# IMPACT OF SYDNEY'S DEEPWATER OCEAN OUTFALLS ON GARIE BEACH

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In 1990 and 1991 three deepwater ocean sewage outfalls were commissioned (Malabar in September 1990, North Head in December 1990 and Bondi in August 1991) to alleviate the problem of frequent fouling of many of Sydney's premier ocean beaches[1]. The main cause of the beach pollution was the discharge of inadequately treated sewage from nearby shoreline outlets.

The Sydney deepwater outfalls were sited a sufficient distance offshore so the waste field would be entrained in the predominant southerly, East Australia Current[2] and shoreline impacts would be minimised. But the implications of this alongshore transport in terms of ultimate contaminant fate are not fully understood[1,2].

A concern of environmental organisations and individuals was that disposing of effluent through deepwater ocean outfalls into strong offshore currents may result in the discharge polluting a long section of coastline[3]. The Review of Sydney's Beach Protection Program[2] provided some evidence that faecal contamination may be transported by winds and currents to areas which had been unaffected by sewage contamination, particularly to the south.

A primary cause for concern is the transportation of "beach grease" which may contain viruses and bacteria. Through their encapsulation in grease balls, pathogens are protected from sunlight and seawater, which usually cause die-off. Grease particles released through the deepwater outfalls will immediately come to the surface. Studies of wind-driven transport of floatables suggest grease particles discharged through the deepwater outfalls could still arrive at Sydney's beaches and be more widespread than before the commissioning of the deepwater outfalls[2].

Contact with or direct ingestion of small grease particles may present an acute public health hazard. Potential waterborne disease symptoms associated with swimming in faecally contaminated water include:

- gastrointestinal – vomiting, diarrhoea, abdominal pain and nausea;
- respiratory – throat infections, coughs, colds; and
- general – ear and eye infections, skin lesions and fever.

The Sydney Beach Users Study[4] provided evidence that the risk of illness from swimming increases with

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tracks and other facilities may encourage children away from these areas where collision with pedestrians or motor vehicles may result in injury or death. In the Hunter region councils and in-line skating groups have begun exploring possibilities for safe skating venues. In Eastern Sydney findings of this study are being fed back to local government officials.

## PUBLIC HEALTH ACTION AND RECOMMENDATIONS

Public health action in Eastern Sydney has consisted of media releases to inform people of the risk and nature of injuries and to advise skaters to wear protective clothing and avoid skating on roads. Further measures are needed to prevent or reduce injuries and potential deaths from in-line skating and future similar products. They include:

- a mechanism for the independent evaluation of the safety of new consumer goods, particularly those directed at children. The Australian Consumers' Association recommends a national consumer product safety commission to assess and police product safety standards[13]. Such an organisation has been operating in the US since 1973, reportedly substantially reducing injuries and injury deaths[13];
- the broadening of surveillance data to include product brand information;
- promotion of the usage of protective clothing at points of hire and sale and the provision of safety information (protective clothing usage, speed control, surfaces, legislation) on all product packaging; and
- provision of more designated skating venues to encourage children away from footpaths and roads. Multipurpose venues providing supervision of children by parents, skating or community groups could be promoted for a range of activities including in-line skating, rollerskating, skateboarding and future recreational/sporting pursuits.

## ACKNOWLEDGMENTS

Linda Christie, Project Officer, Injury Surveillance Unit, Prince of Wales Children's Hospital, Sydney; Denise Kaminski, Injury Surveillance Unit, John Hunter Hospital, Newcastle.

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13. Mackenzie J, editor. The Australian standard: flag of excellence or compromise? *Choice* 1992; 33(12):28-31.

## *Impact of ocean outfalls*

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pollution levels. The study found there was a consistent increase in the number of reported illnesses with increasing pollution levels for all symptom categories (respiratory, ear and eye) except gastrointestinal symptoms.

If the effluent field from the deepwater ocean outfalls can reach the surf zone of Sydney's beaches there may be sufficient concentrations of pathogens (despite dilution and die-off) to pose some health risk to water users through ingestion or contact. The Public Health Unit for Central and Southern Sydney therefore conducted a recreational water quality survey at Garie Beach before and after the commissioning of the deepwater ocean outfalls. The scientific objective of the study was to determine the impact of Sydney's deepwater ocean outfalls on the microbiological and visual quality of water at Garie Beach in the Royal National Park, south of Sutherland.

### METHODS

Garie Beach was chosen because it is a popular recreational area regularly used by swimmers and board riders who wish to avoid crowded and sometimes polluted city beaches and it is not affected by major sources of faecal pollution such as effluent discharges, urban run-off (except a large car park), sewer overflows, offshore shipping and recreational boating. Sewage from ablution facilities is removed by a pump-out system. Also, the area is within the simulated plume transportation predictions[2].

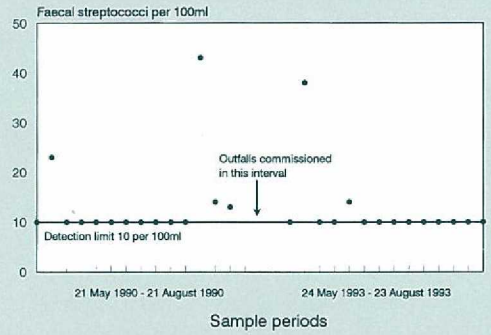
The plume would be expected to surface more frequently in winter[5] and waste fields from the deepwater outfalls may stay entirely away from the coast for weeks at a time, but may impinge on the coast during onshore wind and fortuitous current movements[2]. Two three-month winter monitoring programs, before and after the commissioning of the deepwater ocean outfalls, were conducted.

Three sample sites were selected from a 300m stretch of Garie Beach that encompassed the main swimming and surfing areas. Site 1 was directly below the stormwater drain outlet, Site 2 was below the car park area and Site 3 was 100m north of the surf lifesaving clubhouse.

Water samples were collected on a weekly basis from May 21, 1990 to August 21, 1990 and from May 24, 1993 to August 23, 1993. Each site was sampled by someone wading into waist-deep water, inverting a 250ml sterile plastic sample container and submerging it to a depth of 30-45cm. The container was turned upright, brought to the surface and recapped. While sampling, scrupulous care was taken to ensure the screw cap and neck of the bottle did not touch anything that could contaminate the sample. The samples were refrigerated at 4°C and transported to the NSW Health Department Division of Analytical Laboratories, Lidcombe, for faecal coliform and faecal streptococci analysis using standard methods.

**FIGURE 4**

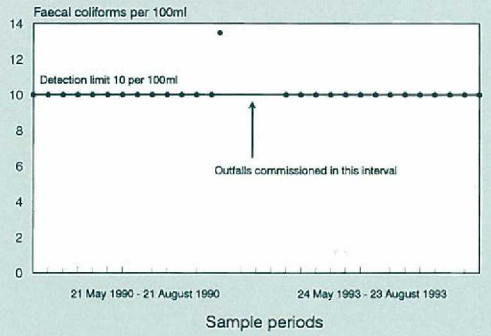
FAECAL STREPTOCOCCI CONCENTRATIONS*




*Note: each point is the geometric mean of three results

**FIGURE 5**

FAECAL COLIFORM CONCENTRATIONS*




*Note: each point is the geometric mean of three results

A visual inspection of the beach and seawater for the presence of material of sewage origin (e.g. faecal matter, beach "grease") was also conducted on the day of sampling.

Meteorological data were obtained from two weather stations, one to the north of Garie Beach (Sydney Airport at Mascot) and the other to the south (Wollongong). Wind direction and strength at 9am and 3pm were recorded the day before and at 9am on the day of sampling. Rainfall data were not collected as Garie is not subject to water pollution from urban run-off or sewer overflows.

### RESULTS

Eighty-four water samples were collected from Garie Beach during the period May-August 1990 and May-August 1993. Very low levels of faecal coliforms and faecal streptococci were detected during both sampling periods. There was little difference in faecal contamination between water collected before and after the commissioning of the deepwater ocean outfalls (Figures 4 and 5). Ninety-four per cent of samples tested for faecal coliforms were below the detection limits of

the laboratory (10 faecal coliforms per 100ml). Similar results were found for faecal streptococci, with 75 per cent of samples below the detection limits of the laboratory (10 faecal streptococci per 100ml).

The wind direction at Sydney Airport during the 1990 survey was predominantly a mild to moderate north-westerly. North-westerly winds occurred on nine days (64 per cent), south-westerly on four days (29 per cent) and north-easterly on one day (7 per cent). Similar results were recorded during the 1993 survey.

Equipment failure meant limited data were available from Wollongong weather station during the 1990 survey. Where data were available, westerly winds predominated. A similar wind pattern was recorded in 1993.

There was no odour or visual evidence of grease, faecal matter or stormwater pollution on any of the 28 days samples were taken during 1990 and 1993.

## Discussion

Recreational water at Garie Beach was found to be free from faecal contamination both before and after the commissioning of Sydney's deepwater ocean outfalls. All water samples met the bacteriological standard for tidal waters set by the NSW Health Department. The standard states: "Water should be considered to be unsuitable for bathing where the faecal coliform count, calculated as the geometric mean of the number of organisms in three water samples taken at the same time from the area being examined, exceeds 300 organisms per 100ml, with an upper limit of 2,000 organisms per 100ml (in any one sample)."[6]

The lack of visual sewage pollution on the shore or in the water is consistent with the bacteriological findings.

A major limitation of the survey was the predominant westerly (offshore) winds recorded during the periods of sampling. Sewage floatables like "grease balls" could affect Garie Beach only with moderate to strong north-easterly, onshore winds and favourable current and eddy movements. North-easterly winds were recorded only once during the 1993 sampling program. Westerly winds predominated during the survey period, reducing the likelihood of faecal contamination from the ocean outfalls reaching the beach. Detailed current and eddy data could not be obtained for areas south of Port Hacking. Despite this, the very low levels of faecal indicator organisms and the lack of visual pollution detected during the survey suggest the Sydney deepwater ocean outfalls are unlikely to have had a detrimental impact on the bacteriological water quality at Garie Beach.

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# Public Health Abstracts

Professor James S. Lawson, Professor and Head of the School of Health Services Management at the University of NSW, has prepared the following public health items from the literature.

### Reduction in deaths from ischaemic heart disease

Deaths from ischaemic heart disease are falling substantially in many countries. A major public health question is the extent changes in important risk factors influence these trends. Finland has been one of the most active countries in developing and testing preventive measures for cardiovascular disease because in the early 1970s middle-aged Finnish men had the highest mortality from cardiovascular disease in the world. Between 1972 and 1992 mortality in parts of Finland fell by 55 per cent for men and 68 per cent for women. These declines have been almost wholly due to falls in the major risk factors, namely serum cholesterol concentration, elevated blood pressure and smoking.

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Vartiainen E, Puska P, Pekkanen J et al. Changes in risk factors explain changes in mortality from ischaemic heart disease in Finland. *Br Med J* 1994; 309:23-7.

### Asthma rise in Australian children

A study between 1982 and 1992 in Wagga and Newcastle, NSW, has shown that the prevalence of recent wheeze in children aged 8-10 years rose 1.5 fold to about 25 per cent of all children. The reason for the increase is not known. However, there are higher levels of allergens – the numbers of house dust mites increased five fold during the study – or there may be new and unknown environmental factors.

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Peat JK, Ven Den Berg RH, Green WF et al. Changing prevalence of asthma in Australian children. *Br Med J* 1994; 308:1591-6.

### Alcohol consumption and high blood pressure

It has long been known that there is a strong association between alcohol consumption and blood pressure. A large international study has confirmed this experience and shown that heavy alcohol consumption (three-four or more drinks a day) taken intermittently has a greater impact on blood pressure than constant heavy drinking. But constant heavy drinking also raises blood pressure. The study involved nearly 5,000 men and 5,000 women between 20 and 59 years in 50 centres on a worldwide basis.

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Marmot MG, Elliott P, Shipley MJ et al. Alcohol and blood pressure: the INTERSALT study. *Br Med J* 1994; 308:1263-7.

### Prevention of suicide: no clear strategies

A detailed review of the evidence indicates that no clear strategies are available for combating the increasing numbers of suicides among young people. Possible interventions include education of health care professionals on the recognition and treatment of depression, strengthening schemes to limit the size of individual prescriptions and reinforcement of media guidelines on the reporting and showing of fictional suicide. To understand the problems of rising suicide in youth, research must address the experience of young people and aspects of economic and social policy at a national level, according to the British authors of this paper.

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Gunnell D, Frankel S. Prevention of suicide: aspirations and evidence. *Br Med J* 1994; 308:1227-33.