

Investment in Australian Desalination – Was it Worth It?

osmoflo

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aws Australian
Water School

Webinar

6th December 2023



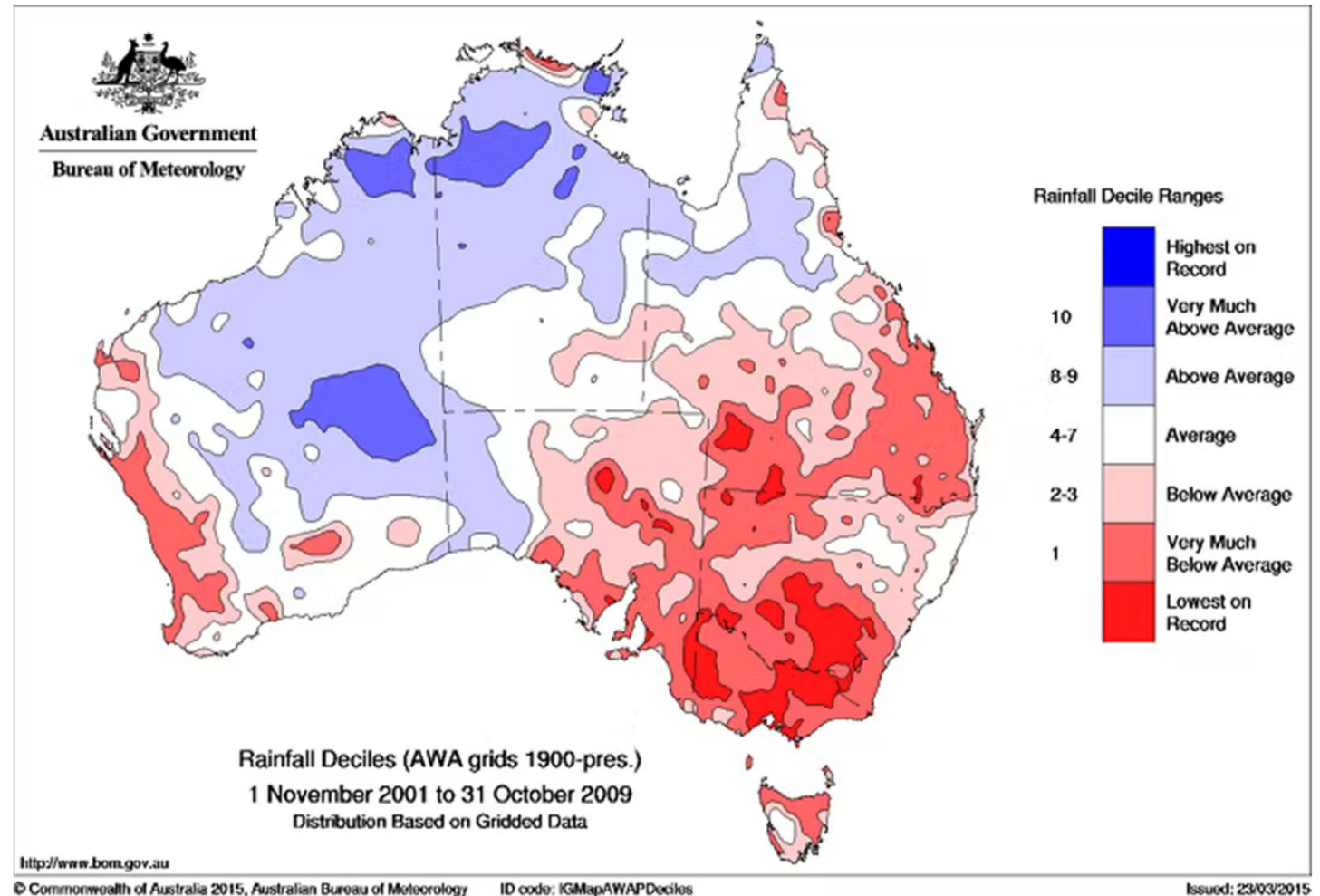
The Big Six Australian Desalination Plants. \$A10b - all delivered in less than 8 years 2004 - 2012

Millennium Drought

Rainfall for 2001 – 2009.

Note the area of “worst on record” in south east Australia and south west Western Australia.

The drought broke in 2011 with floods in eastern Australia.



Australia Rainfall and Seawater Desalination



Gold Coast Desal Plant
133 MLD capacity

Sydney Desal Plant
250 MLD capacity

Victorian Desal Plant
450 MLD capacity

Perth 1 Desal Plant – PSDP
144 MLD capacity

Perth 2 Desal Plant – SSDP
300 MLD capacity

Adelaide Desal Plant
300 MLD capacity

*Average annual rainfall

787 mm

508 mm

522 mm

1173 mm

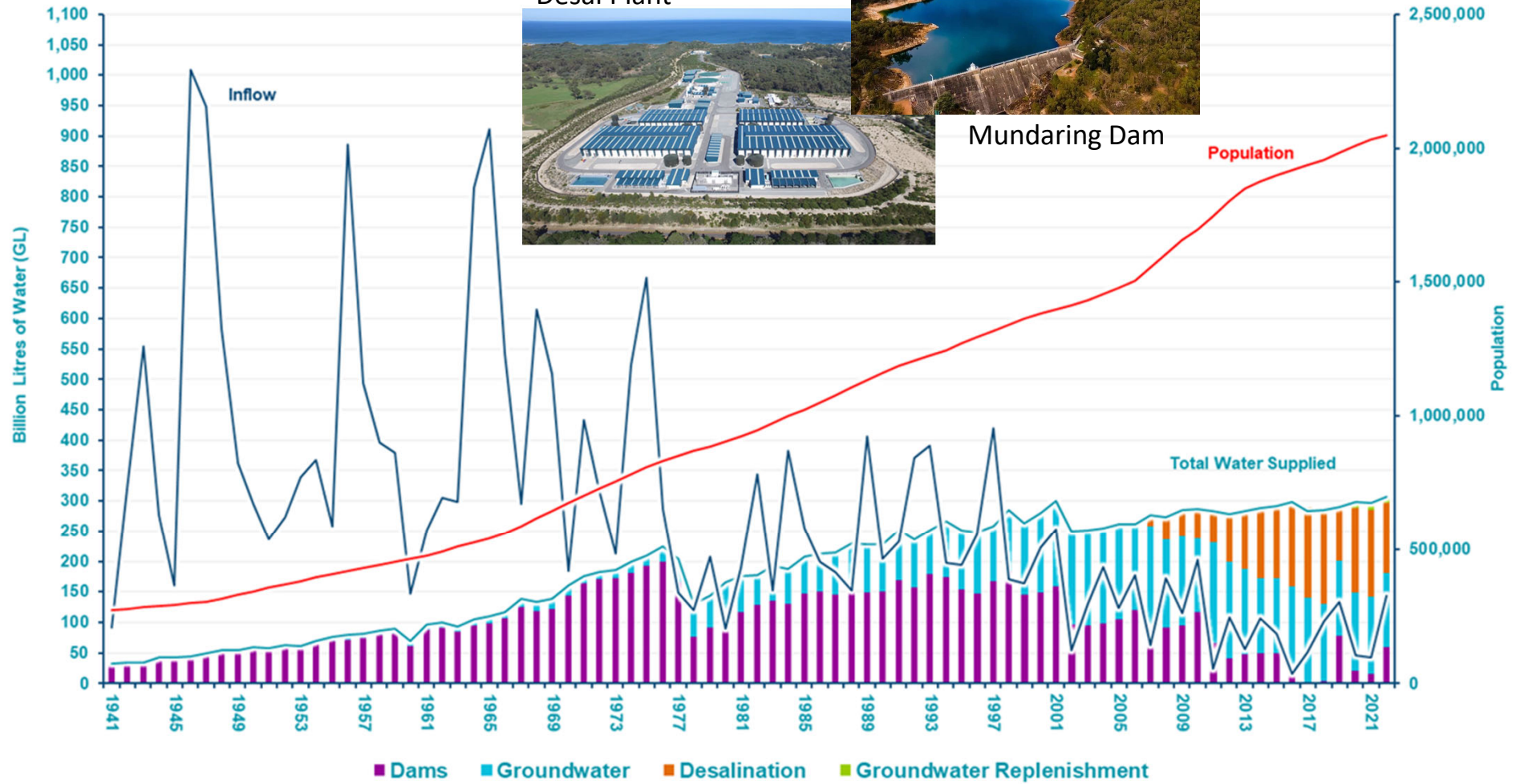
Case Study - Perth

Southern Seawater Desal Plant



Mundaring Dam

Courtesy Water Corporation



Case Study - Melbourne

Melbourne suffered very severe water restrictions during the 13 year Millennium Drought (1997 – 2010)

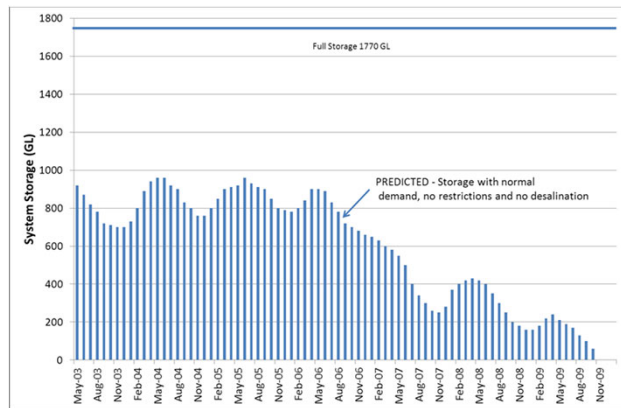
Water storage performance was measured from 2003 – 2009 and published in a report called Melbourne's Water Future

The Victorian Desalination Plant capacity is 150 GL/y, about a third of Melbourne's annual average water demand, but was opened in 2012 after the drought had broken. The plant was mothballed until 2017.

We show what would have happened had the Victorian Desalination Plant been available during the Millennium Drought.

Case Study - Melbourne

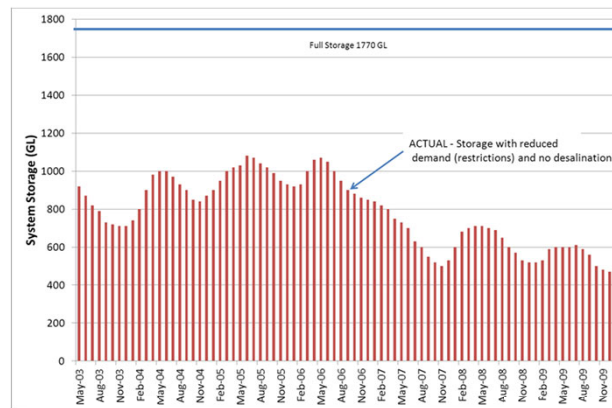
Dam levels 2003-2009 during Millennium Drought



2003

2009

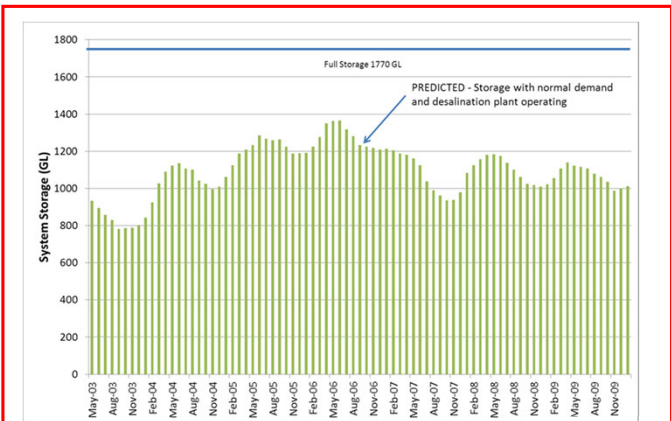
Prediction: with no water restrictions, Melbourne's dams would have been empty by 2009



2003

2009

Actual: with very severe water restrictions, Melbourne maintained some water in the dams



2003

2009

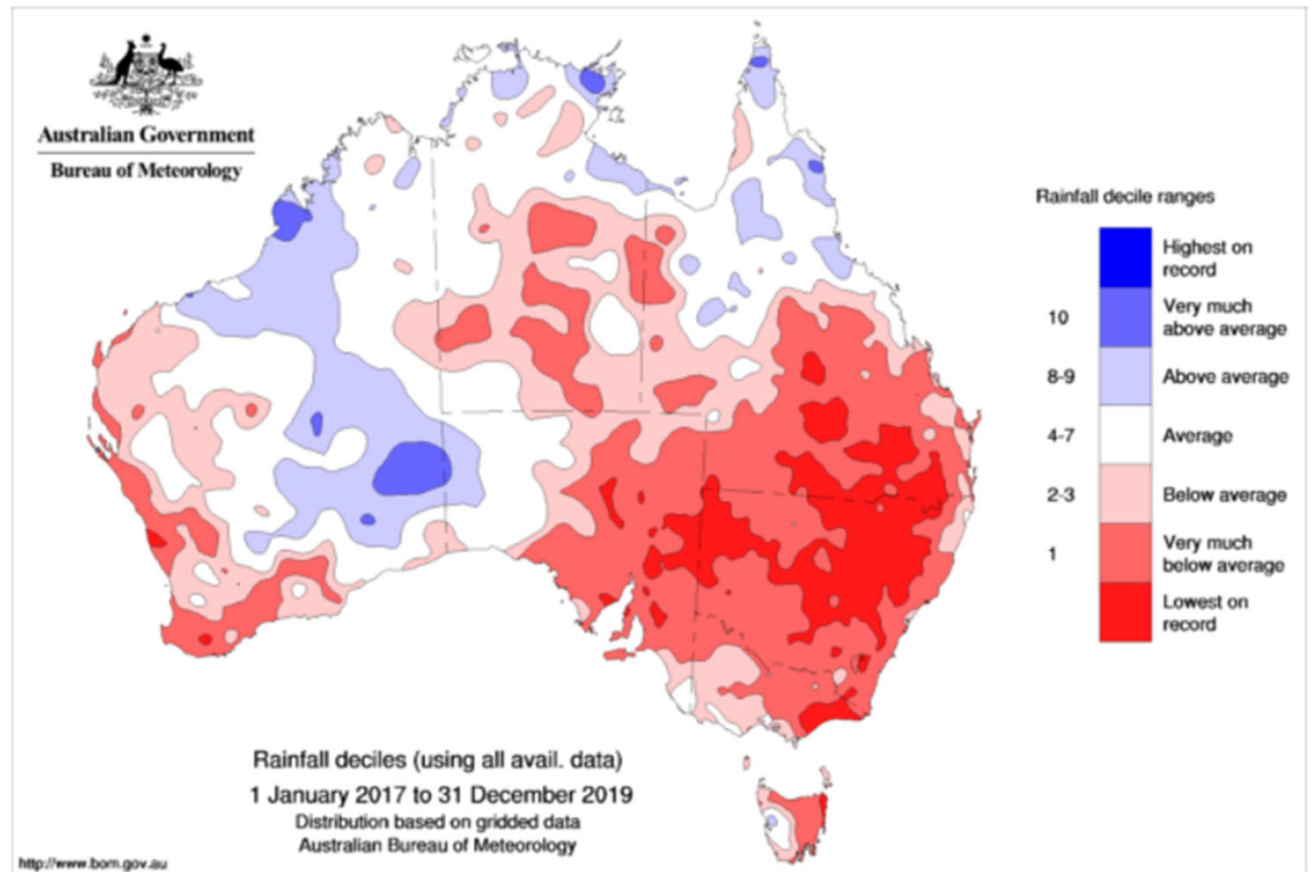
Prediction: had the desalination plant been available, dam levels could have been maintained without the need for water restrictions

More Drought

Everyone was relieved that the Millennium drought was over.

But another drought occurred in 2017-2019.

Note more “lowest on record” in south eastern Australia and continuing dry in south west Western Australia



© Commonwealth of Australia 2020, Australian Bureau of Meteorology ID code: Analyser

Issued: 29/04/2020

Map: Australian rainfall deciles for the 36 months from January 2017 to December 2019. ([Map data source information](#)).

Case Study - Melbourne

So what happened in the subsequent drought (2017-2019)?

Year	Desal Operation GL/y	Desal Operation %
17/18	15	10
18/19	15	10
19/20	125	83
20/21	125	83
21/22	125	83
22/23	15	10

Dam levels at the end of 2022 were 92%.

Without the desal plant, they would have been at 69%.



Thomson Dam

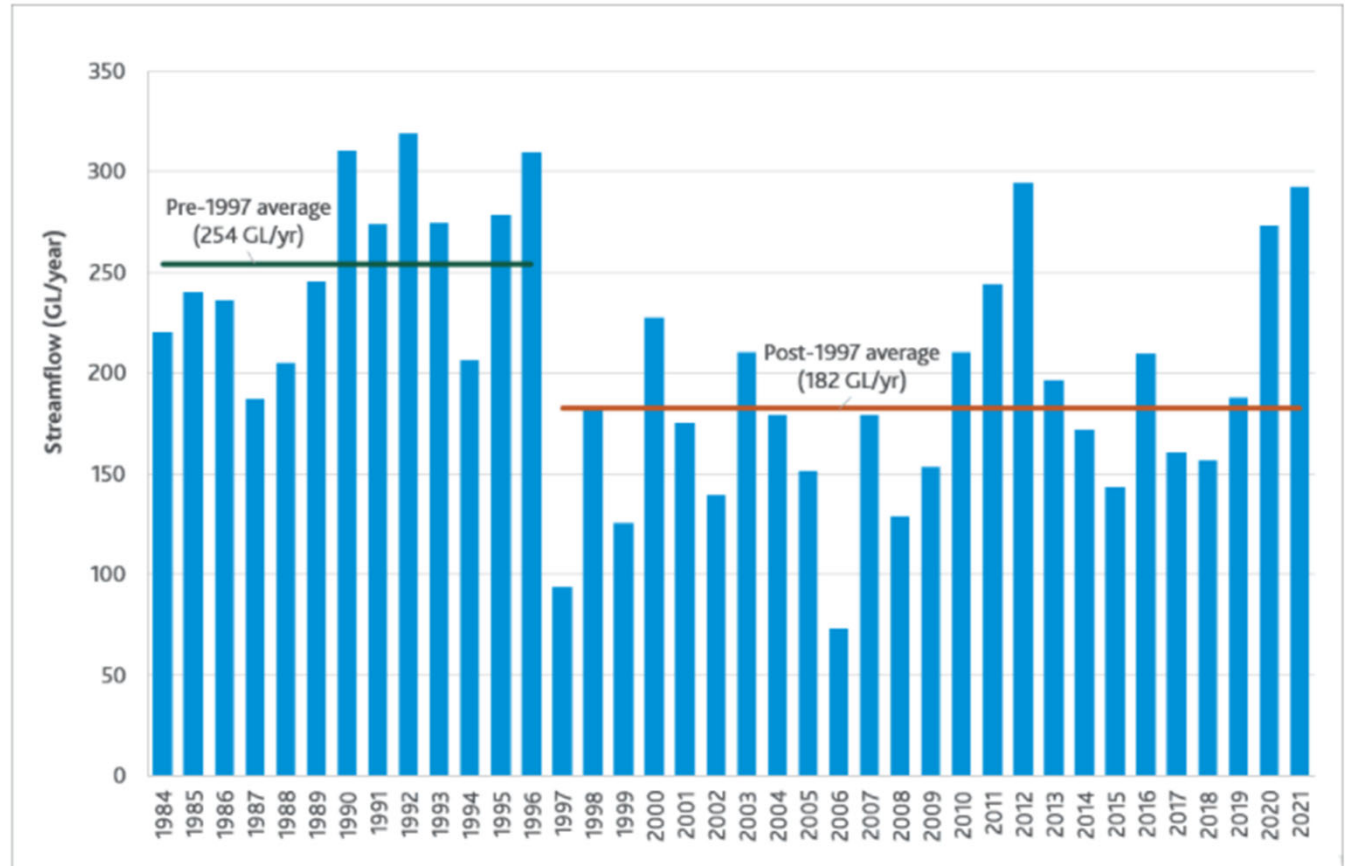


Victorian Desalination Plant

Water Security

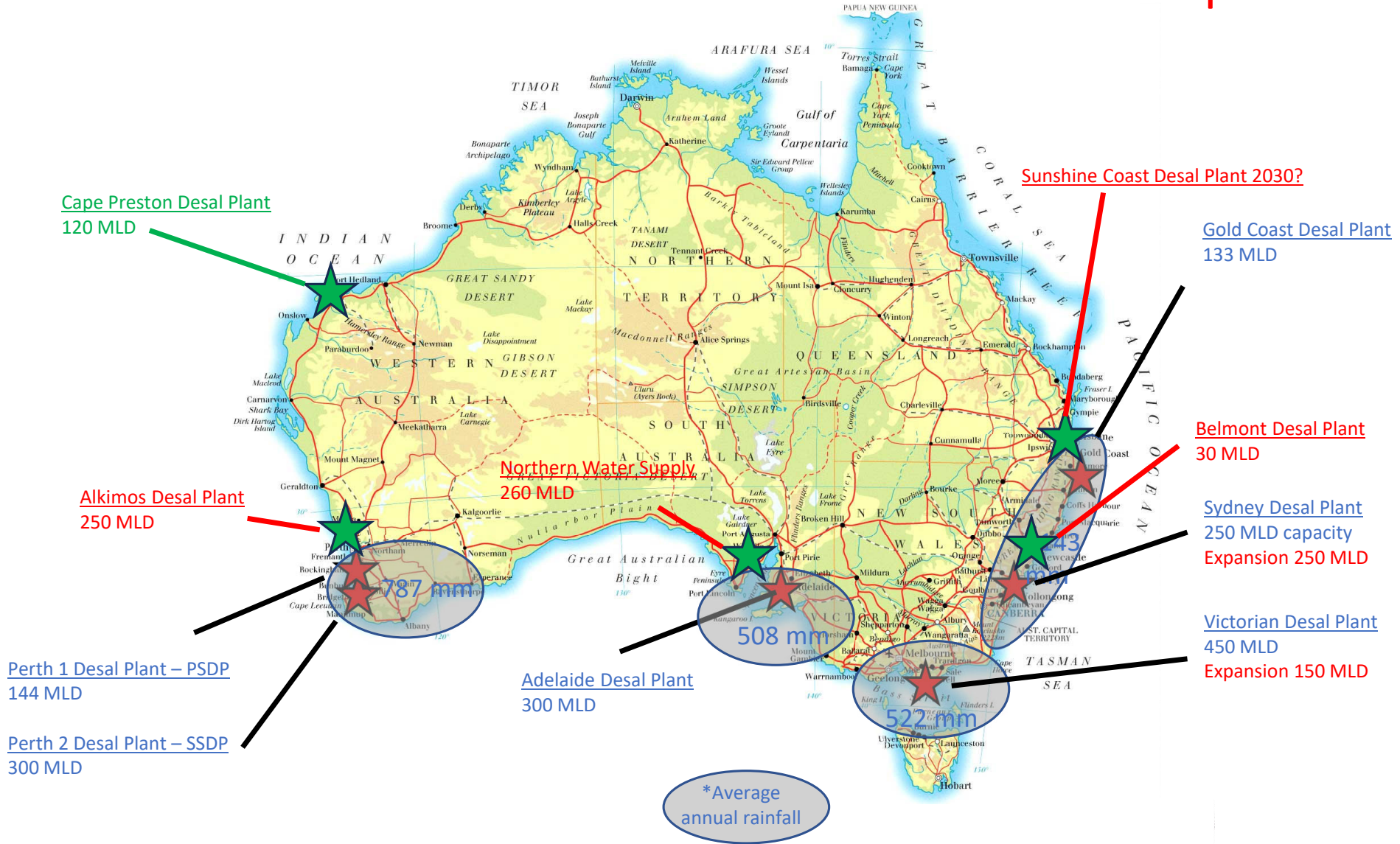


Vic Desal Plant
Capacity 150 GL/y



Thomson Dam Inflows 1984 – 2021
Post 1997 average 192 GL/y

Australia Rainfall and Seawater Desalination – Update 2023



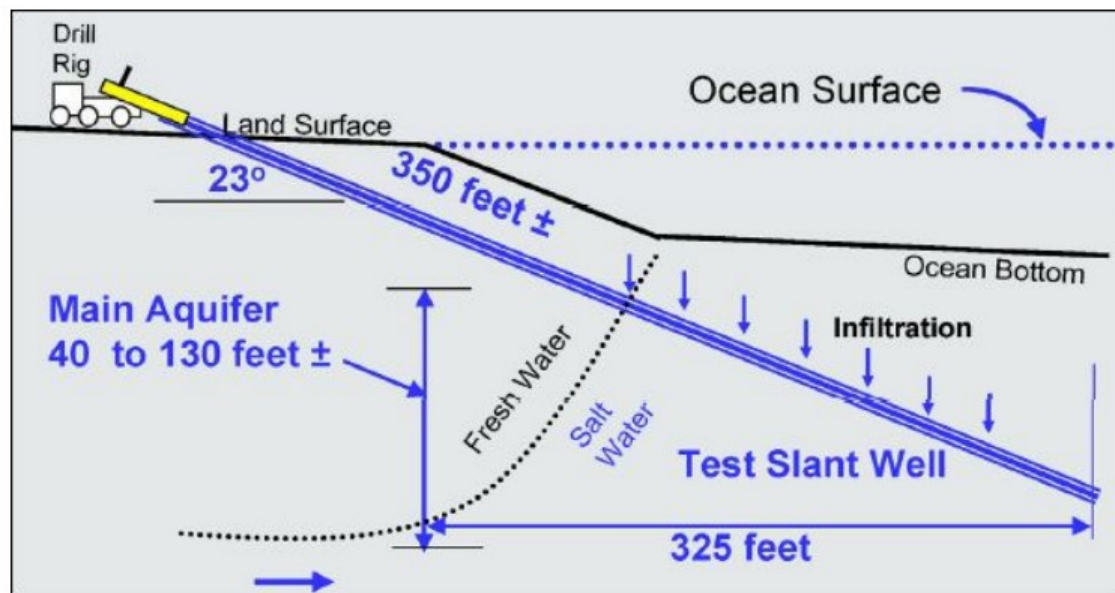
Potential Increase in Large Municipal Seawater Desalination to 2030

PLANT	MLD	PLANT	MLD
Perth SDP	144	WA Alkimos	150+150
Gold Coast	133	SA Northern WS	260
Sydney	250	Sydney Upgrade	250
Adelaide	300	Vic Desal Upgrade	150
Perth SSDP	300	Sunshine Coast	150+150
Melbourne	450	Belmont	30
TOTAL	1710	TOTAL	1115

Increase expected to 2030 is 65%

Innovative Intakes – Slant Well

Over the last 15 years Metropolitan Water District of Orange County (MWDOC) has developed and successfully trialled Slant Wells now being implemented at the Doheny Ocean Desalination Project currently under development.



Source: MWDOC

Figure 4 – Slant Well

View of Slant Well and Test Facility Site Doheny State Beach



Establishing/ Established Pre-Treatment Systems

UF pre-treatment adopted by SA Water and Water Corporation as the preferred method as it reduces or eliminates use of coagulants

Pressure Ultra-Filtration (UF)



Perth 2 SWRO Pressure UF

Submerged Ultra-Filtration (UF)

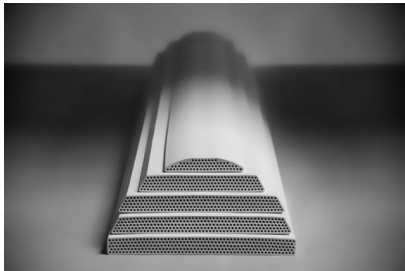


Adelaide SWRO Submerged UF

Emerging Pre-Treatment Systems

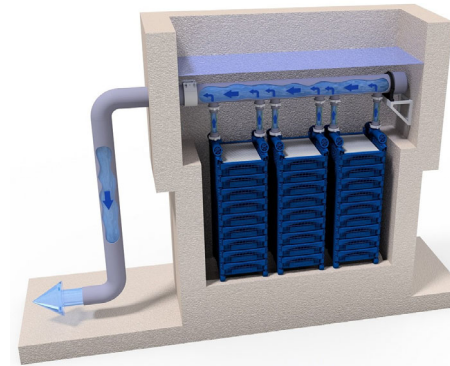
Segmented Monolithic Tubular Ceramic Ultra-Filtration (UF)

Ceramics offer extended membrane lifetimes, even under extreme fouling and cleaning conditions that would destroy their polymeric counterparts

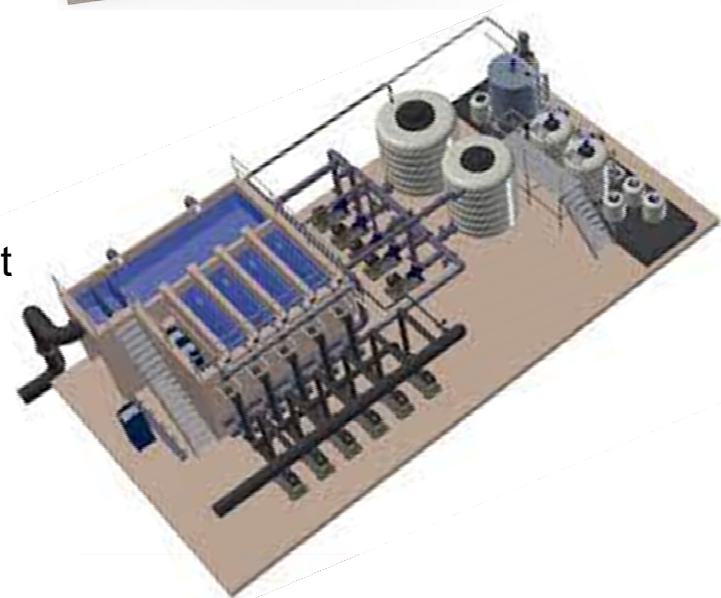


Emerging Pre-Treatment Systems

Submerged Ceramic Flat Ultra-Filtration (UF)



Submerged Ceramic Flat UF modules replacing dual media gravity filters in India. Three times more efficient than media filter in footprint and can remove PFAS.

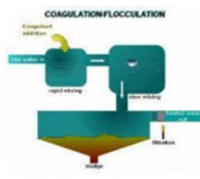


Emerging Pre-Treatment Systems

Submerged Ceramic Flat UF membrane systems can eliminate five sub processes used in conventional pre-treatment. More sustainable using less energy, embedded energy and chemicals and almost eliminating solid waste.



Sea water



Conditioning



Dissolved Air Flotation



Settler



Sand filter



Ultrafiltration (Polymeric)



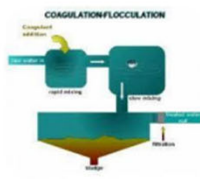
Cartridge Filters



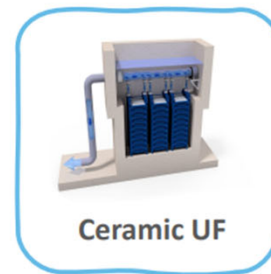
Reverse Osmosis



Sea water



Conditioning



Ceramic UF



Reverse Osmosis

THE HYDROGEN ECONOMY

Asian Renewable Energy Hub



At full capacity:

- 6500 sq km site in Pilbara
- 26 GW solar and wind power
- 1.6 m tonnes green hydrogen/y
- 9m tonnes green ammonia/y
- Abate 17 m tonnes carbon/y
- Needs 80 GL/y demin water
- bp took a 40% stake in July 2022 and will be Operator

Source: bp.com

THE HYDROGEN ECONOMY

Port Bonython Export Hub



Port Bonython

- 1700 ha site in Northern Spencer Gulf
- Multi-user export precinct
- Seven projects shortlisted
- World's largest hydrolyser – 250MW
- \$13b investment
- 1.8m tonnes of hydrogen by 2030

Source: <https://www.safa.sa.gov.au/environmental-s-governance/energy/port-bonython-export-hub>

SA Water: Price of water before and after the Adelaide Desalination Plant

Average real household water rate increase from 2008 (before desal) to 2015, allowing for inflation, was \$7.22 per week

(SA Water, Adelaide)



beers + ciders

Peroni (Italy)	330ml glass	8.0
Fat Yak Pale Ale (WA)	425ml glass	8.0
Coopers (SA)	375ml bottle	7.5
	750ml longneck	13.0



CONCLUSION

There is no shortage of water on Earth – but - fresh water is limited

Impaired water can be converted to fresh water

The strategic investment of \$A10b in major seawater desalination during the years 2006 – 2012 has brought affordable water security to Australia's 5 mainland state capitals

A planned 65% increase in seawater desalination over the next ten years suggests the initial investment was well justified.



THANK YOU