

Water Research Laboratory | School of Civil & Environmental Engineering

## Ocean Pools – Contemporary Coastal Engineering Meets the Steam Age

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UNSW Australia's Global University

## History

Many ocean pools enhanced traditional aboriginal bathing places

The Bogey Hole at Newcastle was convict constructed c1819

Bronte and Bondi were designed by a civil engineer c1890, variously attributed to PWD or Water Board



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## Ocean pools background

Depending on definitions, ~70 ocean pools in NSW, mostly between Newcastle and Wollongong. Similar number in South Africa (~90).

There is one in Queensland (Caloundra), two in South Australia (Kingscote, Edithburgh), and several in the UK (e.g. Bude), USA (Victoria Beach, Laguna Bay), Mediterranean and New Zealand (Dunedin).

Fifteen ocean pools are located on Sydney's northern beaches, mostly built in the 1930s. The last new construction was at Cronulla in the 1991, however, most ocean pools in urban areas are renovated at intervals of 10 to 20 years.

Original pools had little formal engineering design, but often involved local residents and/or life savers excavating favourable portions of rock shelves, and later enhancing these with concrete.

These pools evolved through numerous construction iterations. They are a highly valued local asset and are now generally managed by the relevant local council.

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## Nicole Larkin – The Wild Edge



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### Nicole Larkin – The W

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### Nicole Larkin -

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### Bronte c1890 Wylie's Baths c1907

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### Wylie's Baths and first Olympic women swimmers (1912)

Place	Swimmer	Time
1	Fanny Durack (ANZ)	1:22.2
2	Mina Wylie (ANZ)	1:25.4
3	Jennie Fletcher (GBR)	1:27.0
4	Grete Rosenberg (GER)	1:27.2
5	Annie Speirs (GBR)	1:27.4

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### Disadvantages/limitations

- They displace existing ecological communities
- Commitment required for monitoring, maintenance and refurbishment
- Public safety and its management
- Structure can change wave and sand patterns
- Increased human visitation and congestion may concern some people
- Untested liability issues
- Social, political and environmental complexities
- Uncertain approval pathways
- "1920s vision of the coast"
- Geology

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### Investigations

WRL undertook detailed investigations into four ocean pools close to home, plus numerous others:

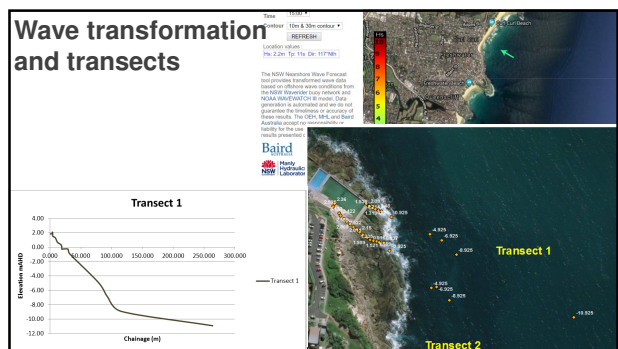
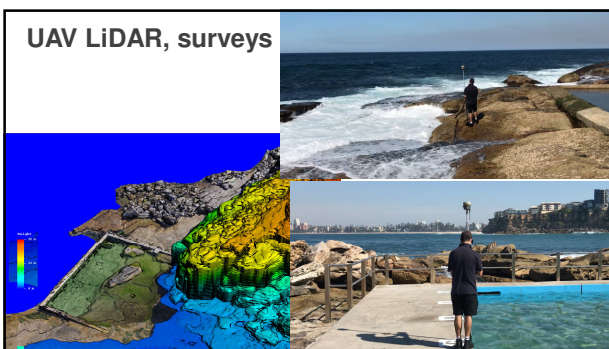
- Dee Why;
- North Curl Curl;
- South Curl Curl; and
- Freshwater.

This included:

- Data collection
- Wave modelling
- Overtopping calculations
- Interviews with lifeguards, life savers, pool users, council staff, coastal experts

Pool	Seaward wall (m AHD)
Dee Why	1.8
North Curl Curl	1.6
South Curl Curl	1.5
Freshwater	1.5
Sawtell	1.8
Black Head	2.0
Forster Pool	1.6
The Entrance Baths	2.0
Pearl Beach	0.94
Bilgola Pool	1.9
Newport Pool	0.8
Mona Vale Pool	1.5
North Narrabeen	1.4
Queenscliff Pool	1.6
Bondi North inner	1.0
Bondi North outer	0.5
Bondi Icebergs	2.4
Ross Jones Coogee	1.0
Wylie's Baths Coogee	1.0
Edithburgh SA	0.0

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### Statistics

**Dee Why**

- Cleaned once per week plus pumped – WQ issues
- Sand ingress minor
- Boulders ~5-10 years
- Dangerous 1-6 times per year

**North Curl Curl**

- Cleaned only ~ 2 times per year – negligible WQ issues
- Sand ingress minor
- Boulders ~5-10 years
- Dangerous once per week to fortnight



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### Statistics

**South Curl Curl**

- Cleaned once per week, daily wave flushing, usually no WQ issues
- Major sand ingress
- Boulders ~10 years
- Dangerous ~12 times per year

**Freshwater**

- Cleaned > once per week plus pumped – WQ issues incl stormwater
- Sand ingress minor
- Boulders ~10 years
- Dangerous ~1 time per year

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### Wave overtopping

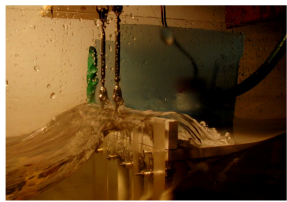
WINTER SWIM

Table 3.3: Limits for overtopping for people and vehicles

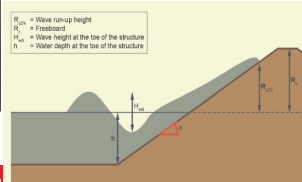
Hazard type and reason	Mean discharge (q) (l/s per m)	Max volume (V <sub>max</sub> ) (l per m)
People at structures with possible violent overtopping, mostly vertical structures	No access for any predicted overtopping	No access for any predicted overtopping
People at seawall / dike crest. Clear view of the sea.	H <sub>w</sub> = 3 m: 0.3 H <sub>w</sub> = 2 m: 1 H <sub>w</sub> = 1 m: 10-20 H <sub>w</sub> < 0.5 m: No limit	600 600 600 No limit
Cars on seawall / dike crest, or railway close behind crest	H <sub>w</sub> = 3 m: <5 H <sub>w</sub> = 2 m: 10-20 H <sub>w</sub> = 1 m: <25	2000 2000 2000
Highways and roads, fast traffic	Close before debris in spray becomes dangerous	Close before debris in spray becomes dangerous

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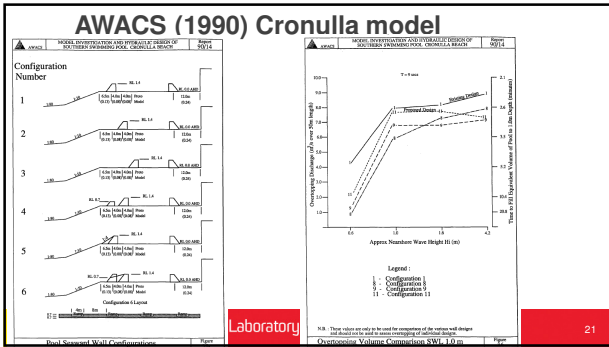
### Wave overtopping flushing and danger



Photograph 16: Overtopping process captured using high-speed photography



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### North Curl Curl

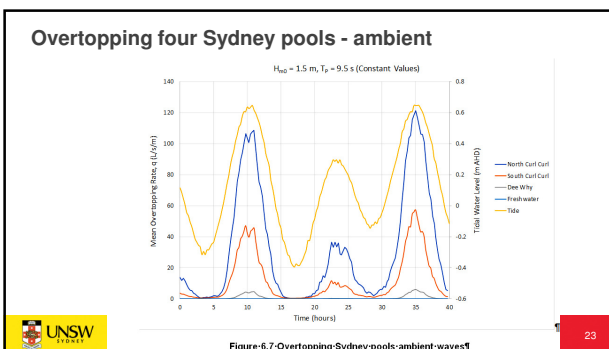
CORONER'S COURT	
Inquest:	Inquest into the death of Christopher DRAKE
Hearing date:	12-16 May 2014
Date of findings:	22 July 2014
Place of findings:	Coroner's Court 64-66 Parramatta Road, Sydney NSW 2015
Findings of:	Paul Macdonald Deputy State Coroner
Conclusions:	CORONAL LAY - Coroner Act 2009. Cause of death: Paternalism in emergency situations by public services, forward charges of public facilities - savings of danger, Recommutations.
File number:	2013/69855
Representation:	Mr C McDerm - Counsel Assisting Ms E Jermol - The Drake Family Mr S Gossard - The Harrington State Council Mr A Heiser - SLS NSW and SLS A

**Figure 6.8: Overlapping Sydney pools - 10% exceedance**

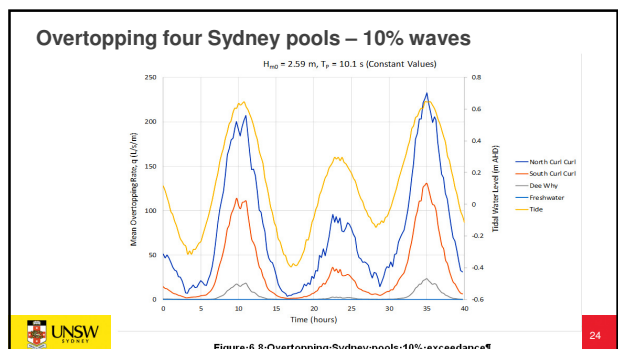
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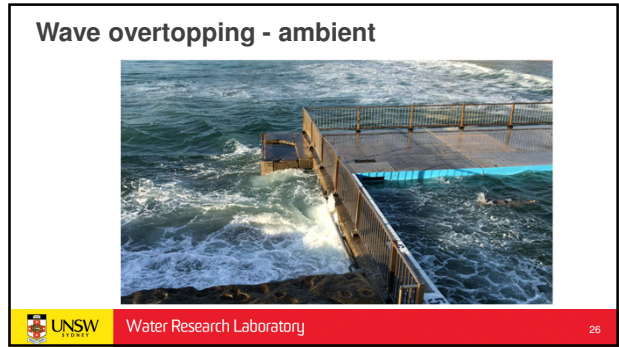
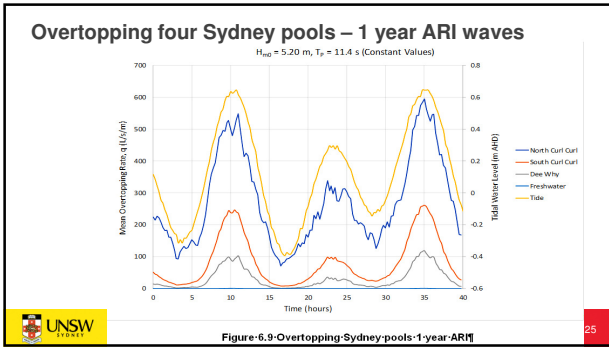
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### Sand and sea urchins



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### Maintenance and pumps

Indicative maintenance costs (\$/year)

Low	\$12,000
Most likely	\$78,000
High	\$137,000

Pump costs

Low	\$0
Most likely	\$13,000
High	\$38,000


13 out of 15 pools on Sydney's Northern Beaches  
Now use pumps

#### Corrosive Liquids

SFQ SERIES - CAST 316 STAINLESS STEEL

The SFQ series is made of austenitic cast 316 liquid in chemical plants or other industrial job of danger and corrosive.

Size	Model	Water Output	Power	Price
10	30010	1.5	1.5	12
15	30015	2.2	2.2	14
20	30020	3.0	3.0	16
25	30025	4.0	4.0	18
30	30030	5.5	5.5	20
35	30035	7.5	7.5	22
40	30040	10.0	10.0	24
45	30045	13.0	13.0	26
50	30050	16.0	16.0	28
55	30055	20.0	20.0	30



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### Patronage and economic benefits

Collaroy: 130,000;	RLS (2017) economic benefits:
Dee Why: 260,000;	Economic benefit of pool visit: \$13.83;
North Curl Curl: 50,000;	Health economic benefit \$26.39;
South Curl Curl: 220,000;	Total benefit of pool visit: \$40.22.
Freshwater: 150,000;	
Queenscliff: 150,000.	


Low use pool (50,000/year) economic benefit: \$700,000/year;  
 Typical pool (150,000/year) economic benefit: \$2 million/year;  
 Typical pool (150,000/year) economic benefit and health benefit: \$6 million/year;  
 High use pool (250,000/year) economic benefit: \$3.5 million/year; and  
 High use pool (250,000/year) economic benefit and health benefit: \$10 million/year.

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### Optimum components & dimensions

- Main pool: 50 m long x 20 m (8 lanes) wide;
- Children's/wading pool: 250 to 450 m<sup>2</sup>;
- Constructed public space: 250 to 450 m<sup>2</sup>.



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### Summary

Ocean pools in Australia are up to 200 years old  
 There are about 70 in NSW, and a similar number in South Africa  
 Communities in areas without ocean pools are increasingly requesting one  
 This paper attempts to reconcile expert user opinions and contemporary engineering  
 The maintenance liability has scared some councils, but it is minor relative to the benefits  
  
 For many coastal dwellers, their local ocean pool is one of the high points of their life

### Les Murray: The Ocean Baths

Chinning the bar or Thirties concrete rim  
 of this ocean baths as the surf flings velleities of spray  
 brimming the bright screen  
 I am not in the sea but the sea's television.  
  
 As the one starfish below me quivers up  
 through a fictive kelp of diffraction, I'm thinking of workers  
 who made pool-cementing last, neap tide by neap,  
 right through the depression

Thank you

