fishery.⁸⁰

3.99 These threats to sustainability originate not only from the polluted Adelaide Coastal Waters. Coastal towns such as Edithburgh, Stansbury, Port Vincent and Coobowie on the Yorke Peninsula do not have a common effluent infrastructure. Discharge points into the Gulf have a high environmental impact.⁸¹

Prawn Fishing

3.100 According to Mr Martin Smallridge from the Prawn Industry South Australia, there has been a 30 year effort in ensuring the sustainability of the prawn catches.⁸² The fishery was closed in 1991-92 and 1992-93 to allow stocks to recover and the number of commercial fishers was reduced to 10. The fishery operates under five-year management plans with good coordination with the government through management committees responsible for the management of the fishery. The total take of prawns has varied between 250 and 350 tonnes. Mr Smallridge believes it has a sustainable potential of becoming a 400-tonne fishery.

3.101 Mr Smallridge informed the Committee that there is now a significant amount of work being done into assessing, reducing and improving the survival rate of the bycatch. Over the last two years the fishers have changed their gear configuration and gear size and had up to 97 per cent reduction in the amount of bycatch of some particular species.⁸³ Bycatch reduction devices which are most suitable to conditions within the fishery will be assessed as part of a national research program being carried out by the CSIRO (Marine Division) in collaboration with the South Australian Research and Development Institute (SARDI).⁸⁴

3.102 At present the boats that are used in the Gulf St Vincent prawn fishery are smaller vessels than those used in most other prawn fisheries in Australia. Because of the sustainability of the fishery in the last six years, a decision has been made to improve the efficiency of the industry by changing to larger vessels. Over the next two

79 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 37.

80 *Proof Committee Hansard*, Adelaide, 3 February 2000, pp 38-39.

81 Yorke Regional Development Board, Submission 31, p 8.

82 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 37.

83 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 41.

84 Government of South Australia, Submission 45, p 10.

to five years there will be a move towards the same systems as are in place in all other prawn fisheries.

3.103 Mr Smallridge informed the Committee that this would provide a higher quality, higher value product. Improving efficiency allows fewer trawl shots or shorter trawl shots as well as a reduction in fishing nights. Changing the mesh size and sorting on the vessel to enable any of the by-catch species to be kept alive and to be returned to the water alive are also being considered.⁸⁵

Aquaculture

3.104 The Committee was informed that there is potential for aquaculture ventures to be established in Gulf St Vincent. The success of these ventures depends very much on access to unpolluted waters but in turn they have been implicated in introducing excess nutrients to the marine environment through waste products. There is also concern that diseases could be introduced which could affect wild fish stocks. Although there are more aquaculture ventures taking place in Spencer Gulf than in Gulf St Vincent, aquaculture in the Gulf is seen as a fast growing area with job and wealth creation potential.

3.105 Parts of the Gulf are now being allocated for aquaculture operations. Oyster leases have been approved near Edithburg and others are being considered in the vicinity of Stansbury on the western side of the Gulf. The aquaculture industry has developed rapidly to satisfy increasing demand for quality stock. It is becoming increasingly important economically and for this reason it is expected that more ventures will be established in the Gulf.

3.106 According to the State of the Environment Report for South Australia, there is little data on the impact of aquaculture operations in the marine environment.⁸⁶ Environmental concerns include: waste discharges, marine mammal entrapment, potential feral populations and ecological sustainability of the industry. Caged fish are particularly vulnerable to toxic or harmful algal blooms as they cannot swim away from them. There have been suggestions too, that the waste products from the aquaculture industry itself can induce algal blooms.⁸⁷

3.107 The impact on Gulf St Vincent will very much depend on developments operating under strict guidelines and management plans which include adequate monitoring and transparent recording. Caution is advised because the impacts of aquaculture are not well documented in any of the monitoring publications.⁸⁸

85 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 43.

86 State of the Environment Report for South Australia 1998, p 157.

87 *The Cells from Hell*, Quantum, ABC TV, 23 March 2000, transcript at <http://www.abc.net.au/quantum/stories/s112832.htm>.

88 South Australian Fishing Industry Council Inc, Submission 33, p 14.

Contentious developments

3.108 During its inquiry the Committee's attention was drawn to some controversial development decisions made by the State Government and which are expected to have significant impacts on Gulf St Vincent. It is disturbing that for all the resources being poured into improvement programs and for all the environmental strategies being written, these developments continue to proceed. It raises the question whether the State Government has a greater commitment towards rhetoric and motherhood statements than to genuinely addressing the issues facing the Gulf.

3.109 Developments which are of particular concern are the Barcoo Outlet, the Pelican Point power station and the Port Adelaide sewage plant upgrade.

Barcoo Outlet

3.110 In the past, the Patawalonga Lake was used for recreational activities such as boating and swimming but in recent times it has become too polluted for such primary contact. As part of a series of proposals to develop the Glenelg Foreshore and Environs, the State Government has determined to "return the Patawalonga Lake to a condition suitable for primary contact recreation and useable for planned community events on a more reliable basis, particularly through the summer months".⁸⁹

3.111 The State Government, using a proportion of Federal funds, is going to construct a stormwater control weir to divert stormwater flows from most rainfall events directly to the Gulf. The weir will have flap valves in it to enable south-north tidal circulation. The Barcoo Outlet will consist of a new watercourse and a buried duct that will run under the sand hills and the beach, and out to sea. It will release stormwater about 200 metres offshore. The proposal will cost approximately \$15-\$16.8 million.

3.112 In light of all of the evidence on the effects of urban runoff and sewage effluent on the Gulf environment, it seems to be a backward step to be constructing yet another stormwater outlet to the Gulf. According to Councillor Harold Anderson from the City of Charles Sturt:

This proposal is akin to mending a broken leg by bandaging its big toe.⁹⁰

3.113 The State Government and other supporters of the proposal, argue that at the present time, the pollution to the Gulf is worse without the Outlet. This is because bio-available toxicants from sediments in the Patawalonga Lake are re-mobilised during storms and then overflow to Gulf St Vincent from the Lake. Less environmental harm

89 Fourth amendment to the assessment report for the Environmental Impact Statement (as amended) for the Glenelg Foreshore and Environs, Barcoo Outlet Proposal (West Beach), Minister for Transport and Urban Planning, January 2000, p 5.

90 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 47.

will be created by a combination of catchment works to improve stormwater quality and direct discharge of stormwater to the sea.⁹¹

3.114 Mrs Pat Harbison from pH Consulting, however, asserts that there has been no data collected on the concentration of bio-available pollutants in the Patawalonga Lake or in the water that is released from the gates. She told the Committee that the model used to predict the concentration of pollutants may or may not apply in the Patawalonga situation.⁹²

3.115 The Committee heard that the Patawalonga Lake and the Torrens Lake are two major retention basins in the catchment. Both of these serve a great purpose as sedimentation ponds. However, according to the State Government, the Patawalonga Lake is about one-tenth the size it should be to operate as a sedimentation pond without being overloaded.

3.116 According to Mrs Harbison, the proponent predicts that an improvement in the quality of run-off discharged to the Gulf through the Barcoo Outlet will occur. This improvement however will depend on the provision of adequate wetlands or sedimentation basins at the end of the catchment, the upkeep of these wetlands to maintain their capacity and minimise resuspension, and the ability of sediment traps to capture and retain fine particles. She told the Committee:

It has already been established that adequate wetlands cannot be constructed at the end of the catchment because of the airport bird strike issue, and the inability of sediment trap devices, unless they are extremely large, to capture and retain the finest fractions which carry the highest concentration of pollutants, is widely recognised. The Patawalonga Basin is the only sediment trap at the bottom of the catchment which is large enough to settle the very fine silt and clay fractions and protect the Gulf from this input.⁹³

3.117 Submissions to the Committee canvassed alternatives to the Barcoo Outlet which they said were not given full consideration. Mrs Harbison believes that water quality in the Patawalonga Lake could be improved by a seawater flushing system, with salt water brought in through a pipeline at the north end of the Lake. It would mix with any stormwater that came in from the catchment, and run out at the southern end of the Lake.⁹⁴

3.118 The City of West Torrens, in association with a number of other organisations, has for a couple of years been investigating the feasibility of returning the Patawalonga waters to the Adelaide Parklands via an underground pipeline. The

91 Patawalonga Catchment Water Management Board, Submission on the Third amendment to the Assessment Report for the Environmental Impact Statement (as amended) for the Glenelg Foreshore and Environs, Barcoo Outlet Proposal, in Appendix B to the Fourth amendment, January 2000.

92 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 49.

93 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 49.

94 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 50.

stormwater could then be used for irrigation and perhaps ponded and used to irrigate golf courses, the Morphettville Racecourse, the Adelaide Airport, the Weigall Oval, the West Adelaide Football Club and many other areas.⁹⁵

3.119 Witnesses thought the \$15 million would be better spent upgrading the Heathfield Waste Water Treatment Plant. This Plant discharges secondary treated effluent into Sturt Creek which flows into the Patawalonga Lake. Witnesses were highly critical of the Plant for its high levels of nutrients released to the environment.

... they talk about the four sewage works that live in Adelaide. They do not talk about the Heathfield works which is at the top of Sturt River and runs in through the Patawalonga. That has very high levels of nutrients in it, far higher than the metropolitan ones have. Eventually it ends up in the Gulf.⁹⁶

3.120 Mrs Harbison, does not believe that Heathfield is a direct problem for Gulf St Vincent in the current situation because the treated effluent is held in the Patawalonga. She thinks that Heathfield is a real problem for water quality in the Patawalonga because it contributes nutrients and organic matter but compared with what goes into the Gulf from other sewage treatment works, it is only a small part of the problem in the Gulf.⁹⁷ Presumably, if the Heathfield Plant were upgraded and other catchment works were undertaken, the Barcoo Outlet would not be necessary in order to improve water quality in the Lake.

3.121 There has been pressure since the early 1990s, and indeed provision has been made in SA Water's capital works plan for the financial years 1996-'97 and 1997-'98, to upgrade the Heathfield Plant. Witnesses expressed frustration to the Committee that no physical works have yet been done. According to the Patawalonga Catchment Water Management Board newsletter, however, SA Water has committed \$550 000 for the first stage of the upgrade of the Heathfield Plant. This money is to be spent this financial year.⁹⁸

3.122 Evidence provided to the State Environment, Resources and Development Committee inquiry into the Environment Protection Agency by Henley and Grange Residents Association suggests that although agreement has been reached between SA Water and the Environment Protection Agency that the Heathfield Waste Water Treatment Plant needs to be upgraded, there is disagreement over the timing and the extent of the upgrade. SA Water will need to expand its plant within around five to 10

95 City of West Torrens, Submission 46, pp 1-2.

96 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 46.

97 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 52.

98 *Patawalonga Water*, News from the Patawalonga Catchment Water Management Board, December 1999, p 5.

years to meet population growth requirements. It has indicated that it would prefer to delay any upgrade in treatment effectiveness to coincide with that expansion.⁹⁹

Pelican Point power station

3.123 Most of Adelaide's electricity is presently generated at the Torrens Island Power Station. This power station uses water from the Port River for cooling and discharges heated water back into the river via the Angas Inlet. This discharge causes thermal pollution that encourages algal growth and causes changes to the fish species composition in the area.

3.124 A paper by the South Australian Research & Development Institute indicates that certain species of fish avoid the area of the discharge in the summer/autumn months but are attracted to it in the winter/spring months. The warmer waters provide an extensive growing season, significantly higher growth rates and promote premature movement out of the inner estuary for different fish species.

These latter effects may alter the population structures of these species by increasing their vulnerability to heavy localized fishing intensity, aggregation of natural predators and point-source pollution.¹⁰⁰

3.125 The paper also mentions the possible indirect effect on fish from the disappearance of seagrass beds in the thermally affected area. There is no information, however, on the distribution of seagrasses within Barker Inlet prior to the installation of the Torrens Island power plant.

3.126 The decision which has concerned various groups is the approval of a new 500 megawatt gas fired power station at Pelican Point near the mouth of the Port River. Concerns were raised over the proximity of the new source of thermal pollution to the container wharf. There is increased risk of introduced marine pests from ballast water becoming established in the warmer waters.

3.127 Discharges from the plant could have a more intrusive effect than even the existing Torrens Island power station because the new station is to be situated at the mouth of the river and this could act as a barrier to marine fauna migrating past this point. According to the Australian Dolphin Research Foundation, the full effects of the thermal discharge into the river are not known.¹⁰¹

99 Environment, Resources and Development Committee, transcript, p 178 (provided to the Senate Committee).

100 *Nearshore Fish Community of the Port River-Barker Inlet Estuary, South Australia. I. Effect of Thermal Effluent on the Fish Community Structure, and Distribution and Growth of Economically Important Fish Species*, GK Jones, JL Baker, K Edyvane and GJ Wright, *Marine and Freshwater Research* 47, pp 785-799.

101 The Australian Dolphin Research Foundation, Submission 27.

3.128 Concerns were also raised about the amount of water to be used by the new power station:

At this stage we believe there has been insufficient investigation of the amount of cooling water required in relation to the total river flow. Particularly at times of dodge tide when there is reduced flow a significant proportion of the plankton entering and leaving the estuary will pass through the cooling system.¹⁰²

3.129 According to Community Action for Pelican Point:

The new power station will contribute thermal pollution and chemical pollution to a recognised dolphin breeding ground and important entrance to South Australian fish breeding grounds ... The thermal pollution will also become another source of altered fish type patterns and algal blooms in combination with sewage nutrients ... The power station will significantly add to existing cumulative air pollution levels ... The development has not been subject to a community or public environmental consultation process ... no testing or studies have been done by the State government as to the expected impact on marine or human health.¹⁰³

3.130 Ms Gwen Moore from Community Action for Pelican Point told the Committee that the builders of the new power station have been forced in other locations, such as in Hazelwood in Victoria, to change the design of their plant from the deep water diffusion method. This was because of the impact of this method on the marine environment. Ms Moore continued:

So we are particularly concerned that they have been forced to use the better technology in other locations but it seems to be okay to use the lesser technology in this location. We do believe, as we said, that with the combination of the dodge tides and with the shipping channel being right through the area where the heated water would be and the possibility of introduced species in the area with the warm water and the nutrients from the sewerage plant not far away, that that is actually a recipe for disaster and we feel that we cannot risk that in this particular area.¹⁰⁴

3.131 The Committee strongly deplores the decision to go ahead with the new 500 megawatt gas fired power station in such a potentially attractive area as Pelican Point. The Committee is concerned that the power plant will have negative consequences on marine life in the area and on the local dolphins in particular.

3.132 As part of its site inspections, the Committee passed the 180 megawatt Osborne Cogeneration Plant - also on the Port River. This Plant uses air cooling rather than water cooling and therefore does not produce the thermal pollution of the existing

102 Port Adelaide Resident's Environment Protection Group, Submission 24.

103 Community Action for Pelican Point, Submission 21, pp 2-3.

104 *Proof Committee Hansard*, Port Adelaide, 4 February 2000, p 90.

plant and that proposed for the new plant. At the very least, the Committee believes that the State Government needs to make it a requirement of the new power station licence that thermal pollution prevention measures be included in the design.

Recommendation 5

The Committee recommends that the licence to be issued to the Pelican Point Power Station be made conditional on measures being taken to prevent thermal pollution.

Port Adelaide Waste Water Treatment Plant Upgrade

3.133 The Port Adelaide Waste Water Treatment Plant is scheduled to be upgraded. It currently discharges into the Port River and has been implicated in providing the nutrients for the red tides which occur in spring every year. The microalgae which include toxic dinoflagellates and a range of other species are introduced in ballast water. The algal blooms are so large because of the nutrients that are fed to them through the Port Adelaide sewage treatment plant and a couple of other industries in the area.¹⁰⁵

3.134 A number of upgrade options are being investigated and the Committee was told of concerns with an outfall into the Port River being considered as part of the upgrade - despite all of the evidence of the effects of pollution in the area from existing outfalls.

3.135 The Port Adelaide Resident's Environment Protection Group believes that:

... zero discharges is the way this should be handled. The reason we say this is that everybody says, 'We can get down to 10 milligrams per litre here and we can get down to 15 milligrams per litre over in Bolivar,' but there is no real basis for saying what the effects of this reduction are going to be. Nobody has gone out there and said, 'Look, if we drop our level of nutrients down to a certain level we are going to see this sort of effect on the environment.' In fact nobody seems to look at the environment at all. They seem to look inside the plant and at what the plant is capable of, rather than what the final effect is.¹⁰⁶

3.136 The Committee was told that one of the problems with the Port Adelaide system is that it is an old system in a very low lying area and many of the pipe systems are below the watertable which is highly saline. There is infiltration through

105 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 7.

106 *Proof Committee Hansard*, Port Adelaide, 4 February 2000, p 88.

leaky joints and things of that nature which elevates the salinity to above levels that are normally able to be used for irrigation or other reuse purposes.¹⁰⁷

3.137 Because of this high salinity, only 30 per cent of the flow from a portion of the drainage area can be reused. The Environment Protection Agency is proposing to divert that portion to the Bolivar Waste Water Treatment Plant and then make it available for irrigation in the Virginia area of South Australia.

3.138 The Committee heard that it is possible for the saline waters to go through a modern plant and then undergo some tertiary treatment in saline wetlands.¹⁰⁸

3.139 According to the City of Port Adelaide Enfield, five new options for the Port Adelaide Plant are currently being reviewed due to the level of community activism over Pelican Point issues. The Council's preferred position is that the plant be upgraded to a standard where it is not going to be discharging effluent. Any clean water can then be pumped to the Bolivar plant so that it can be used as part of the Bolivar irrigation program.

3.140 The Committee cannot help but agree with the Mayor of the City of Port Adelaide Enfield who said:

It just seems to me to be unsatisfactory to do a major upgrade and still include an outfall either to Gulf St Vincent or within the enclosed river system. I was astounded to see that they would even consider an outfall within the river system.¹⁰⁹

3.141 Mr Tony Bazeley from Port Adelaide Residents Environment Protection Group expressed a similar opinion:

The problem of the saline effluent has not been solved. There are various solutions – to pipe it here, to pipe it there and to pipe it somewhere else – but essentially it is going to go into the marine environment. ... we think zero discharges is the way this should be handled.¹¹⁰

3.142 The Committee was told of an innovative project in Griffith, New South Wales where treated effluent is run underneath what is effectively a standing cereal crop. The cereal crop takes up the nutrients and then the polished effluent is discharged.¹¹¹

What we are asking for is that somebody should sit down and look at some of these alternatives. People are not; it is not familiar territory to them. They

107 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 14.

108 *Proof Committee Hansard*, Port Adelaide, 4 February 2000, p 87.

109 *Proof Committee Hansard*, Port Adelaide, 4 February 2000, p 80.

110 *Proof Committee Hansard*, Port Adelaide, 4 February 2000, p 88.

111 *Proof Committee Hansard*, Port Adelaide, 4 February 2000, p 88.

are involved in the design of sewerage plants. There are not the resources or the willingness within the state to look at those sorts of alternatives. We think it is very important because there must be lots of saline effluence throughout Australia. It must be a problem that is occurring in a lot of coastal areas. We think it would be a good role for the Commonwealth in this case to sponsor a reputable organisation, such as the CSIRO or one of the cooperative research centres, to have a look at the feasibility of setting up a facility to provide zero base discharge in this case.¹¹²

3.143 In the Committee's view every effort should be made to investigate successful land-based sewage treatments in operation both in Australia and overseas in order to adopt the most appropriate approach for the Port Adelaide Waste Water Treatment Plant with a view to minimising sewage discharge into the Gulf.

Recommendation 6

The Committee recommends that the South Australian Government consider off-budget construction options for the upgrading of the Port Adelaide Waste Water Treatment Plant utilising land-based disposal of sewage effluent.

Regional areas

3.144 Whilst the degradation of the marine environment appears to be mainly on the eastern side of the Gulf, around metropolitan Adelaide, this does not mean that the western side will necessarily escape the effects of population as a matter of course. It seems that away from the metropolitan area, little is known about the state of the Gulf. According to Mr Robert Veitch from the Wakefield Regional Council:

In terms of the Wakefield Regional Council area it is almost out of mind, out of sight once you get further north from Adelaide in terms of media and, in the past, grants for looking at that sort of thing. It is not in the media a lot so it is not in the public eye a lot. It is a case of where the population is, that is where the focus tends to be. There is no hard data that will help with saying it is in a bad state in the top of the Gulf. As a council we tend to find as you get further north there is less known about the problems up that way.¹¹³

3.145 There do not seem to be procedures in place to avoid the sorts of problems that will inevitably occur with population increases. Regional areas serve as popular tourist destinations with populations swelling during summer and on weekends. This characteristic of the area is bound to have an impact on the Gulf.

112 *Proof Committee Hansard*, Port Adelaide, 4 February 2000, p 88.

113 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 33.

But some of these [impacts] take a while, like the tourism side and the development. Whilst we only have 31,000 people that are permanent residents, we have a lot of people visiting on weekends. They come Friday night and go back Sunday night. The actual coast road carries more traffic than national Highway 1 does on weekends. You have a travelling population into there growing on a very rapid basis, so I believe we should not wait until something actually collapses before we try to fix it. We should be there trying to fix it before the seagrasses die.¹¹⁴

3.146 The Committee heard that on the western side of the Gulf the amount of building activity has increased between 10 and 25 per cent in coastal towns over the past 10 years. This increase does not take into account the majority of tourists that visit the peninsula who travel in caravans and are camping.¹¹⁵ Few regional towns have a common effluent drainage scheme and they generally use septic systems. Shacks, houses and other buildings may be situated on the edge of rivers and the coast. This proximity to the water can result in polluted runoff from septic systems flowing untreated into waterways.

3.147 There are plans to convert towns but a lack of resources means that this will take time. The Committee was told that the State government has allocated approximately \$3 million to a Septic Tank Effluent Disposal (STED) Scheme in country areas such as the towns along the Yorke Peninsula coast. The Scheme enables all of a town's septic tanks to be pumped into a common storage area for treatment.

3.148 However, there are only sufficient funds to put in about one STED Scheme for a town of 1,100 per year. Towns are therefore ranked according to their need for a STED Scheme based on factors such as the number of people in the town, the soil types, the effectiveness of septic tanks in terms of drainage, whether they have to be pumped out or not because the water does not drain away from them because of the nature of the soil. One of the most critical factors is whether they can demonstrate faecal contamination in aquaculture areas.¹¹⁶

3.149 The Committee heard that:

... the town of Coffin Bay on the west coast recently jumped to the top of the priority list because it was found that on the porous Aeolianite limestone all around the bay, when they had their annual influx of 10,000 visitors in the holiday season, the septic tank effluent was simply just running straight into the bay right on top of the oyster lease which was at the top end of the bay. Coffin Bay immediately went to the top of the list for the STED Scheme and other places which had been on the list for a long time went down.¹¹⁷

114 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 33.

115 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 33.

116 *Proof Committee Hansard*, Port Adelaide, 4 February 2000, p 85.

117 *Proof Committee Hansard*, Port Adelaide, 4 February 2000, p 86.

3.150 The order of priority means that it is not necessarily those towns that have waited the longest who will become beneficiaries of the Scheme.

Landfills

3.151 The Committee received a number of submissions, along with approximately 279 form letters, voicing concerns about proposed landfills at Dublin and Inkerman on the north-eastern side of the Gulf. These landfills are, in part, to replace the waste repository at Wingfield, Adelaide and other existing landfills. There are fears that toxins from the waste will leach into the water table and find their way to the Gulf, jeopardising ecosystems and one of the State's valuable fish breeding grounds.

Dublin

3.152 A proposal for a balefill landfill site has been approved in the Mallala Council rural area 3 km south of Dublin. According to the Council:

Gulf Saint Vincent forms the entire western boundary of the Mallala District Council area. Its conservation significance can only be described as outstanding due to the high diversity of sea grass and other marine species some of which have survived from earlier tropical periods due to the warmer temperatures sustained in the shallow waters.

... The dump site is within 4 kilometres of the Gulf and immediately abuts a Coastal Zone. A portion of the subject land also contains samphire wetlands.¹¹⁸

3.153 The Council is concerned that leachate from the facility could contaminate aquifers and eventually enter Gulf waters with subsequent environmental degradation. It asserts that the facility breaches standards set for assessing proposals for landfill dumping facilities throughout the State and that balefill cells will be embedded approximately 2 metres beneath the level of the seasonal groundwater table.¹¹⁹

3.154 The Dublin & Districts Ratepayers Association too is concerned that the landfill is located close to the Gulf and that waste will be dumped directly into groundwater. The Association has undergone a long and frustrating experience in trying to stop the landfill from going ahead. It asserts that:

The Public consultative process has been ignored and the investigation process has been extremely biased. We have been accused of suffering from the NIMBY syndrome (Not in My Backyard Syndrome) which has been

118 District Council of Mallala, Submission 42, p. 1.

119 District Council of Mallala, Submission 42, p. 1.

used for far too long by Government departments to negate and trivialize people's very real concerns for the environment and for their future.¹²⁰

3.155 This issue of bias was also raised by the Council:

The operation of bias seriously favouring the Developer's perspective has been identified both in the assessment of this facility and the development of policies to guide the assessment and development of future landfill dumps. Such bias has been at the cost of environmental factors particularly in respect of increasing the risk of ground water contamination with potential implications for the waters of the Gulf of Saint Vincent.¹²¹

3.156 The Dublin & Districts Ratepayers Association raises the issue of disease transmission from the landfill to feedlot sheep, cattle for export, piggeries, poultry sheds, cereal growing and grazing and private dwellings in the area. This could occur through the droppings of birds, through foxes and through vermin whose numbers will increase as a consequence of their attraction to the site.¹²²

Inkerman

3.157 At Inkerman one landfill has been approved with a further four awaiting development applications. Inkerman is a broad acre farming area with a small population. It is situated 15 km south of Port Wakefield and contains coastal swamplands, mangroves and tidal channels, aeolian sand dunes with a high risk drift potential, and has highly saline underground water. It is registered by the Soil Board as a high-risk wind erosion area.

3.158 Members of the Inkerman Proposed Landfill Action Group drew the Committee's attention to the pristine condition of the environment at the northern end of the Gulf with mangroves, samphire and fish breeding grounds and abundant bird life. The waters at the top of the Gulf move in a circular motion and therefore do not flush readily.¹²³

3.159 The Group is concerned at the gases which landfills produce as well as the possibility of leachate contaminating the Gulf. It suggested that the clay which is to be used to provide a 1 metre liner for the landfill to prevent leachate will be ineffective if on-site clay is to be used. The Group provided the Committee with a dramatic demonstration of the unsuitability of the local clay if it is used without an additive - a plug of clay which came out of a test hole on the landfill site was placed in a glass of water and immediately dissolved when it came in contact with the water.

120 Dublin & District Ratepayers Association, Submission 11, p 3.

121 District Council of Mallala, Submission 42, p 2.

122 Dublin & District Ratepayers Association, Submission 11, p 10.

123 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 67.

3.160 The landfills are also of concern to industry that relies on the purity of the Gulf waters for its business. Cheetham Salt Limited, which is located across the Gulf at Price, informed the Committee:

The quality of the water pumped from the Gulf St Vincent ... determines our ability to produce a product which is acceptable for human consumption both here and overseas. Contamination, by any pollutants, of the water would affect our ability to meet domestic and export demand.¹²⁴

The world is demanding food which is free of contaminants and Australia is in a strong position to fill this demand.¹²⁵

Environment Protection Agency response

3.161 The South Australian Environment Protection Agency assured the Committee:

Both landfills will have a one metre thick, low permeability, compacted clay liner. On top of the liner there will be a drainage layer to collect any leachate that may form. Modelling using the US EPA hydrological evaluation of landfill proposals, otherwise known as HELP, and local climatic data has indicated the amount of leachate generated under the proposed operating conditions and following closure is minimal. This is a function of the low rainfall and high evaporation rate common in the area, the proposed liner and leachate collection systems and the final capping system.

Investigations at both sites have indicated that there are no continuous high permeability soil layers that could provide a direct connection to the Gulf. Ground water modelling has indicated there are no risks to human health of the Gulf and, furthermore, I should point out that stage 1 of the integrated waste services landfill proposed near Dublin is six kilometres from the coast. Stage 9, which is some 60 to 80 years away, after commencement would be three kilometres from the coast. The Pathline proposal near Inkerman: the closest distance to the coast is 3.7 kilometres and this is a conservative distance, given the interpreted north-westerly ground water flow direction which suggests a flow path distance of nine kilometres. So, given the distance, the security systems and the very low level of leachate generated, the risk of contamination is zero.¹²⁶

3.162 The Committee understands that only one of the landfills is in operation at the moment, and there are no demonstrable impacts on the Gulf at the present time. The Committee notes the evidence given by the South Australian Environment Protection Agency that there is no risk of contamination from the proposed landfills.

124 Cheetham Salt Limited, Submission 28, p 2.

125 Cheetham Salt Limited, Submission 28, p 3.

126 *Proof Committee Hansard*, Adelaide, 3 February 2000, pp 15-16.

CHAPTER 4

RESPONSES TO THE PROBLEM

4.1 Since the mid-1990s, there has been increasing commitment from the South Australian authorities to counteract the pollution problems in the Gulf. Many programs and works, involving all levels of government, industry and the community, are being undertaken to address water quality issues. Many of these programs utilise the latest in scientific knowledge and innovation and others are as simple as increasing awareness in the community.

4.2 Environment groups and some local councils who made submissions to this inquiry questioned whether enough is being done to turn the trend of increasing pollution of Gulf waters and damage to the surrounding lands. Terrestrial discharge impacts on the ecological processes in the Adelaide coastal waters are poorly understood. For example nutrients in treated sewage effluent are implicated in the loss of seagrass off the metropolitan coast, however, the assimilative capacity of the waters, the impact of other toxicants, the legacy of past influences and other issues, are poorly understood. Similarly even today, the relative environmental significance of stormwater as compared to other discharges is not understood.¹

Adelaide Coastal Waters Study

4.3 In recognition of this problem, the South Australian Environment Protection Agency has decided to undertake a detailed, integrated study of the Adelaide coastal waters to redress many of the shortfalls in the current knowledge base and to assess the current status of, and the impact of future changes in, nutrient levels.

What we are endeavouring to do is raise \$4 million to conduct a detailed investigation with a view to developing what we call a seagrass adaptive management system, where we have a much better handle on the mechanisms causing that decline and then, based on that, develop a monitoring program and target what I would call environmental capital to make sure future investment in improvements to the catchments, the sewerage plants and any other activities causing decline are properly targeted.²

4.4 The CSIRO undertook a scoping study to develop a program of work that would achieve an integrated understanding of the ecological, physical, biological and chemical processes in the sediments, water and biota of the coastal waters.³

1 Office of Catchment Water Management Boards, Submission 3, p 2.

2 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 3.

3 CSIRO, Division of Marine Research, Adelaide Coastal Waters Study, Scoping Report, p i.

This integrated study will deliver an assessment of the state of the system now, a set of tools to support management, and a continuing program of monitoring and adaptive management which would take account of, and continually reduce, uncertainty.⁴

4.5 This set of management tools will be invaluable in giving confidence to long-term sustainable management not only in the Gulf, but possibly in other waterbodies as well.⁵

4.6 The CSIRO estimated that the study would cost \$3.5M over 3-4 years. \$2.1M has been pledged thus far but applications for Commonwealth Coasts and Clean Seas funding to make up the shortfall of \$1.5M were twice refused. The Coasts and Clean Seas Program - a part of the Natural Heritage Trust (NHT) - generally limits grants to a maximum of between \$80 000 - \$250 000 over the life of the project depending on which of the 3 primary NHT objectives the project contributes. Priority for funds is given to capital works projects and on-ground activities.

4.7 In the Committee's view, it is vitally important for this type of study to be undertaken so that appropriate responses to the problems identified can be put in place. Accordingly,

Recommendation 7

The Committee recommends that the Commonwealth provide additional funding for the Adelaide Coastal Waters Study.

Marine and Estuarine Strategy

4.8 On a related front the Committee was told that the South Australian Government released a marine and estuarine strategy, published as "Our Seas & Coasts", in September 1998. According to the Environment Protection Agency the release demonstrates that a more strategic approach to managing the coastal environment is being taken.⁶ The strategy was prepared with input from industry representatives, conservation groups, government agencies, recreational users and the general public. It provides general strategies for sustainable use, improved management and conservation of South Australia's marine and estuarine environment.

4.9 The Marine and Estuarine Strategy establishes a framework for protecting marine habitats and their biodiversity. It embraces five major commitments, each of which will require specific actions:

4 CSIRO, Division of Marine Research, Adelaide Coastal Waters Study, Scoping Report, p ii.

5 *Proof Committee Hansard*, Adelaide, 3 February 2000, pp 4-5.

6 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 1.

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- clean, healthy seas - to address wastewater, stormwater, ballast water and coastal processes
 - sustainable use - to ensure that the principles of ecologically sustainable development underpin all uses of the marine environment
 - conserving biodiversity and heritage - to ensure protection of the marine habitat and species therein
 - working together - the community has a right to be involved in decisions on use and resource allocation
 - better understanding - acquiring the knowledge that will provide the basis for conserving and managing the natural heritage and resource base.

4.10 The component of the strategy on which the Environment Protection Agency has been concentrating is the pollution control aspects.⁷ In addition, there is a complementary initiative that is being pursued through the Coastal and Marine Planning Program, a part of the Coasts and Clean Seas Program. The State Government has sought funding, in conjunction with the Local Government Association, to carry out a planning strategy for Gulf St Vincent, Spencer Gulf and the Kangaroo Island area.⁸ The Committee supports this approach:

Recommendation 8

The Committee recommends that the Commonwealth provide funding through the Coastal and Marine Planning Program for the Environment Protection Agency of South Australia to develop a planning strategy for Gulf St Vincent.

4.11 The Committee notes that some groups expressed concern about the willingness of the Environment Protection Agency (EPA) to take strong action on controversial environment issues. For example, Henley and Grange Residents Association Inc, expressed concerns about the lack of will of the agency to intervene on issues of environmental importance; the damaging aspects of the South Australian Government Development Act which overrides the Environment Protection Act, giving no third party rights of appeal or requiring a proper EIS to be conducted; a failure by the EPA to consult effectively with communities; and its failure to enforce the conditions of the Act on environmental offenders.⁹

4.12 Mr Robert Thomas, the Executive Director of the Environment Protection Agency admitted that the EPA needed to be strengthened in certain areas and he has given the State Government an indication of what sort of resources are required. He

7 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 3.

8 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 3.

9 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 55.

also made the point that in terms of resources it is not just about numbers, it is about quality:

All EPAs are facing the same problem: increasingly our salaries are just not competitive with the private sector and we are finding it increasingly difficult to recruit environmental scientists and environmental engineers, particularly in the brown side of the business, as I describe it – the pollution management side. Those sorts of people are not being trained up at a rapid rate and the experienced people are in high demand and are very hard to recruit. We are very dependent on those sorts of people so it is really about quality as much as quantity.¹⁰

4.13 The Committee was concerned to hear that there appears to be a lack of trained professionals with appropriate qualifications in the area of environmental protection. In the Committee's view it is important that governments play a role in encouraging more people to enter this field with major implications for future development of resources in this country.

Recommendation 9

The Committee recommends that both the Federal and State Governments give consideration to sponsoring an increased number of scholarships in the field of environmental science.

Call for action

4.14 A number of the submissions received by the Committee expressed frustration that there have been too many inquiries into the Gulf without any concrete results. They argue that the nature of the problems facing the Gulf is clear.

... probably a thing that frustrates us is that as a result of these inquiries you get policy changes. We need policy, you have to have policy; I am not saying you do not but the actual on the ground changes, where the lay person sees what is happening and what is not happening – they do get frustrated.¹¹

However, we also recognise that enough research has been done to demonstrate the areas and causes of greatest negative impact. Further, enough technical knowledge and proven examples exist to support the benefits of dedicating considerable funds towards speeding up the processes to curb further degradation.¹²

10 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 6.

11 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 34.

12 South Australian Fishing Industry Council Inc (SAFIC), Submission 33, p 13.

4.15 Notwithstanding these comments, there are gaps in the knowledge base as to: the specific effects on certain ecosystems; the integration of ecosystems; and fundamental baseline data. A precautionary approach is needed when considering new developments and other projects that are likely to have an impact on the Gulf.

4.16 Dr John Hails, a Foundation Director of the Mawson Centre for Environmental Studies at the University of Adelaide, submitted that data on coastal processes has been obtained from discrete studies commissioned by Government and from Environmental Impact Studies associated with proposed developmental projects. This data is collected at infrequent intervals over extended periods and does not necessarily relate to the most significant natural events that are required to verify laboratory investigations and model studies. Knowledge is limited because of a lack of interdisciplinary studies over the past two decades.¹³

4.17 Enough is known, however, to begin redressing pollution issues in the Gulf. Remedial action should not be delayed until the outcome of the Adelaide Coastal Waters Study is available some time in 2003/2004. Indeed, this does not seem to be the case and the Committee recognises that many positive programs are being undertaken by both the South Australian Government and local municipal councils in the Gulf region. However, the Committee is of the view that the Environment Protection Agency could achieve more positive results if it was given enhanced powers to act independently of government in environmental matters.

Recommendation 10

The Committee recommends that the South Australian Government give enhanced statutory powers and greater flexibility and independence to the South Australian Environment Protection Agency to take action to protect the environment more effectively.

Federal Programs

4.18 The Federal government also provides funds for programs that can enhance environmental protection such as the Natural Heritage Trust Oceans Policy and the Living Cities Program.

4.19 Around half of the Living Cities funding of \$50 million goes towards improving urban waterways and reducing coastal pollution. \$11 million is allocated to address the consequences of stormwater runoff.

13 Dr John R Hails, Submission 23.

Introduced Marine Pests - Ballast Water Strategy

In September 1999, the Federal Minister for Agriculture, Fisheries and Forestry announced that Australia would unilaterally implement new rules to make it compulsory for foreign ships to manage their ballast water so that it will not introduce exotic pests in Australia's marine environment. These rules will come into force in mid-2001 and interim arrangements have been established as a prelude to the enactment of legislation.

State Legislation

4.20 The South Australian Government administers environment protection legislation and exercises control through Catchment Water Management Boards. South Australia has legislation in place to support the Marine and Estuarine Strategy in the Gulf. Relevant legislation includes:

- *Environment Protection Act 1993* (incorporating the Environment Protection (Marine) Policy 1994)
- *Harbours and Navigation Act 1993*
- *Fisheries Act 1982*
- *National Parks and Wildlife Act 1972*
- *Pollution of Waters by Oil and Noxious Substances Act 1987*
- *Petroleum Act 1940.*

Environment Protection Act 1993

4.21 The Act came into operation on 1 May 1995 and is the primary pollution control legislation in South Australia. The objectives of the Act are to:

- promote defined principles of ecologically sustainable development; and
- ensure that all reasonable and practical measures are taken to protect, restore and enhance the quality of the environment having regard to the principles of ecologically sustainable development.

4.22 The Act provides for standards of care that apply to industry and the community by means of:

- the general environmental duty;
- offences under the Act; and
- Environment Protection Policies and regulations.

4.23 The general environmental duty places an obligation on everyone not to harm the environment. It states:

A person must not undertake an activity that pollutes, or might pollute, the environment unless the person takes all reasonable and practicable measures to prevent or minimise any resulting environmental harm.

4.24 Failure to comply with this duty is not an offence, however, the Environment Protection Authority may enforce the duty by issuing an Environment Protection Order or a Clean-up Order, or seeking an order from the Environment, Resources and Development Court.

4.25 Environment Protection Policies are subordinate legislation under the Environment Protection Act and can be developed for any purpose directed towards securing the objects of the Act. As a consequence of the Environment Protection (Marine) Policy which was introduced in 1994, dischargers are required to demonstrate by March 2001 that they are complying with minimum standards. Environmental monitoring and Environment Improvement Programs are required as a condition of all discharge licenses.

4.26 A review of the Environment Protection Act is now in progress. The review will cover issues such as the powers and responsibilities of the Environment Protection Authority, enforcement provisions, site contamination matters, the policy making process, licensing and the interrelationship with certain other legislation such as the Public and Environmental Health Act. Consultation will be undertaken of all components of the review through the release of a series of consultation documents that include discussion papers and draft Bills.

4.27 The review of the Act is separate from the inquiry being conducted by the Environment, Resources and Development Committee of the State Parliament. However, recommendations arising from the findings of the State parliamentary committee will be considered as a part of any proposed amendments to the Act.

4.28 Dr John Hails made the comment that since the late 1970s successive governments in South Australia have focussed on “public image” decision-making rather than implementing, and auditing, long-range interdisciplinary management plans for the Gulf. He submitted that there needs to be a commitment by the present and future Governments to implement an ongoing interdisciplinary management program rather than disparate studies from time to time.¹⁴

4.29 Some South Australian environmental groups argue that other states have updated their coastal management legislation and they support the introduction of a new Coastal and Marine Planning Management Act to replace the *Coast Protection Act 1972*.¹⁵ The Senate Committee sees merit in this and recommends that the South Australian government consider this option.

14 Dr John R Hails, Submission 23.

15 Caton, B “A New Coastal and Marine Planning Management Act for S.A.?, *South Australian Regional Ripples*, Vol. 6 No. 1 Autumn 99, 1-3

Recommendation 11

The Committee recommends that the South Australian Government consider an overhaul of the current coastal protection legislation with the introduction of a new Coastal and Marine Planning Management Act.

Licences

4.30 Persons who are undertaking activities deemed to be of major environmental significance are required to hold an environmental authorisation in the form of a licence, an exemption or a works approval. Conditions are attached to the authorisation and must be complied with.

Environment improvement programs

4.31 The Environment Protection Agency told the Committee that Environment Improvement Programs are attached to licences for significant industries that discharge into the Gulf, including BHP, various electricity utilities and SA Water. The South Australian Government submission states that hundreds of millions of dollars have been spent by industry on these programs over the last five years.¹⁶

4.32 SA Water is required to undertake Environment Improvement Programs for each wastewater treatment plant. Under these programs the 4 metropolitan wastewater treatment plants at Bolivar, Port Adelaide, Glenelg and Christies Beach are to be upgraded, primarily to remove nitrogen from the discharges. The South Australian government has committed \$210 million to these upgrades.

4.33 The Environment Protection Agency informed the Committee that its preference is for there to be no discharge to the marine environment. This would be in accord with the Planning Strategy for Metropolitan Adelaide. The Environment Protection Agency has encouraged effluent reuse schemes to lower discharges and to decrease the pressures on groundwater and on the Murray River.

4.34 In September 1997 Cabinet approved construction of a \$30 million Bolivar Dissolved Air Flotation/Filtration (DAFF) plant to provide high quality treated wastewater from the Bolivar Waste Water Treatment Plant for irrigation in the Virginia market gardening region. A smaller reuse scheme has also been established in the Willunga Basin in the McLaren Vale district. The winegrowers themselves funded a pipeline from the Christies Beach Waste Water Treatment Plant to carry treated effluent for irrigation of vines.

16 South Australian Government, Submission 45, p 14.

4.35 The Environment Protection Agency anticipates that once the Environment Improvement Programs are implemented there will be an approximate 77% reduction in nitrogen discharged to Gulf St Vincent from treated wastewater.¹⁷ The reuse of treated effluent is anticipated to be 22 000 megalitres per annum from the Bolivar plant and 2000 megalitres per annum from the Christies Beach plant. This compares with a total of about 80 000 megalitres of treated effluent from the four major Adelaide plants disposed of to the Gulf in 1997.¹⁸ These amounts of effluent reuse could increase as on-farm irrigation systems and other supporting infrastructure are put in place.¹⁹

Reuse schemes

4.36 Aside from the two schemes mentioned above, there is an increasing emphasis on recycling sewage effluent, primarily for watering ovals, parks, golf courses, nature strips and community open spaces. This should have a positive impact on the Gulf, as there will be a lesser amount of nutrient-rich effluent entering its waters.

4.37 It is hoped that the waste water treatment plant upgrades and reuse schemes will limit the decline in water quality in Gulf St Vincent and that seagrass beds will regenerate. The Environment Protection Agency is unsure, however, whether the destruction is due solely to sewage discharges. It believes that stormwater runoff also has a role to play in the demise of seagrass.

4.38 Because the impact of nitrogen on the marine environment is being targeted in the sewage plant upgrades, it is quite possible that once this problem has been brought within acceptable levels, the Environment Protection Agency will find that the other pollutants in waste water become of issue.

4.39 It is a concern that SA Water dismisses bio-available phosphorus as “not an issue for the marine environment” in relation to the Heathfield Waste Water Treatment Plant.²⁰ Whilst phosphorus may not be important in the marine environment, the Heathfield plant discharges into the Sturt River which enters the Gulf via the Patawalonga. The Committee heard that this plant produces very high levels of nutrients - far higher than the metropolitan sewage plants.²¹

17 South Australian Government, Submission 45, p 22.

18 Environment Protection Authority, *Protecting Gulf St Vincent, A statement on its health and future*, September 1997, p 6.

19 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 4.

20 SA Water, Submission on the Third amendment to the Assessment Report for the Environmental Impact Statement (as amended) for the Glenelg Foreshore and Environs, Barcoo Outlet Proposal, Appendix B to the Fourth amendment, January 2000.

21 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 46.

Catchment Water Management Boards

4.40 Following the repeal of the *Catchment Water Management Act 1995* (SA), it is under the *Water Resources Act 1997* (SA) that Catchment Water Management Boards are now established to manage and improve water quality. The Boards have the role of taking a lead position to focus attention on an overall coordinated catchment plan to integrate existing programs and to pinpoint any gaps. Prior to their establishment, no State or Local Government agency could take a lead position. Catchment management had been considered a Local Government responsibility, yet Councils lacked a funding base or expertise, or there were problems that extended outside their boundaries and agreement could not be reached with other Councils.²²

4.41 The general functions of these Boards are:

- to prepare and implement a catchment water management plan in accordance with the *Water Resources Act 1997* (in many areas this also includes preparation of water allocation plans for prescribed water resources);
- to provide advice to the Minister and the constituent councils for the board's area in relation to the management of the water resources in accordance with the *Water Resources Act 1997*;
- to promote public awareness of the importance of the proper management of the water resources in the board's area and of the sustainable use of those resources; and
- such other functions as assigned to the board by or under the Water Resources Act or any other Act.²³

4.42 There are four catchment boards that have catchments that discharge to Gulf St Vincent. They are the Onkaparinga Catchment Water Management Board, the Patawalonga, the Torrens, and the Northern Adelaide and Barossa. Members of the Boards are skills- and expertise-based rather than representatives or advocates of other bodies. They are appointed by the Minister responsible for the catchment program.

4.43 The Boards are funded through levies on ratepayers of approximately \$15-\$20 each per annum. They can attract additional funding by developing partnerships with Commonwealth, State and local Governments, as well as with the private sector. To be fully effective, the Boards must link with Local Government and State Government agencies to broker in-kind partnerships so that they can implement their catchment plans. These plans are developed in conjunction with the local community. Similar relationships are developed with Soil Conservation Boards and major Landcare groups

22 Office of Catchment Water Management Boards, Submission 3, Attachment, pp 2 & 3.

23 South Australian Department for Water Resources, website at

<http://www.environment.sa.gov.au/water/catchment.html>

to ensure that the Boards' work can complement (rather than replace) existing initiatives.²⁴

4.44 According to the Torrens and Patawalonga Catchment Water Management Boards, opportunities to implement broad-scale innovative water sensitive designs and appropriate waterway management strategies, particularly in existing urban areas, are limited. The ability to 'retrofit' appropriate designs is related to planning approval legislation that, in turn, is linked to the economic climate and local councils' interest in enforcing improvements. The role of the Boards, through their catchment plans, is to ensure consistency across all Local Government areas in the catchments and strengthen the connection with their own environmental plans.²⁵

4.45 The Catchment Water Management Boards have invested significant funds in installing gross pollutant traps, silt traps and trash racks. These devices intercept gross pollutants and silt before they enter the Gulf. Since 1996 more than 5000 tonnes of gross pollutant solids have been prevented from reaching Gulf St Vincent.²⁶

Torrens and Patawalonga Catchment Water Management Boards

4.46 The Torrens and Patawalonga Catchment Water Management Boards together cover catchments with a total area of about 800 km² which accommodate a population of around 700 000 Adelaide metropolitan and hills residents. The rural and urban runoff from these catchments has an impact on the Port River and the waters of the Gulf, adjacent to the Adelaide metropolitan area.

4.47 The Boards' objectives include the removal of solid and dissolved impurities from catchment water currently discharging to the Gulf to improve both inland and marine aquatic environments and to allow for reuse of stormwater where possible. The Boards are working towards these objectives through the implementation of a range of initiatives including construction of physical works, education programs and planning measures.

4.48 In the urban areas, wetlands and gross pollution traps have been constructed whereas in the rural parts of the catchment, fencing and revegetation of watercourses, in partnership with landholders, has been the major focus of the Boards' physical works programs.²⁷

4.49 A joint initiative of the Torrens Water Catchment Management Board and the Cities of Port Adelaide Enfield, Prospect, and Charles Sturt, is the Northwest Region Pollution Prevention Project - or more commonly - the "Street Smart - River Clean" project. This project is aimed at improving the stormwater management practices of

24 Office of Catchment Water Management Boards, Submission 3, Attachment, p 4.

25 Office of Catchment Water Management Boards, Submission 3, Attachment, p 5.

26 South Australian Government, Submission 45, p 23.

27 Office of Catchment Water Management Boards, Submission 3, p 1.

the approximately 9000 businesses and industries within the Port River and environs. It involves a team of 6 project officers circulating among Port Adelaide businesses, talking to them about stormwater issues and working with them to solve any stormwater pollution problems or other environmental management problems that they may have.²⁸

Wetlands

4.50 Wetlands act as a self-sustaining natural filtration and water treatment system. The reed beds, open water (shallow and deeper), sedimentation ponds and gross pollutant traps are all part of a system designed to maximise the removal of pollutants from stormwater by retaining flows for as long as possible — desirably, a minimum of ten days. As flow rates are reduced, sediments and pollutants settle out, organic matter is consumed by aquatic organisms, and nutrients are taken up by aquatic plants. Outflows from wetlands are usually of excellent quality, enabling reuse for aquifer recharge and storage, irrigation or commercial uses.²⁹

4.51 There can be some difficulty in accessing land to construct wetlands that are large enough to deal with stormwater from an entire catchment.

One of the problems [the Patawalonga Catchment Management Board has] is to find suitable land space to be able to introduce the size of the wetland required that would equate to the size of the Patawalonga Basin, which has been basically the settlement area. There is not a huge amount of land available unless the government, of course, is prepared to pay a lot of money to get some of that land made available.³⁰

4.52 There are other constraints on the construction of wetlands apart from the availability of land. The Committee was told that wetlands were required to improve stormwater flowing into the Patawalonga Lake but adequate wetlands cannot be constructed at the end of the catchment because of the airport bird strike issue.³¹

4.53 There is also the difficulty for the catchment boards of being unable to control various land uses. An article in the December 1999 issue of “Patawalonga Water”, reports that the Adelaide City Council effectively ruled out any hope of developing an urban wetland in the South Park Lands in favour of sporting and recreational uses.³²

28 Torrens and Patawalonga Catchment Water Management Boards website at <http://www.cwmb.sa.gov.au/programs/ssrc>.

29 City of Salisbury website at <http://www.salisbury.sa.gov.au/environment/wetlands.htm>.

30 *Proof Committee Hansard*, Adelaide, 3 February 2000, pp 58-59.

31 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 49.

32 *Patawalonga News*, Patawalonga Catchment Water Management Board, December 1999, p 2.

Northern Adelaide and Barossa Catchment Water Management Board

4.54 The Northern Adelaide and Barossa Catchment Water Management Board has a total catchment area of approximately 2000 km². The catchment drains into the Gulf and the Barker Inlet. In partnership with key stakeholders, the Board will implement a program of works and management initiatives to ensure the sustainable use of water resources and the preservation and enhancement of associated ecosystems. The Board has a direct concern with the ecology of the Barker Inlet and invests significant funds on environmental improvement programs within the catchment to minimise the impact of development on the marine environment.³³

Onkaparinga Catchment Water Management Board

4.55 The Onkaparinga Catchment Water Management Board is responsible for an area of approximately 920 km² with a population of over 174 000. The Board's Catchment Water Management Plan is being prepared. It, and a Water Allocation Plan for the McLaren Vale Prescribed Wells Area, provide the basis for the operations of the Board for five years, commencing July 2000.³⁴

4.56 All of the catchment boards are introducing a range of capital works programs to improve the quality of stormwater that flows into the Gulf. The boards have developed wetlands which, depending on their design, can absorb 50-80% of pollutants from stormwater runoff before it enters the Gulf. The wetlands also reduce sediment loads. According to the South Australian Government, the greatest contribution of the catchment boards is to invest in capital works that can remove gross pollutants and sediments from stormwater discharges to the Gulf.³⁵

Criticisms of the catchment boards

4.57 The Committee heard that whilst witnesses praised the work of the Catchment Water Management Boards, there was some feeling that with the formation of the Boards, the South Australian Government was distancing itself from responsibility for water quality and that there are limits on actions which the Boards can take because they are answerable to the State Minister for the Environment:

It appears to us that a great level of responsibility is now being passed on to the catchment management board and handballed away from the government and its various authorities to be put fairly and squarely on the shoulders of the catchment management board to try to rectify some of the problems. I think they should be concerned about that.³⁶

33 Northern Adelaide and Barossa Catchment Water Management Board, Submission 13.

34 Onkaparinga Catchment Water Management Board, Fact Sheet No. 1.

35 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 9.

36 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 59.

4.58 There was also concern that the South Australian Government lacks faith in total catchment management:

The South Australian government has made a major commitment to total catchment management. It is evidenced by the number of catchment management boards which have been set up in this State now, the latest being one in the arid areas. The construction of the Barcoo Outlet will clearly indicate to the levy paying community that total catchment management is not the solution to the problems of water quality in receiving waters. In addition to their catchment levy which they pay, they will as taxpayers now fund the \$20 million pipeline to divert all stormwater straight out to sea.³⁷

4.59 In some instances, frustration was expressed that although the local councils manage wetlands the catchment boards are not accountable to them but to the State Government:

The establishment of the water catchment boards, whilst in principle is something that the councils have no problem with – and, in fact, I think would be generally supportive of – has also meant that the body now tends to establish policies and strategies for the prevention of further pollution of the waters is not accountable to the councils but, rather, to the state government; that is the catchment boards themselves.³⁸

4.60 Wakefield Regional Council praised the Water Management Catchment Boards, yet made the comment that:

Unfortunately much of the work is long overdue and it will take many decades to resolve problems. There must be continual and ongoing commitment by Government to these programs ... so that long term solutions can be developed without fear that a project may only be partly completed before funding ends.³⁹

Local Government

4.61 Local Councils have invested in a range of measures aimed at improving the marine environment in their jurisdiction. The Committee heard that there were many frustrations for Councils in not being able to control activities that affected their council areas. Development decisions too are made which have adverse impacts in areas of local council control.

The reality is that our council can only do so much because we are only in control of a portion of the area where discharge occurs and, secondly, we are only in control of matters that local government has direct control over.

37 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 50.

38 *Proof Committee Hansard*, Port Adelaide, 4 February 2000, p 76.

39 Wakefield Regional Council, Submission 15, p 3.

For example, the Bolivar treatment plant is a State government responsibility and we have no control over that.⁴⁰

4.62 Some of the activities undertaken by Councils who made submissions to the inquiry and which are expected to improve the state of the environment of Gulf St Vincent appear below. The Committee did not receive evidence from all Councils whose areas have an impact on the Gulf.

City of Adelaide

4.63 Accepting that it has a role in the state of the environment of Gulf St Vincent, the Council has endorsed the following actions:

- undertaking a feasibility study with catchment boards, SA Water and other Councils into the reuse of waste water from the Glenelg Waste Water Treatment Plant;
- investigating the effective use of sewage closer to source in the City;
- investigating the recycling and reuse of Adelaide Aquatic Centre water;
- implementing a stormwater pollution prevention education program with the catchment boards;
- installing gross pollutant traps to prevent hard rubbish from entering the waterways and ending up in the Gulf; and
- investigating stormwater retention options for domestic and commercial buildings in the City.⁴¹

City of Onkaparinga

4.64 The Onkaparinga Council has made a commitment of working to restore and enhance the environment in partnership with its community as well as relevant government and non-government institutions. The environmental strategies include:

- the development of a coastal management plan with a key focus on the sustainable use and management of the coastal environment; and
- the implementation of partnership projects which improve the quality of water entering Gulf St Vincent with a major focus on catchment management initiatives, including those which may be located in areas beyond the coast.⁴²

4.65 Management approaches include:

40 *Proof Committee Hansard*, Port Adelaide, 4 February 2000, p 74.

41 City of Adelaide, Submission 18, p 4.

42 City of Onkaparinga, Submission 36.

- limited pedestrian access to beaches;
- fencing of sensitive dune areas together with vegetation;
- community information, education and involvement;
- examination of cliffs to ensure safety and identify future measures;
- litter control;
- development and promotion of visitor/tourist features along the coast consistent with education and care of the marine environment;
- stormwater management for sustainable use of stormwater and protection of the marine environment; and
- water sensitive design in urban coastal environments.

City of Salisbury

4.66 The City of Salisbury has for many years been active in the development of wetlands, riverine corridors and innovative environmental strategies to address the decline of urban waterways and the receiving waters of the Barker Inlet. Council has a general vision to work towards the elimination of all polluted wastewater from entering the marine environment.

4.67 In 1984, the City of Salisbury established the St Kilda Mangrove Trail which is the longest such trail in the world. It, and the attached Interpretive Centre, draw attention to the coastal ecology, provide environmental education and attract over 20 000 visitors annually.

4.68 Wetlands are an integral component of stormwater drainage systems in the City of Salisbury and are being developed as part of the drainage infrastructure wherever opportunity permits. Nearly 30 wetlands are operating constructively in the Salisbury area.⁴³ These wetlands range from small, simple stormwater detention ponds, to a complex system extending over 114 hectares. Where practicable, wetlands are included and integrated into the drainage of new subdivisions, providing landscape enhancement, water quality improvement and a reduction in peak stormwater flows.⁴⁴

4.69 The Council is also investigating aquifer storage and recovery of wetland water. A feasibility trial, conducted at the Paddocks Wetlands by Council and Mines and Energy, South Australia, demonstrated that significant volumes of good quality water could be harvested and stored this way. During the high rainfall period in winter, excess stormwater filtered and cleaned by the wetlands, is pumped into the aquifer, 164 metres below the ground. During the dry summer, the water is recovered,

43 *Proof Committee Hansard*, Port Adelaide, 4 February 2000, p 77.

44 City of Salisbury website at <http://www.salisbury.sa.gov.au/environment/wetlands.htm>.

as needed, to irrigate the sports fields and turf areas of the paddocks. This eliminates the demand on mains water for irrigation.⁴⁵

4.70 The Committee was told that the quality of the aquifer storage and recharge water is exceeding the quality of mains water in areas such as salinity. An average of approximately 80 megalitres of the water per year is used for irrigation of recreational areas.⁴⁶

Barker Inlet Summit

4.71 In March 1999, the Salisbury Council held a one day “Barker Inlet Summit” which provided a vehicle for the presentation of research results on the decline of key aspects of the ecosystem of the Inlet. One of the outcomes of the Summit was the formation of the Barker Inlet Port Estuary Committee (BIPEC).

4.72 The objectives of BIPEC are to:

- coordinate, oversee and provide the strategic development of a regional management planning program; and
- facilitate a comprehensive review of the existing regulatory and institutional framework relating to the Barker Inlet Port River Estuary in order to determine its adequacy and suitability in addressing the multitude of complex environmental, economic, recreational and land use problems.

4.73 BIPEC is presently seeking funding from the relevant catchment boards to undertake the review of the current institutional management frameworks for the area. When BIPEC achieves its objectives it should have a positive impact on both the Barker Inlet area and the Gulf. BIPEC hopes to come up with a model of legislative and management instruments that can be applied not only to Barker Inlet but also to other areas such as Gulf St Vincent.⁴⁷

City of Port Adelaide Enfield

4.74 The City of Port Adelaide Enfield carries out similar programs to Salisbury. It also employs three officers who are currently engaged in an education program with industry. They focus on industrial discharges and encourage industry to look at other ways of dealing with industrial pollution. The City’s total program for Coastcare, Waterwatch and education is in excess of \$300 000 - \$400 000 per annum.⁴⁸

45 City of Salisbury website at <http://www.salisbury.sa.gov.au/environment/water.htm>.

46 *Proof Committee Hansard*, Port Adelaide, 4 February 2000, p 79.

47 *Proof Committee Hansard*, Port Adelaide, 4 February 2000, p 86.

48 *Proof Committee Hansard*, Port Adelaide, 4 February 2000, p 78.

4.75 In the City of Port Adelaide Enfield most of the stormwater channels have gross pollutant traps in one form or another and most of the new urbanised areas have stormwater catchment detention areas which would have gross pollutant traps as part of the process. Aquifer recharge as part of the process to remove stormwater from going into the stormwater channels is also being considered by the Council.

4.76 The evidence put to this inquiry suggests that many efforts are now being made to address the problems of water quality, the protection of the coastal environment and of the wildlife supported by Gulf St Vincent. It will be some time before the results of those efforts can be appreciated. However, the Committee is of the view that the outcome would be more positive if there was greater coordination of the efforts being made by various agencies. Accordingly,

Recommendation 12

The Committee recommends improved mechanisms for liaison between State and local government agencies in relation to the management of Gulf waters and the coastal environment of the Gulf.

Recommendation 13

The Committee recommends that representatives of the Catchment Water Management Boards, local Councils and relevant State government agencies meet at regular intervals to discuss and implement an integrated approach to programs aimed at improving water quality and the general environment of the Gulf.

Monitoring programs

4.77 The Environment Protection Agency undertakes monitoring programs in the Gulf environment. These programs include:

- water quality monitoring along the metropolitan bathing waters and the Port River estuary. Samples are collected monthly for key characteristics including nutrients, heavy metals, chlorophyll, and indicators of faecal contamination. Based on this data water quality of these areas has been classified as moderate;
- a routine sediment monitoring program in the Port River estuary. Samples are collected every six months and analysed for heavy metals, pesticides and organochlorines. The results generally indicate low levels of sediment contamination;
- hot spot monitoring to assess localised impacts. For example, the detection of elevated levels of PCBs in dolphins in the Port River area prompted a survey of

local stormwater drains to determine if PCBs are entering the waterways from that source;

- aerial photography is used to assess changes in seagrasses over the last 50 years;
- satellite imagery has been used to assess changes to seagrasses; and
- regular surveying of the temperate reef systems off the Adelaide coast to assess their condition.⁴⁹

4.78 Local councils too are engaged in extensive water monitoring programs of their waterways and stormwater systems.

Audits

4.79 In 1999 the Environment Protection Agency undertook an audit of industries, of slipways and other boat type activities in the immediate vicinity of the Port River. The results of these findings were not available to the Committee as they had not been released by the Minister. A more complete audit of industries in the area is currently being done.⁵⁰

4.80 The Committee recognises the need for ongoing monitoring and evaluation of the programs aimed at improving water quality and conserving the Gulf environment that are currently in place. Catchment Water Management Boards for example are involved in a number of programs and it is essential that these be properly monitored and evaluated so that those that are achieving results can be duplicated elsewhere and the others improved.

Recommendation 14

The Committee recommends that the Federal and South Australian governments provide increased funding for the monitoring and evaluation of programs aimed at cleaning up the waters and environment of the Gulf.

Education and awareness raising programs

4.81 All levels of government are involved in programs designed to raise awareness of the need to protect the coasts and waterways of Australia. Waterwatch is a national community water quality monitoring program. A range of physical, chemical and biological parameters are monitored. The South Australian Office for Waterwatch is located in the Environment Protection Agency. Funding support for

49 Environment Protection Authority, Submission 40, pp 2 & 3.

50 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 7.

Waterwatch comes from the Natural Heritage Trust, the State Government, Catchment Water Management Boards and Local Councils.⁵¹

4.82 A number of the agencies interested in the protection of the Gulf environment are involved in programs designed to raise the awareness of the community relating to threats to the Gulf, its wildlife and its surroundings. In 1997 the Environment Protection Authority produced *Protecting Gulf St Vincent: A statement on its health and future* which was targeted at the general community to raise awareness about some of the problems facing the Gulf and what is being done about these problems. A similar pamphlet - *Cleaning up the Port Waterways, A strategy to protect and restore the waters of the Port River, West Lakes, North Arm and Barker Inlet* - was released in relation to the Port River and surrounds.

4.83 The City of Salisbury has initiated and promoted the Yellow Fish Project whereby all the drains within the city will be marked with a yellow fish to remind people that the water ultimately ends up in the sea and will affect fish life. The Council too engages stormwater project officers who primarily focus on industries. The aim is to ensure that the polluted runoff from industries goes into wetlands rather than straight down the drain.

4.84 The Patawalonga and Torrens Catchment Water Management Boards conceived of the "WaterCare" program which is designed to accelerate behavioural change. WaterCare is a generic education campaign that will tell people about the state of the waterways and provide practical ways for individuals and businesses to help clean and protect them.

4.85 "Our Patch" is a hands-on program which encourages the community to be involved in activities to help clean up waterways. People monitor the health of their local waterway, revegetate the area with locally indigenous plants, remove weeds, pick up litter and generally care for the area. The program provides workshops, free seminars and field days as well as small grants and technical advice.

4.86 The Northern Adelaide and Barossa Catchment Water Management Board has a "Yellow Fish Road program" coordinated by Waterwatch throughout the Northern Adelaide and Barossa Catchment Water Management Board region. This program is a stormwater awareness program which involves stencilling yellow fish on drains followed up by letter box drops, the use of car bumper stickers and posters which explain the significance of the yellow fish. Volunteers such as scouts, girl guides, schools and community groups are encouraged to help prevent water pollution by joining the program and becoming involved.⁵²

4.87 Reef Watch is an environment-monitoring program which is run by the community and coordinated by the Conservation Council of South Australia Inc.

51 EPA News, Issue 1, 1999, p 15.

52 City of Salisbury website at http://www.salisbury.sa.gov.au/whats_new/yellowfish_launch.htm.

Recreational divers gather data about the health of the reefs they dive on. Diver involvement develops community awareness about the state of reefs and triggers action for their protection. The majority of the funding is provided by Coastcare with additional support from the Environment Protection Agency of South Australia. The Committee was told:

In terms of Reef Watch itself, whilst it is a marvellous educational tool getting recreational divers to think about what it is that they are diving on and looking at and also a good tool for collecting data, it should not be the only thing that an agency relies on, other than occasional surveys by scientists. There really is a need for much more widespread and detailed monitoring in the Gulf, particularly in an area of such high impact which the State relies on so much economically.⁵³

4.88 The Committee commends all the groups involved in educating the community about the importance of the Gulf to South Australia and the need to protect its waters and coastal areas. Some of this effort is concentrated in schools. In the Committee's view it is vitally important to identify the older age groups that may be missing out on education programs about the state of the Gulf and to target information at them.

Recommendation 15

The Committee recommends that all levels of government increase the level of resources currently available for raising awareness of the environmental threats to the Gulf and for community education programs about possible solutions to some of the pollution and degradation problems.

Tourism potential of dolphins

4.89 Most people find dolphins highly "charismatic" animals and they are the focus of tourism in many parts of the world. In almost all cases the dolphins are either wild animals seen from a boat, or a small group of trained dolphins which have been lured to a tourist destination for a feeding demonstration. In both cases the dolphins' natural behaviours are impacted on by the tourism and there is the potential for this impact to be detrimental to the well-being of the dolphins.

4.90 Adelaide's Port River is home to a substantial colony of resident dolphins as well as to frequent visiting animals. According to Dr Mike Bossley from the Australian Dolphin Foundation, the relative narrowness of the river provides an internationally unique opportunity for shore-based tourists to view the animals in a totally non-intrusive manner.

53 *Proof Committee Hansard*, Adelaide, 3 February 2000, p 20.

4.91 Dr Bossley believes that there is a substantial opportunity for a dolphin-based eco-tourism operation to be developed. Ideally this would involve an interpretive centre on the river bank which could be linked electronically to passive underwater microphones which could give the location of any dolphins in the area. The centre could also have electronic displays which can be updated from information obtained by observers out in the field.

4.92 The “authenticity” of the experience would be enhanced by the provision of background information on individual dolphins which has been obtained from 13 years of monitoring of individual dolphins in the area. This would mean that when dolphins swim past, the tourists would see not just generic dolphins but would be able to identify individual animals with a known life history.

4.93 The Committee supports this type of development and believes it could generate useful tourist dollars for the area as well as play a valuable educational role. It would very much depend however, upon the success of the clean-up programs for the Port River and its environs in order to ensure the continued existence of the resident dolphins and other visiting animals in the area.

Senator Lyn Allison

Committee Chair

APPENDIX 1

LIST OF SUBMISSIONS

1	Confidential
2	South Australian Federation of Residents & Ratepapers Associations Inc (SAFRRA) Inc.
2a	South Australian Federation of Residents & Ratepapers Associations Inc (SAFRRA) Inc.
3	Office of Catchment Water Management Boards
4	Mr David Kirner
5	Mr Stephen E. Jones
6	Mr Alex Wyschnja
7	Mr Ray Phillips
8	Ms Margaret Whyte
9	A.Denis Story
10	Mr William R. Catherry
11	Dublin & District Ratepayers Association
12	City of Salisbury
13	Northern Adelaide and Barossa Catchment Water Management Board
14	Mr J.M. Moller
14 a	Mr J.M. Moller
15	Wakefield Regional Council
16	City of Port Adelaide Enfield
17	South Australian Recreational Fishing Advisory Council Inc (SARFAC)
18	City of Adelaide
19	Marine Life Society of South Australia Inc
20	Friends of (Living) Christie Creek Inc. FO(L)CC
21	Community Action for Pelican Point
21a	Community Action for Pelican Point
22	Henley & Grange Dunecare
23	Dr John R. Hails
24	Port Adelaide Resident's Environment Protection Group
25	CSIRO Environmental Projects Office

26	Dump Coalition South Australia
27	The Australian Dolphin Research Foundation
28	Cheetham Salt Limited
29	Jill and Reg Stewart
30	Confidential
31	Yorke Regional Development Board
32	Barker Inlet Port Estuary Committee (BIPEC)
32a	Barker Inlet Port Estuary Committee (BIPEC)
33	South Australian Fishing Industry Council Inc
34	Mrs Barbara Hardy AO
35	South Australian Opposition
36	City of Onkaparinga
37	Prawn Industry South Australia
38	Yorke Peninsula Tourist Association
39	Henley and Grange Residents Association
39a	Henley and Grange Residents Association
40	Environment Protection Authority
41	Mr Peter Lecons
42	District Council of Mallala
43	Defence Estates Organisation SA
44	City of Charles Sturt
44a	City of Charles Sturt
45	South Australian Government
46	City of West Torrens
47	Conservation Council of South Australia
48	E.B. Potter
48a	E.B. Potter
49	Ms Michelle McConnell
50	Ms Eve Nuari
51	Mr Renaldo De Panfilis
52	Mr Antonio De Panfilis
53	Mr Brett Stephens
54	Ms Alice Jones

55	Ms Jill Jones
56	Mr Mathew Jones
57	Ms Rebecca Penny
58	J. Farrugui-Gay
59	Ian & Leona J. Polley
60	Mr Peter Judd
61	P. Hackett
62	K. Oettel
63	Mr Dudley Kemp
64	Mr Robert W. Henschke
65	A.P. Lange
66	Mr Richard W. Henschke
67	Mr Graham Mossop
68	Ms Kym Penny
69	R. Kelly
70	Ms Ann Du Bois
71	Ms Yvonne James
72	H. Arthur
73	J.M. Secomb
74	W.L. Hecker
75	B. Alexander
76	C. Walker
77	R.G. Potter
78	Mr Ross Burley
79	Mr Mark Girndt
80	Mr Kurt A. Girndt
81	Mr Joe Librandi
82	S. Oliver
83	Mr Keith Van Deraa
84	Mr Tim Taylor
85	P. Tsilofos
86	Ms Jane Lindner-Gould
87	Mr Willam Anderson

88	Mr M.P. Pratt
89	Mr Gary Linder
90	Mr B.D. Bowden
91	Mr Chris Hieatt
92	Mr R. Wihelm
93	Mr J. D. Starks
94	Mr A. Becht
95	Mr Peter D. Lisford
96	Mr R.J. Harris
97	Mr Gavin Stevens
98	Mr Robert Dorigo
99	Mr Vince Atanasoy
100	Ms Kathy von Bertouche
101	Ms Julie von Bertouche
102	Ms Carolyn Potter
103	D.L. Clarke
104	Ms Wendy Pfeifer
105	W.H. Pfeifer
106	A. Malpass
107	Mr Trevor Ball
108	Mr/Ms Buckley
109	Ms Sheree Ismonger
110	Ms Elizabeth Buckley
111	Ms Tanya Ryan
112	R. Hunt
113	S. Hunt
114	Mr Jim Skewes
115	Ms Carol Skewes
116	Ms Alison Mary Skewes
117	Mr Damian Rouse
118	Mr Kevin Duffy
119	Dulcie Skewes
120	Ms Louise Eldridge

121	Mr Brett Eldridge
122	B.J. Read
123	Mr Jack F. Webb
124	Ms Sharon Clark
125	Ms Joan Anderson
126	Mr David John Tillson
127	Val Bamford
128	D.R. Tiller
129	Macoll May
130	Mr William E.B. Witt
131	Ms Deborah Stewart
132	Robin Manley
133	Ms Yvonne Webb
134	D. Mc Pharlin
135	Jory Robertson
136	Mr Rob Bielby
137	Ms Grace Blacket
138	A.J. Stewart
139	C.W. Blacket
140	Mr Peter Hall
141	Ms Jessica Jones
142	Ms Rebecca Jones
143	Ms Natasha Anne Jones
144	Ms Tania Jones
145	George and Doreen Jones
146	N.B. & W.E. Gubbin
147	D. Voigt
148	Mr Graeme Cordes
149	Ms Sandara E. Witt
150	Mr Melvyn Zerk
151	Jo May
152	Ms Lorraine Jenner
153	Ms Dawn Nottle

154	Mr Ian Dixon
155	Ms Marie Dixon
156	Ms Sue Schutz
157	L.J. Klingner
158	Ms Daphne Fiegert
159	Ms Jessica Moore
160	Dale Gathercole
161	Ms Susanna Tilly
162	P.E. Holloway
163	Ms Lyn Urwin
164	Mr David Burford
165	B. Clark
166	Mr John Shepherd
167	K. Gould
168	Mr Ben Mudge
169	Mr Peter Johnson
170	Ms Anne Collins
171	R.A. Hellyer
172	M.J. Thiele
173	Mrs Andrea Rundle
174	A. Smith
175	Ms Mandy Shepherd
176	Ms Bernice Zerk
177	Ms Andrea Roberts
178	K. Turner
179	B. Dahl
180	A. Runeckles
181	Ms Carolyn Goldney
182	Ms Cathy Buckley
183	Shoama Summers
184	Ms Michelle Singleton
185	Kevyna Gardner
186	R. Renfrey

187	Mr Lloyd Morean
188	Mr Paul Bezzino
189	Ms Deidre Grace
190	Ms Sheila Clifton
191	Mr David Hunt
192	R.E. Hunt
193	L.A. Hunt
194	Carradean Farley
195	Juzetta Farley
196	Mr David Farley
197	Ms Karen Hunt
198	Mrs Carole Rossier
200	Mr Mitchell Elliot
201	Mr Barry Loechel
202	Mr Barry John Nottle
203	Mr Steven Hunt
204	Mr Malcolm L. Hart
205	K. Philbey
206	Mr D.W. Lines
207	Ms Marina Bozzetti
208	Mr Robert Hart
209	Ms Christine Hornby
210	Mr Barry K. Peek
211	Mr Chris Belcher
214	Mr Michael Austen
215	Mr J.A. Dyer
216	B. Glendinning
217	R. Brandford
218	Mr Adam Brandford
219	Mr Jonathan Porter
220	Mr Peter R. Moochra
221	Ms Anthea Moochra
222	B.C. & C. Aldhouse

223	Mr Christos Lasraridis Argiri
224	Mr Lee Slater
225	M. Grandison
226	R. Grandison
227	Mr Mark Earl
228	Ms Barbara Miller
229	Mr Lionel H. Miller
230	Mr Robert Taylor
231	Barb Taylor
232	Mr Robert Rylander
233	Mr Roberty Sabey
234	Ms Sheila Weatherill
235	Mr David Weatherill
236	Mr Peter A. Ryan
237	Ms Patricia Smith
238	Kathleen A. Ryan
239	Mrs Kerry J. Rylander
240	Mr John Bell
241	Ms Gwen Bell
242	Mr John Girdler
243	Ms Elly Girdler
244	Mr Ray Brosbow
245	Mr John Waters
246	Mr Michael Peter Ryan
247	Ms Karen S. Sobey
248	Ms Megan Jacka
249	Mr Kevin W. Sobey
250	Mr Tony Pym
251	Ms Leah Thomas
252	A. Robertson
253	Mr Paul Herbert
254	Mrs G. Millward
255	Mr Craig Goldney

256	K.B. Julyan
257	Mr Glenn Lane
258	Ms Tracy Lane
259	R. Rankin
260	M.G. Tiller
261	Ms Kirsty Paterson
262	M.K. Heaslip
263	A. Hearnden
264	Ms Jenny Sheperd
265	Ms Jessica Patersson
266	Ms Robin Gail Cooper
267	T. Wickliam
268	Ms Michelle Bran
269	J. Parker
270	J. Hancock
271	Mr Neil Anderson
272	R. Alsop
273	Ms Rebeka Nyland
274	R.G. Vigar
275	Ms Helen Saboth
276	Mr Rex Penna
277	Ms Jean L. Neuman
278	J.W. O'Hara
279	Mr Michael Nyland
280	Mr Terry Gibbons
281	Mr Mark Reynolds
282	Ms Wendy Stone
283	Jo Williame
284	H.J. Ramsell
285	Mr Mike Clishy
286	Mr Stephen Lawrie
287	Mr Way McCreight
288	Ms Carowl Lawrie

289	Ms Suzanne McCreight
290	Mr Sam Davidson
291	M.A. Gregor
292	Ms Sascha Mudge
293	Mr Simon Gill
294	Ms Megan Mudge
295	Ms Anita Coleman
296	R.W. Tiller
297	Mr Andrew McCreight
298	Ms Leah Aphi
299	Mr Colin Jenner
300	Miss Francis Rhodes
301	Ms Deb Robertson
302	Mr Kenneth James Anderson
303	Ms Diane Modlowski
304	Mr Gary Tracker
305	Mr Angus Mudge
306	Mr John Jennings
307	Ms Lynne Jennings
308	Ms Sally Dajkovic
309	Erin Harrald
310	Ms Vicki Power
311	Dr Sarah Marshall
312	Mr/Ms Cork
313	Ms Sarah O'Neill
314	Ms Debbie Adams
315	Mr Greg May
316	Dr Mitra Arimi
317	Ms Leisha Mulligan
318	Mr James Boradbont
319	Mr Steven Ashley
320	M. Keen
321	Ms Julie Forbes

322	D. Heitton
323	Ms Kay Gough
324	Ms Iolanda Riva
325	Diane Davis & Malcom Lavars
326	Mrs Dev Henderson
327	Mr David Bourn
328	Ms Barbara Reid

Submissions 48-328 were in the form of a standard letter. Some names may have been misspelled because of handwriting which was difficult to read.

APPENDIX 2

INDIVIDUALS WHO APPEARED BEFORE THE COMMITTEE AT PUBLIC HEARINGS

Thursday, 3 February 2000, Adelaide

Government of South Australia (Submission 45)

Dr John Cugley, Principal Adviser, Water Quality, Environment Protection Agency

Dr Gary Morgan, Director of Fisheries, Department of Primary Industries and Resources

Mr Vic Neverauskas, Manager, Marine Habitat Program, Department of Primary Industries and Resources

Mr Robert Thomas, Executive Director, Environment Protection Agency

Mr Robert Thomas, Project Director, Environment Improvement Program, SA Water

Mr Robert Tucker, Manager, Coast and Marine Section, Environment Protection Agency

Conservation Council of South Australia (Submission 47)

Mr James Brook, Marine Campaigner

Mr Anthony Flaherty, Regional Coordinator, Marine and Coastal Community Network

Ms Michelle Grady, Executive Officer

Australian Dolphin Research Foundation (Submission 27)

Dr Mike Bossley

Yorke Regional Development Board (Submission 31)

Councillor Barry Nottle, Board Member

Ms Derryn-Lee Gladwin, Business Development Manager

Wakefield Regional Council (Submission 15)

Councillor Barry Nottle

Mr Robert Veitch, Environmental Services Manager

South Australian Fishing Industry Council (Submission 33)

Mr Jeff Wait, Alternate Director

South Australian Recreational Fishing Advisory Council (Submission 17)

Mr Terry Mitchell, Metropolitan Recreational Fishing Committee
Secretary

Mr Trevor Watts, Project Officer

Prawn Industry South Australia (Submission 37)

Mr Alistair McFarlane, Independent Chairman, Gulf St Vincent Prawn
Boat Owners Association

Mr Martin Smallridge, Executive Officer

City of Charles Sturt (Submission 44)

Councillor Harold Anderson

Mr Andrew Craig, Acting City Engineer

Mrs Pat Harbison, Consultant, pH Environment

Henley & Grange Dunecare (Submission 22)

Mr Mark Pierson, Deputy Chairperson

Henley & Grange Residents Association (Submission 39)

Ms Kathleen Barrett, Vice-President

Mr Jim Douglas, President

Mr Jack Moller (Submission 14)**Dr John Hails** (Submission 23)**Dublin and District Ratepayers Association** (Submission 11)

Mr Stephen Jones, Vice President

Mrs Christine Lawrence, President

Mrs Wendy Pfeifer, Secretary

Inkerman Proposed Landfill Action Group (Submission 30)

Mrs Jill Stewart, Secretary

Mr Reg Stewart, Member

Mr Reuben Webb, Chairperson

Mrs Yvonne Webb

Friday, 4 February 2000, Port Adelaide**City of Port Adelaide Enfield** (Submission 16)

Mr Paul Davos, Director, Environmental Services
Mayor Johanna McLuskey

City of Salisbury (Submission 12)

Mr Hemant Chaudhary, Manager Project Services, Environment
Mr Harry Pitrans, Manager, Infrastructure Planning
Mayor Tony Zappia

Barker Inlet Port Estuary Committee (Submission 32)

Mr Jon Emmett, Catchment to Coast Project Officer, City of Port Adelaide Enfield
Mr Anthony Flaherty, Regional Coordinator, Marine and Coastal Community Network
Mrs Pat Harbison, Chairperson
Mr Harry Pitrans, Executive Officer

Port Adelaide Resident's Environment Protection Group (Submission 24)

Mr Tony Bazeley, Treasurer
Mr David Case, Member

Community Action For Pelican Point (Submission 21)

Ms Gwen Moore, Co-convenor
Ms Anni Telford, Co-convenor

APPENDIX 3

ADDITIONAL DOCUMENTS RECEIVED BY THE COMMITTEE

Australian Dolphin Research Foundation - Submission 27

Fax from Mike Bossley, dated 1 May 2000.

Barker Inlet Port Estuary Committee - Submission 32

Small boat chart, Gulf St Vincent, South Australia, Department of Transport, Marine and Harbors Agency.

City of Charles Sturt - Submission 44

Extract from Torrens Comprehensive Catchment Water Management Plan - 7.3 *Reductions in Pollutant Discharge to Gulf St Vincent*, pp 7-5 & 7-6.

Fourth amendment to the Assessment Report, For the Environmental Impact Statement (as amended) for the Glenelg Foreshore and Environs, Barcoo Outlet Proposal (West Beach), Planning SA, January 2000.

City of Port Adelaide Enfield - Submission 16

Laminated aerial photograph of the Port River Estuary/Barker Inlet.

Conservation Council of South Australia - Submission 47

A New Coastal and Marine Planning and Management for S.A.?, article from *South Australian Regional Ripples*, Vol 6, Number 1, Autumn '99, May 1999.

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Overheads: 10 Year Seagrass Protection Plan

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Appendix 2 - Recommended SA Marine Fish Species for Protection, from *Conserving Marine Biodiversity in SA*, Part 1 - Background Status & Review of approach to Marine biodiversity Conservation in SA, Dr K Edyvane, May 1999, pp 154-157.

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Some Marine Fish Species found in South Australian waters listed on the international Union for the Conservation of Nature Red List of Threatened Species, prepared by Tony Flaherty, MCCN (SA).

Vulnerable Mollusc Species in South Australia, collated by Tony Flaherty.

Inkerman Proposed Landfill Action Group - Submission 30

Overheads:

Special areas in Gulf St Vincent, Map 1.

Water Movements 1996, Map 3.

Leachate.

Land Fill Gas.

Photograph - View of Tidal Channel on the West of Highway One adjacent Inkerman Landfills.

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Notes of meeting held between Robert Veitch WRC's Building & Development Officer & Cr. Barry Nottle on 2/2/00 at Council Chambers.

Table: Status of water quality from Adelaide sewage discharges

Replies to adverse comment (see report, paragraph 1.5):

Letters from:

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Henson, G, General Manager, Mobil Refining Australian Pty Ltd, dated 17 December 1999.

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