case study
Water

Victorian Desalination Project

providing a rainfall independent source of water supply to residents in Victoria

Without a doubt, the biggest challenges to water supply in Australia continue to be drought and climate change. Despite raised community awareness and increased sustainability practices including water saving and recycling, there was a need to increase water supply in Victoria in order to guarantee a secure and safe water supply for future generations. In 2007, the Victorian government released a long-term plan for water – *Our Water Our Future, the Next Stage of the Government's Water Plan*. The objective of the plan was to provide lasting water security for Victoria's growing population and economy. The plan included a range of actions to diversify and boost water supplies in the State's major population centres.

The Victorian Desalination Project was a critical part of the Victorian Government's plan. It included the construction, operation and maintenance of a state-of-the-art desalination plant treating ocean water from the Bass Strait through 84 km of transfer pipeline and 87 km of powerlines. The project was delivered by the AQUASURE consortium consisting of SUEZ, Thiess Pty Ltd and Macquarie Group in partnership with the Capital Projects Division of the Victorian Department of Environment, Land, Water and Planning.

The Victorian Desalination Project provides a rainfall independent source of water. It services a population of around 4.5 million residents in Melbourne, Geelong and towns in the Western Port and South Gippsland region. Designed to produce up to 150 gigalitres[1] (GL) annually, the facility can be upgraded to supply up to 200 GL in the future.

the Victorian Desalination Project is **one of the world's largest** Public Private Partnership (PPP) projects

[1] A gigalitre is equivalent to one billion litres

delivering, operating and maintaining the most technically advanced, environmentally friendly and energy efficient desalination facility in Australia

an environmental design

An Environmental Management Framework for the plant applies to the main facility, marine structures, pipelines and power supply. It includes 221 strict environmental performance requirements across 38 areas, from wetlands and waterways to air quality and visual amenity.

The plant has been designed to minimise adverse impacts on the landscape, local communities, cultural heritage and flora and fauna.

Its living green roof is the largest in the southern hemisphere. It includes the landscape-wave design which helps limit visibility of the industrial buildings from the surrounding public areas and provides a link to the nearby coastal landscape.

The land-based plant is integrated into its surroundings and preserves the natural environment by creating an ecological space, thus reducing the environmental impact.

KEY FACTS

Australia's largest living green roof of 26,000 square metres, with 100,000 indigenous plants

100 per cent offset of electricity by renewable energy certificates

improving energy efficiency

At full capacity (150 GL/year), about 90MW is required to run the plant and pipeline. This power is 100 per cent offset by renewable energy. AQUASURE has committed to buying the same amount of renewable energy every year to operate the desalination plant and transfer pipeline. This ensures thus ensuring that an equivalent amount of renewable energy is injected into the electricity grid.

The plant uses the reverse osmosis process which has been demonstrated to be the most energy efficient method of desalination. AQUASURE has introduced a number of innovative systems to minimise power consumption within the plant during the reverse osmosis process. These include world-leading energy recovery and reuse devices.

The plant's compact modular design reduces pipe work and eliminates inefficient energy use. Constructing the plant at a low level relative to sea level also saves energy by reducing the amount of energy needed to lift seawater into the plant.

Other energy reducing features such as variable speed drives, high efficiency motors and low energy use membranes have also been adopted.

giving back to the community

Since the first day of the project, one of the team's key objectives has been to minimise the project's ecological impacts and to enhance the local environment.

As part of the project, a 225 ha ecological reserve around the plant was constructed. This is one of the largest ecological restoration projects ever undertaken in Victoria. Today the ecological reserve is open to public, providing local community with a variety of leisure activities such as walking, bird watching, bike rides or picnics with families and friends. This community friendly approach contributes to enhancing the local environment as well as the life of residents living in the area.

this is one of the largest **ecological restoration projects** ever undertaken in Victoria

TECHNICAL INFORMATION

DESIGN CRITERIA

Characteristics	Mimimum	Average	Maximum
Seawater TSS (mg/L)	1	2	8
Seawater salinity (g/L)	36	37.1	38
Temperature (°C)	11	16	20
RO 1st pass TDS (mg/L)	300	350	500
RO 2nd pass TDS (mg/L)	5	10	20
Production TDS (mg/L)	35	40	<120
Production Br (mg/L)		<0.02	<0.1
Production turbidity (NTU)		<0.1	1
Production water (pH)	6.8	7.7	7.8

1. Administrative and utilities complex

The complex includes the administration building, the operational control centre, which is the heart of the desalination plant, and a research and development laboratory, monitoring water quality and process optimisation.

2. Seawater lift pumping station

The seawater lift pumping station transfers seawater from the underground tunnels to the desalination treatment line. It also returns seawater concentrate to the outlet at the end of the process.

- 12 pumps, each capable of moving up to 1000 litres/second

3. Pre-treatment

Pre-treatment is an important step contributing to the performance and to the efficiency of the reverse osmosis facility. This area contains a number of screening facilities which sort large and fine particles (such as sand and sediment) from the raw seawater prior to the desalination process.

- 3 large drum screens to remove seaweed and other large suspended solids
- 72 dual media pressure filters to remove smaller particles

4. Reverse Osmosis building or desalination process

Reverse osmosis is a desalination process using membrane technology. During the two stages of reverse osmosis, high pressure filtered water passes through the semi-permeable membranes where the salt and other dissolved inorganic solids are removed. At the completion of the process, pure water (known as permeate) remains on one side of the membrane and concentrated seawater (brine) remains on the other.

- 51 reverse osmosis racks
- 55,000 membranes separating salt from water

5. Potabilisation line

Following the desalination process, the permeate is re-mineralised to meet high quality drinking water standards. This area includes buildings which house chemicals including lime, fluoride and carbon dioxide used in the remineralisation process, membrane cleaning chemicals, treated water storage ponds, sludge and solids treatment buildings.

6. Transfer pump station

The water transfer pipeline is designed to carry up to 200 GL per year of drinking water to Cardinia reservoir. This area also contains the water outlet where the seawater concentrate (brine) is safely returned to the ocean through diffusers.

the plant was named '**Desalination Plant of the Year**' at the Global Water Awards in 2013

TYPE OF CONTRACT

BOOT
(Build, Own, Operate, Transfer)

PROJECT CAPACITY

440 MLD

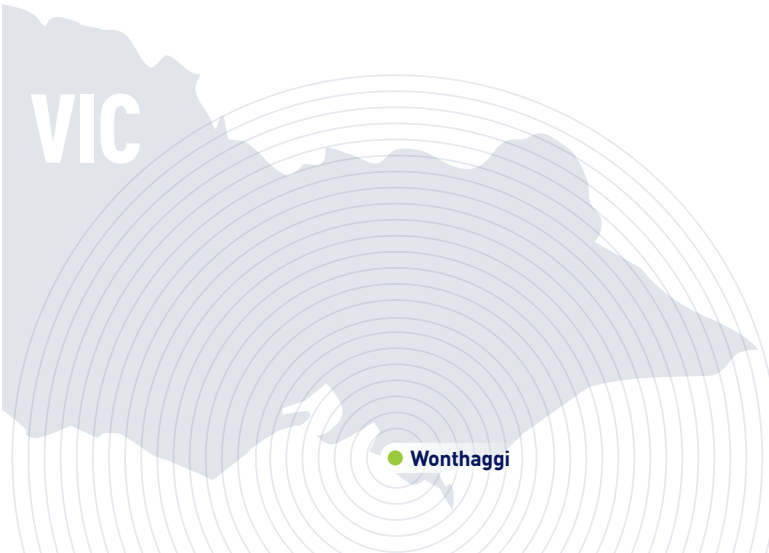
CONTRACT DURATION

D&B **2009 - 2012**
O&M **2012 - 2039**

ESTIMATED POPULATION SERVED

4.5 Million

Victorian Desalination Project



MLD: Megalitres Per Day

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SUEZ Australia & New Zealand

Level 6, 5 Rider Boulevard
RHODES NSW 2138 Australia

suez.com/en/australia-new-zealand

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