

Beenyup Wastewater Treatment Plant

Sludge treatment process

The thickened excess activated sludge is mixed with raw sludge from the primary sedimentation tanks and transferred to a two-stage heated anaerobic digestion process. Here treatment by bacterial action in the digesters (above 35 degrees Celsius) followed by dewatering in centrifuges converts sludge into a residue (biosolids) that is an excellent soil conditioner for agricultural use. Methane gas produced in the digestion process is used to provide the fuel for the digester's heating and mixing requirements. Any excess methane is burnt off through a waste gas burner at 750 degrees Celsius to destroy any odorous gases.

A portion of the biosolids produced in this process is transported by trucks to agricultural areas where it is applied, under strict guidelines, to paddocks for use as soil improver. The remainder of the biosolids produced is used as an ingredient in commercial compost for landscaping. For more information on the Water Corporation's Biosolids Re-use Program, visit www.watercorporation.com.au (see the Wastewater section, under 'Biosolids').

Odour management

A major odour improvement project was completed in 2005 which included the covering of odorous areas of the plant, and the extraction and treatment of odorous gases.

Odorous gases collected from the covered parts of the plant are vented to chemical scrubbing towers for treatment. These chemical scrubbing towers remove the hydrogen sulphide and other odorous gases from the extracted air and release the treated air to the atmosphere through a 50-metre high stack. The height of the stack ensures good dispersal and dilution of any residual odours.

Wastewater disposal

The secondary treated wastewater flows by gravity to the Indian Ocean via two adjacent outlets, one 1850 metres and the other 1650 metres offshore, and is discharged into 10 metres of water where it is rapidly diluted and dispersed.

Regular monitoring of ocean water quality, through the Perth Long term Ocean Outlet Monitoring (PLOOM) program, is carried out to confirm that environmental and health standards are met.

For more information on the PLOOM program, visit: www.watercorporation.com.au (see the Wastewater section under 'Ocean Outfall').

History of the plant

Early sub-divisions in the northern suburbs were served by small local treatment plants. These were gradually closed down when a temporary plant was established at Beenyup in 1970.

In 1972 the first stage of the permanent plant was commissioned which catered for a flow of 3.6 million litres a day. This plant utilised the extended aeration process and provided for effluent to be disposed of by on-site soakage.

By 1978 the plant had been expanded to treat 27 million litres a day using the conventional activated sludge process. Also at this time a gravity outfall system was commissioned which enabled the treated effluent to be discharged into the Indian Ocean off Ocean Reef. Sludge disposal was by incineration.

Further upgrades were commissioned in 1984 to enable the plant to treat 54 million litres a day. The sludge digestion facilities were commissioned in 1990, replacing the sludge incineration process.

New secondary treatment facilities were opened in 1996 to cater for flows of 112.5 million litres a day. State-of-the-art odour control and further facility enhancements were completed in 2005 to increase the plant's capacity to 120 million litres a day.

In 2007 work began to increase the plant's treatment capacity to 135 million litres a day, while maintaining a high level of odour control.

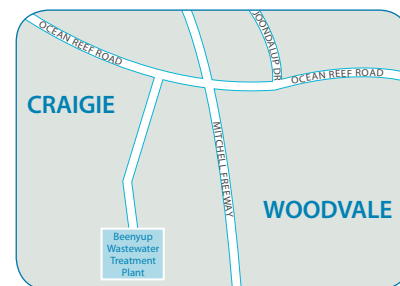
In the future, the plant will be developed to treat up to 200 million litres a day, which can serve a population of 1.1 million people



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The Beenyup Wastewater Treatment Plant serves Perth's rapidly developing northern suburbs from Quinns Beach through to Scarborough and inland through Dianella and Bayswater to the foothills east of Midland. It is an advanced secondary treatment plant. Capacity is currently 120 million litres a day but it will be ultimately developed to treat 200 million litres a day which can serve a population of 1.1 million people. The treatment process is designed to minimise environmental, public health and community impacts.

The wastewater is predominantly from household kitchens, bathrooms, toilets and laundries. Wastewater entering the plant is more than 99 per cent water.

Like other wastewater treatment plants across the state, the Beenyup plant is subject to regulation and licensing by the Department of Environment and Conservation.

Most of the treated wastewater from the Water Corporation's metropolitan wastewater treatment plants is discharged to the ocean, but our preference is to use this valuable resource. In the longer term, the Water Corporation believes that most of Perth's wastewater can be recycled. By 2030 it is estimated that water recycling in Perth will exceed 30 per cent.

The Water Corporation believes that major advances in water recycling can be made through large-scale recycling schemes such as:

- Groundwater replenishment, where high quality recycled water is stored in groundwater for use in drinking water supplies;
- Recycling to industry; and
- Providing recycled water to irrigate public parks, garden and for horticulture.

Australia's first groundwater replenishment trial will be located next to the Beenyup Wastewater Treatment Plant. The trial will involve water from the Beenyup Wastewater Treatment Plant being treated using ultrafiltration, reverse osmosis and ultraviolet disinfection. To produce high quality water for recycling. This water will be added to an underground aquifer, where it will be further filtered by natural processes to safely replenish groundwater. If this trial proves successful, it may result in more groundwater being available for Perth's drinking water supplies.

Wastewater treatment process

Preliminary treatment

Raw wastewater enters the plant from three main sewers that combine at the site inlet channel. It then flows through a screenings process comprising five step screens (with

6mm openings) that remove large material such as rags and plastics from the inflow. The removed material, called screenings, is then washed and compacted ready for disposal to an approved landfill site.

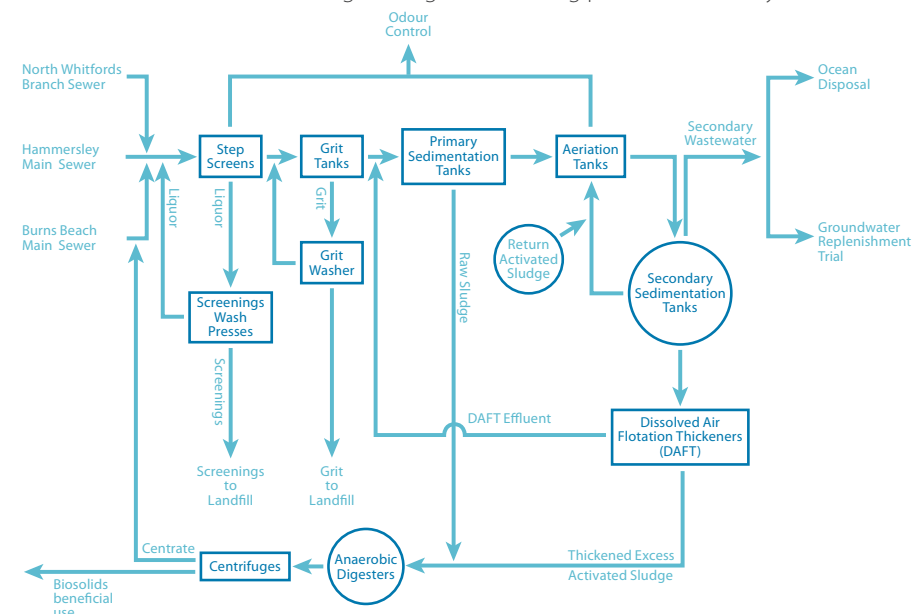
After screening, the wastewater flows through grit removal tanks to allow inorganic material (grit) to settle while the organic material remains in suspension.

Water is drained from the settled grit by a screw conveyor, then the grit is washed and sent to an approved landfill site, together with the screenings.

Primary treatment

Following preliminary treatment, the flow enters the primary treatment process consisting of six rectangular tanks and a raw sludge pumping system.

The wastewater remains in the tank long enough for 90 per cent of the solids to settle to the floor of the tanks while the oil and grease floats to the top of the tanks. Mechanical scrapers push the settled solids to a hopper at the inlet end of the tank and the oil and grease is collected at the opposite end of the tank. The settled solids are pumped to the sludge treatment area while the oil and grease is sent back to the head of the plant where it is absorbed onto the rags during the screening process and slowly removed.



Secondary treatment

The Beenyup treatment plant uses an advanced secondary treatment process incorporating a conventional activated sludge process with biological nutrient removal. The primary treated wastewater is blended with the microbiological biomass, to form 'mixed liquor' in reinforced concrete aeration tanks.

Mechanical blowers provide the air which is diffused into the mixed liquor through a series of fine bubble membrane diffusers on the floor of each of the tanks. This diffused air provides the oxygen for the microbiological processes that break down the organic compounds in the primary treated wastewater.

The mixed liquor from the aeration tanks flows into 20 circular sedimentation tanks. The biologically active sludge that settles in these tanks is continually removed and returned to the aeration tanks to sustain the microbiological population there. A portion of this settled sludge (excess activated sludge) is thickened in three dissolved air flotation thickeners before being sent to the digesters.

The overflow from the sedimentation tanks is the final treated wastewater, suitable for ocean discharge.

