INFORMATION SHEET

OLYMPIC DAM EXPANSION EIS

WATER SUPPLY

The Olympic Dam mine and processing plant operate in an arid, isolated area so providing a reliable long-term water supply for the operation is a major challenge. Olympic Dam and the township of Roxby Downs currently use water that is piped from two wellfields in the Great Artesian Basin (GAB) under licence from the South Australian Government.

The ore body at Olympic Dam is one of the largest in the world. To develop the operation further the expanded mine will need a lot more water. The expanded operation and township would require an additional average of 200 ML/d. A coastal desalination plant at Point Lowly in Upper Spencer Gulf is BHP Billiton's preferred primary water supply option. This option also creates a new South Australian Government water supply option for the towns in the Upper Spencer Gulf and Eyre Peninsula regions that currently take water from the River Murray.

The major alternatives to a coastal desalination plant that were assessed and rejected were:

- a third wellfield in the GAB – the two existing wellfields supplying the current operation could not sustain the additional demand. It would have been necessary to establish a third wellfield much further into the GAB to ensure the continuing protection of the GAB springs. The resulting production of much warmer water would have been technically difficult and very expensive to cool to the required temperature and pipe to Olympic Dam

- Adelaide treated wastewater – the majority of Adelaide's treated sewage effluent is routinely discharged to the sea. The option of using this water via a 600 km pipeline to Olympic Dam was rejected because of its variable quality, and the existing and likely demands in the future for its use by industry on the Adelaide Plains

- River Murray water – at a very early stage, BHP Billiton rejected the River Murray option because it would have run counter to South Australian and Australian government initiatives to remedy the ecological stresses of drought and of increased water abstraction from the river.

Point Lowly

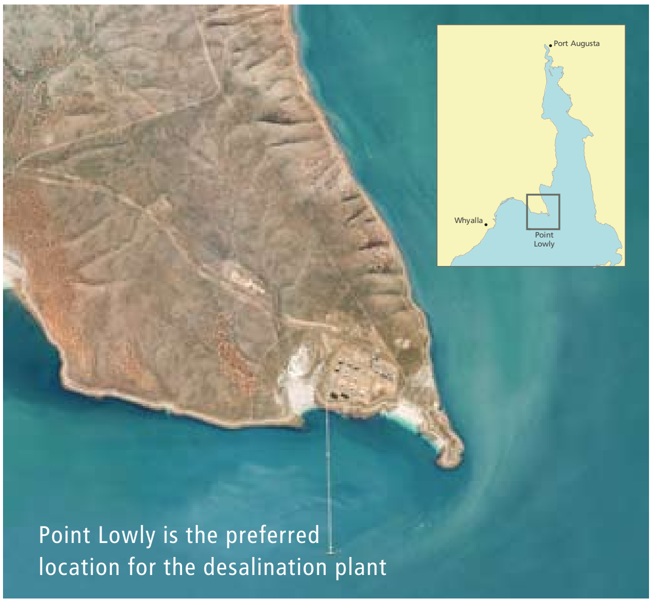
The location of a coastal desalination plant for Olympic Dam requires an environment where the performance standards for intake water quality and return water discharge could be met. Sites at Point Lowly, Port Augusta, Whyalla, south of Whyalla, south of Port Pirie and at Ceduna were assessed against the following criteria:

- proximity to Olympic Dam with clean, deep water (i.e. greater than 20 m) in a high-energy environment (i.e. where the return water could be rapidly diluted and dispersed, protecting marine species)

- accessibility and constructability of the water supply pipeline

- availability of, and access to, land and utilities (e.g. power, road and telecommunications infrastructure).

Point Lowly, north of Whyalla, meets the criteria and became the preferred option.



Point Lowly is the preferred location for the desalination plant

Looking for further information on the Draft Environmental Impact Statement?
Please visit our website www.bhpbilliton.com/odxeis or call our toll free information line on 1300 766 715

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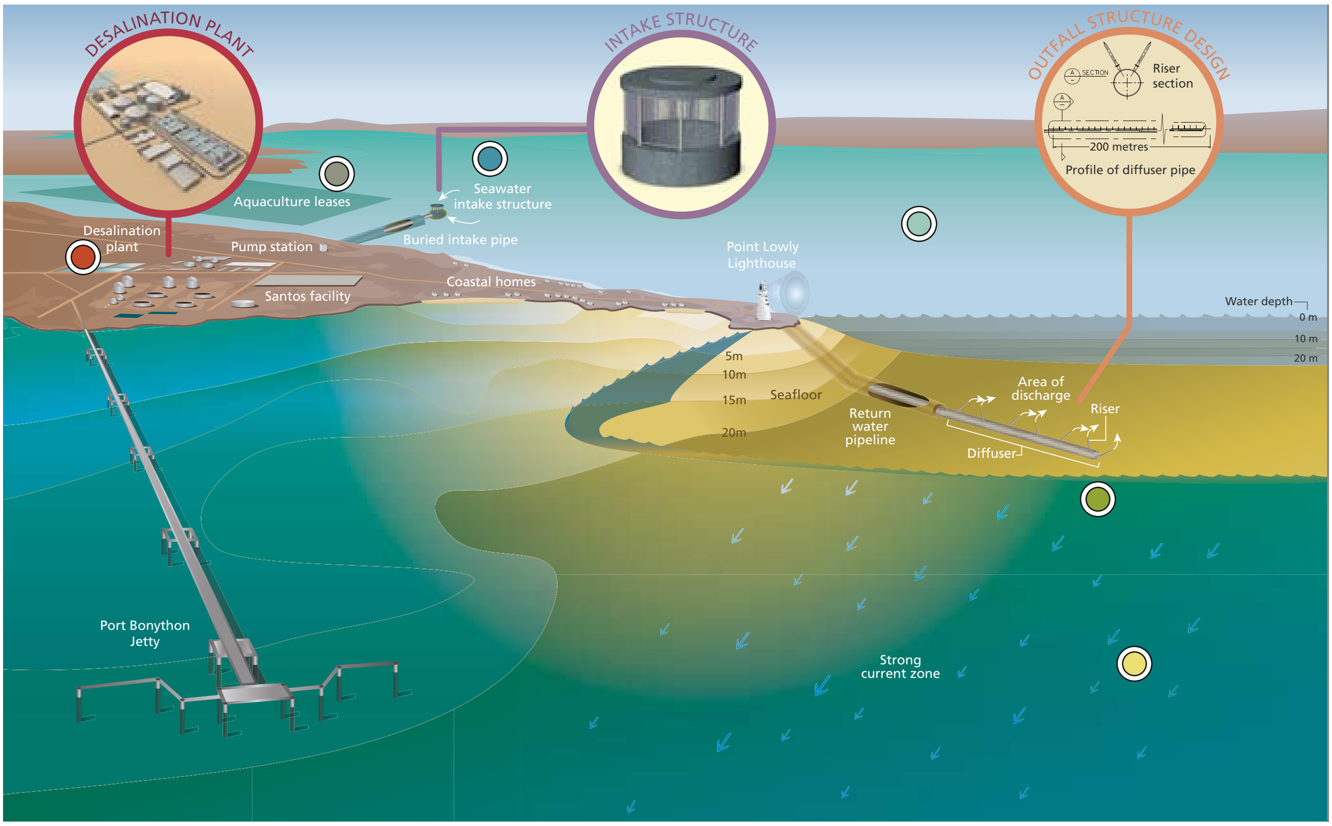


Water is pushed at high force through the reverse osmosis membranes

Desalination plant

Seawater desalination is a widely used and proven technology, with more that 12,300 plants operating in 147 countries.

About 1,500 of the world's desalination plants in 96 countries, including the existing plant at Olympic Dam, use reverse osmosis, and this method is proposed for the new plant.

This method involves seawater being pumped through fine membranes to produce low-salinity product water and high-salinity return water.

The first step in the desalination process would remove suspended solids from the seawater by passing it through a sand and coal based filter system. This system works in the same way as a domestic pool filter, trapping solid particles in the sand. Filtered seawater will then be pumped to the reverse osmosis plant where it will pass through high pressure pumps that generate the force to push water through the reverse osmosis membranes. The membranes separate fresh water from seawater.

The return water will travel via an underground pipeline back to sea, where it will be discharged through a diffuser system into the deep, fast moving currents off Point Lowly. This ensures rapid mixing of the return water with seawater.

Water produced by the desalination process will be pumped by a 320km pipeline to Olympic Dam.

Intake pipe

There has been some community concern about the potential of the intake pipe to entrap both large and small marine organisms. The underwater intake structure is designed so that seawater is taken into the pipeline very slowly, slower than the prevailing tidal currents. This reduces the entrainment of marine life into the structure.

Return water

The return water would be a combination of brine (which is about twice as salty as seawater) and small quantities of anti-scalant chemical used to prevent scale accumulating on the membranes of the plant.

The return water would be discharged at sea through a purpose built and designed diffuser, allowing it to be mixed with the ambient seawater by the strong currents off Point Lowly.

The location and design of the outfall pipe and diffuser has the greatest potential for reducing impacts on the marine environment. The start of the diffuser would be at least 400 m off-shore and positioned on the sea floor in at least 20 m of water. The return water, which is denser than the ambient seawater, would be released under pressure from the diffuser and directed towards the surface to create jets of up to 5 m in height that would enhance mixing with water driven by prevailing currents.

Extensive modelling of Spencer Gulf and the area around Point Lowly has indicated that the return water would disperse rapidly, ensuring sensitive marine life such as the Australian Giant Cuttlefish would not be affected. The zone of ecological effect and the breeding habitat of the Australian Giant Cuttlefish are well separated both horizontally and vertically ensuring the cuttlefish population is protected (a graphical animation for this topic is available at www.bhpbilliton.com/odxeis and on the disc accompanying the Executive Summary). This is because the higher salinity return water is heavier than normal seawater and would therefore fall towards the sea floor away from the breeding habitat. This natural process creates a vertical separation between the higher salinity return water and the cuttlefish breeding habitat, which extends from the surface to a maximum depth of about 10 m.

Australian Giant Cuttlefish at Point Lowly

Marine life

BHP Billiton has devoted much attention to investigating the potential effects of the desalination plant and developing a design to meet a conservative interpretation of acceptable performance. This work has included:

- habitat surveys of the sea floor
- computer modelling of the tides, salinity, water exchange and return water dispersion from 13 alternative sites within the gulf
- a number of conservative measures have been built into the return water dispersion modelling and ecotoxicology studies, including: peak (rather than average) discharge flows; lowest effect concentrations for a range of species; safety factors associated with the national water quality guidelines; unrealistically continuous exposure to diluted return water (rather than intermittently as would occur in reality); and a combination of least favourable seasonal conditions (summer), dodge tides and wind conditions
- laboratory ecotoxicology bioassays with manufactured return water diluted with Point Lowly seawater to examine the effects on 15 test species. The bioassay tests were conducted at different levels of dilution and included mortalities, growth inhibition, germination, reproduction, juvenile and adult growth, larval growth, larval development and hatching
- extensive biological studies, including more than 100 hours of scuba diving, to further understand the marine ecosystems.

Commercial and recreational fishing

A species protection trigger value (SPTV), essentially a safe level of return water dilution, was derived from the bioassay results of ten of the species most relevant to Upper Spencer Gulf (five species more than the national guidelines). The 'safe' dilution of return water required to protect 100% of species from experiencing inhibitory effects in background water of 41 g/L salinity is 1:85 (one part return water to 85 parts seawater). The area where return water dilution is less than the safe level has been termed the zone of ecological effect. The high tidal velocities in the Point Lowly area help ensure dilutions are rapid therefore minimising the size of this zone. The ecotoxicology studies indicate that there will be no impact to species outside of this zone.

There are several aquaculture leases in Upper Spencer Gulf. The closest is 5 km to the north of the proposed outfall. Even in periods of very low tidal movement when the zone of ecological effect covers the largest area, the closest boundary of the aquaculture leases would still be more than 2.5 km away.

Commercial and recreational fish species move throughout the gulf, including within the zone of ecological effect. Commercial fish species tested by BHP Billiton were found to be less sensitive to increasing salinity levels. Dispersion modelling showed that the zone of ecological effect for fisheries species would typically extend no more than 100 m from the outfall.

Dodge tides

During a dodge tide, when tidal movement is at its lowest, salinity would increase by less that 10% above background levels at 100 m from the outfall pipe. When tidal movement is at its highest, greater dispersion would be achieved with salinity predicted to be 1% above background levels at 100 m.

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Sea Pen off Point Lowly

Accumulation of salt in Spencer Gulf

Natural salinity levels measured in Upper Spencer Gulf in 2008 are about the same as those measured 25 years ago. This demonstrates that accumulated salt is effectively removed from the gulf. This occurs because salt is removed in 'slugs' of high salinity water, which move down the eastern side of the gulf, while lower salinity water moves up the western side. This natural process flushes Spencer Gulf and would ensure that the slight increase in salinity from the operation of the desalination plant would not lead to a long-term accumulation of salt (a graphical animation for this topic is available at www.bhpbilliton.com/odxeis and on the disc accompanying the Executive Summary).

Construction

The rocky reef habitat near Whyalla and Point Lowly is the site of the only known mass aggregation of spawning Australian Giant Cuttlefish in the world. Females attach hundreds of eggs to the rocky substrate under ledges or in caves between May and September each year and hatching continues through October. While the Australian Giant Cuttlefish is not a listed species, the annual breeding event has become an important tourism attraction in its own right and also attracts the interest of scientists and recreational divers. To avoid potential impacts on the cuttlefish during the installation of the intake and outfall pipes, construction activities in the rocky reef habitat off Point Lowly would be restricted to 1 November through to 1 May.

Less than 400 m^2 of cuttlefish breeding habitat (or 0.06% of breeding habitat in Upper Spencer Gulf), would be directly affected by the construction activities. The reef in this area would be reinstated to maintain habitat value.

Powering the desalination plant

The proposed desalination plant would require 35 MW of electricity, which would be supplied by a new 25 km 132 kV transmission line from the Cultana substation. The electricity for the desalination plant would be supplied by renewable energy sourced from the National Electricity Market.

Laboratory studies of Australian Giant Cuttlefish