

The wastewater treatment process

The collection, treatment and disposal of wastewater is an integral part of the water cycle. This brochure explains the processes undertaken in a wastewater treatment plant by following the journey from collection of wastewater, from homes and businesses through to the release of recycled water to the environment.

WASTEWATER TREATMENT PROCESS

1 Pre-treatment

Wastewater enters the treatment plant and is screened. Rotating drums remove the inorganic waste such as plastic and other man made objects from the wastewater. The inorganic waste is taken away to a waste landfill site.

2 Grit removal

Further grit removal takes place to eliminate inorganics and solids to protect downstream process equipment from abrasion and blockage. Grit is often made up of sand and stones that pass through the sewers to the Pretreatment zone.

3 Aeration tanks (Bioreactors)



Bioreactors are large tanks containing many microorganisms which make up what's known as an active biomass. The bioreactor provides a range of conditions necessary for a variety of bacteria to grow and work to remove the contaminants. (For detailed

information please refer to the back page).

4 Sedimentation tank



This area allows the activated sludge floc particles to settle in a conical shaped tank leaving clear liquid on the surface which is decanted off the tank as effluent. The settled sludge in the bottom of the Sedimentation Tank (also called a clarifier) is returned to

the Aeration Tanks to mix with the incoming wastewater and ensure an adequate biological population (FM ratio) to perform nutrient and pollutant removal.

This is also where the treatment plant stream divides to Output A: Recycled Water and Output B: Biosolids for agricultural use.

OUTPUT A: RECYCLED WATER

5a Chlorine contact tank

The effluent travels from the Secondary Sedimentation Tank in pipes to the Chlorine Contact Tank. The effluent is contained here for 30 minutes contact time with the chlorine to kill bacteria and pathogens.

6a Storage lagoon

This is the storage area for the final product 'recycled water,' which is pumped out on an outgoing tide or supplied to recycled water customers for uses including golf course and sporting field irrigation, dust suppression on construction and development sites. Process Duration: Approximately 24 hours.

OUTPUT B: BIOSOLIDS USED FOR COMPOST AND LANDFILL

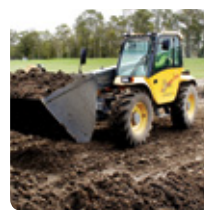
5b Dissolved air flotation

This process is designed to thicken the sludge which is drawn out of the aeration tanks to avoid the bacterial population becoming too large that it is undernourished. This process works by blowing compressed air through the sludge causing the sludge to rise to the surface where it is collected, skimmed off and sent to the Belt Press room for dewatering.

6b Belt press

The Belt Press are like old washing machine rollers which squeeze the water out of the sludge to form a solid sludge cake.

7b Sludge drying beds



The 'solid sludge cake' is placed onto drying beds and spread over a large surface to allow the cake to fully dry out from natural sunlight and evaporation, so it forms into biosolids. The dried biosolids are then taken away for landfill and farming purposes.

Note: any excess liquid that is extracted from the Belt Press and Sludge Drying Beds is transferred back to the Pre-treatment zone for further processing.

The wastewater treatment process

Allconnex Water

Allconnex Water is responsible for collecting, treating and disposing of wastewater through the Logan, Gold Coast and Redlands regions. Most of the system is gravity fed and follows natural catchment drainage lines. Transport to treatment plants is assisted by pump stations strategically placed throughout the region.

Millions of litres of wastewater is treated each day and a target of 20% of this is recycled for uses including irrigation of local golf courses, parks and nurseries. Excess recycled water is released to the ocean.

Allconnex Water operates the wastewater treatment plants in the region and is working to ensure that the wastewater treatment facilities have the capacity to meet future population growth.

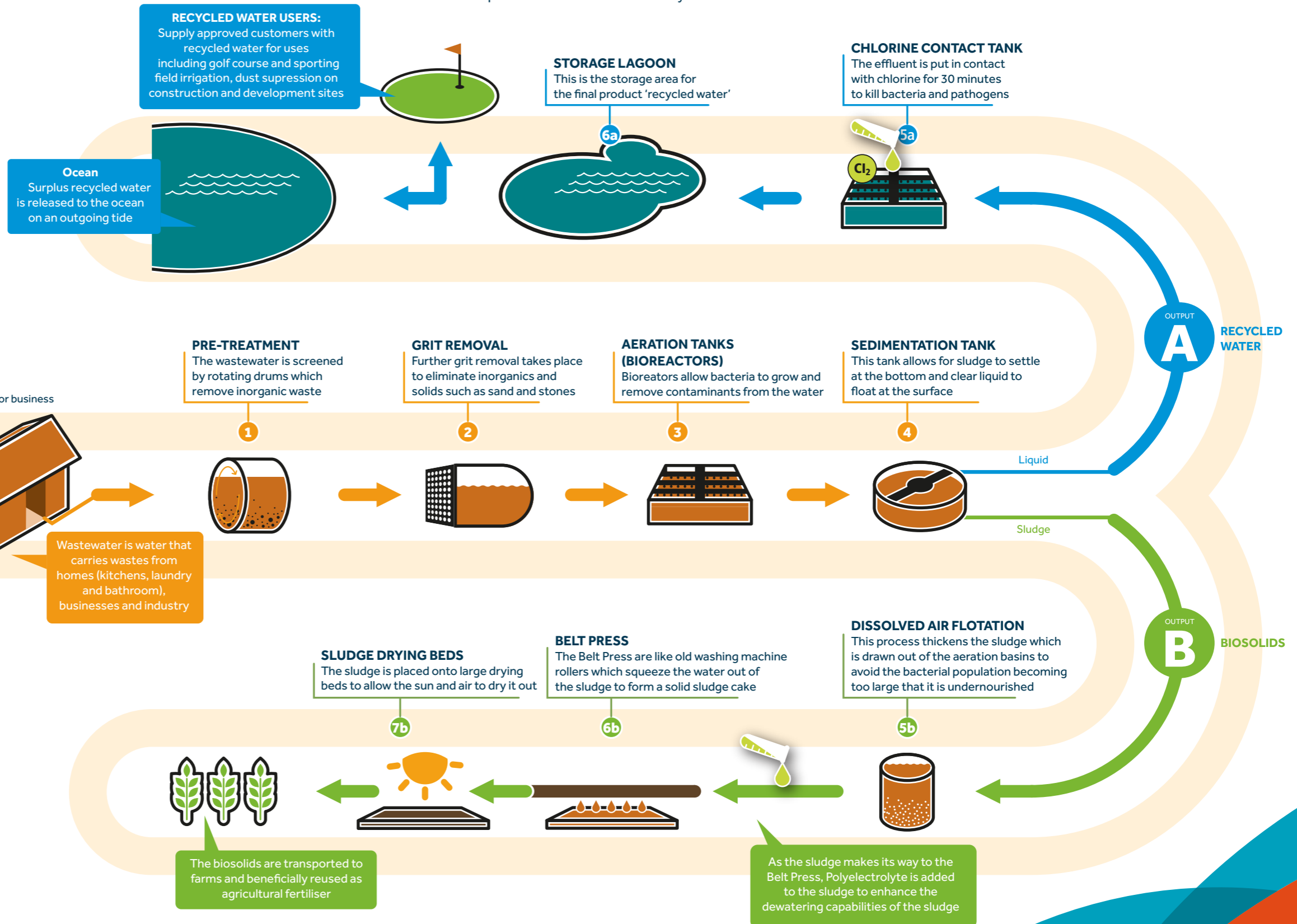
For detailed information on the Class A+ recycled water treatment process please view the separate brochure which is available on the Allconnex Water website.



4 Sedimentation Tank



7b Sludge Drying Beds



Further information

Aeration tanks (Bioreactors)

The active biomass harnesses bacteria to remove nitrogen, phosphorus and carbon from the wastewater via the three zones within the Aeration Tanks. The phosphorus can also be removed chemically by alum dosing. Alum chemically binds phosphorus allowing it to be removed in the sedimentation and biosolids processes.

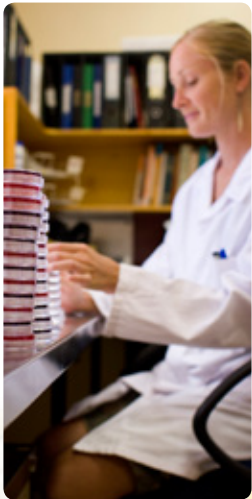
Note for budding scientists:

The three zones within the Aeration Tanks do the following tasks:

- 1. Aerobic zone:** Nitrifiers convert Ammonia to Nitrate and promotes biological phosphorus uptake
- 2. Anoxic zone:** Converts Nitrate to Nitrogen gas that is released to the atmosphere
- 3. Anaerobic zone:** A vital zone for one step in the biological phosphorus uptake process.

Monitoring

Allconnex Water is responsible for monitoring the entire wastewater treatment process from beginning to end to ensure every stage is functioning as required. Allconnex Water have adopted a HACCP (Hazard Analysis Critical Control Point) certified system (within the Gold Coast region only) which identifies monitoring needs at each stage of treatment for the early detection of system malfunctions.



Additionally, Allconnex Water monitors effluent and recycled water quality to meet strict standards issued by the Department of Environment and Resource Management in order to supply recycled water to customers and to release excess recycled water to the ocean. Parameters which are monitored against these standards include BOD (biological oxygen demand), suspended solids, pH, dissolved oxygen, chlorine, nutrients and bacteria. Annual quality data is available on the Allconnex Water website.

Glossary of terms

- Alum:** A general term used for aluminium sulphates used as a coagulant in water treatment.
- Biosolids:** This is wastewater that has been de-watered using belt filter presses to produce biosolids which are beneficially reused as agricultural fertiliser.
- Coagulation:** The process whereby alum or similar chemicals cause particles in water to group together.
- Evaporation:** The process by which water changes from a liquid to a gas; as part of the water cycle water in the ocean evaporates to form water vapour that rises into the atmosphere eventually condensing to form clouds.
- Floc:** Clumps of bacteria and particulate impurities or coagulants that have come together and formed a cluster. Found in aeration tanks and secondary clarifiers.
- Flocculation:** The process whereby water that has been treated with a coagulant, is agitated to allow smaller particles to grow in size or floc together.
- FM Ratio:** A food to micro organism ratio. A measurement of the amount of incoming food divided by the amount of micro organisms in your system.
- Inorganic:** Non-living matter.
- Nutrients:** Mineral elements absorbed by plants for nourishment; excess nutrients in wastewater, particularly phosphorus and nitrogen, can lead to excess algal growth resulting in a range of environmental impacts including outbreaks of blue green algae and reduced oxygen levels.
- Phosphate:** Phosphate is a salt of phosphoric acid and a nutrient that can cause uncontrolled growth of algae.
- Polyelectrolyte:** Synthetic or natural polymer containing many positive or negative charges. This material is water soluble, promotes changes in the fluid properties of aqueous suspensions and slurries, is strongly reactive with particles or ions carrying the opposite charge, and is frequently resistant to biological decomposition.
- Recycled water:** Treated wastewater suitable for specific purposes, for example the irrigation of golf courses, sporting fields and dust suppression.
- Sedimentation:** Is a physical water treatment process used to settle out suspended solids in water under the influence of gravity.
- Sewage:** The term given to wastewater of domestic or industrial origin; not to be confused with stormwater.
- Sludge:** Sludge is the residual semi-solid material left from industrial, water treatment, or wastewater treatment processes.
- Wastewater:** Comprises of liquid waste discharged by domestic residences, commercial properties, industry, and/or agriculture and can encompass a wide range of potential contaminants and concentrations.