

Treatment process

Raw water

Raw water (or untreated water) for the Mt Stromlo Water Treatment Plant (WTP) is sourced through selective abstraction, which means the best quality water is sourced from the storage reservoirs. Water is mainly sourced from Bendora Dam through a gravity fed pipeline called the Bendora Gravity Main. Water can also be sourced from the Cotter Dam using pumps.

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Pre-dosing

Whilst in the Bendora Gravity Main, raw water is dosed with substances needed for the treatment process. Dosing the water whilst it is still in the main allows a 60 second reaction time before the water reaches the plant. Pre-dosing substances include:

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- **Potassium Permanganate** is added seasonally to oxidise and precipitate manganese and iron particles, making them solids, which are then removed in the direct filtration process.
- **Carbon Dioxide** lowers the pH level which is required for flocculation to occur and helps to increase alkalinity and stabilise the raw water.
- **Lime** increases alkalinity to assist flocculation.

Rapid dosing and coagulation

This pre-dosed water then enters the flash mixing tank. Here, additional dosing and fast mixing occurs to encourage solid particles in the water that could host viruses and bacteria to group together to form larger particles, this is called coagulation.

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Following substances are added to the water:

- A **coagulant** (mainly Alum) is added and begins producing larger particles called flocs.
- **Polyaluminium Chloride (PACl)**, a coagulant aid, can also be used if raw water quality is poor. PACl costs more than Alum but it produces less solid waste and is more tolerant of higher pH levels.
- **Carbon Dioxide** can be added to trim pH to the optimal level for flocculation. This is typically used when the plant receives larger amounts of raw water.

Flocculation and filter aid

Larger particles produced as a result of the coagulation process are called flocs. Flocculation is a process of separating the flocs from the water. It involves mixing and circulating the water which causes the flocs to float to the top in a sludgy froth. This process occurs over a minimum nine minutes in two stages that gently agitate and encourage the bonding (agglomeration) of small floc particles to form larger floc particles. This process removes turbidity and colour along with some other contaminants.

At this point, a cationic polymer is added to strengthen the floc particles and helps to prevent them making their way through the filter.

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Dissolved air flotation and filtration (DAFF)

Dissolved air flotation (DAF) is only used when the raw water quality is relatively poor as it is expensive. It involves dissolving air in the water and then releasing it into the flow stream at high pressure. This causes the air to come out of the water and form tiny bubbles full of suspended matter such as oil, solids or algae which float to the surface where they are removed to the waste stream. With these solids removed, the water moves through the media more easily.

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Or

Direct filtration

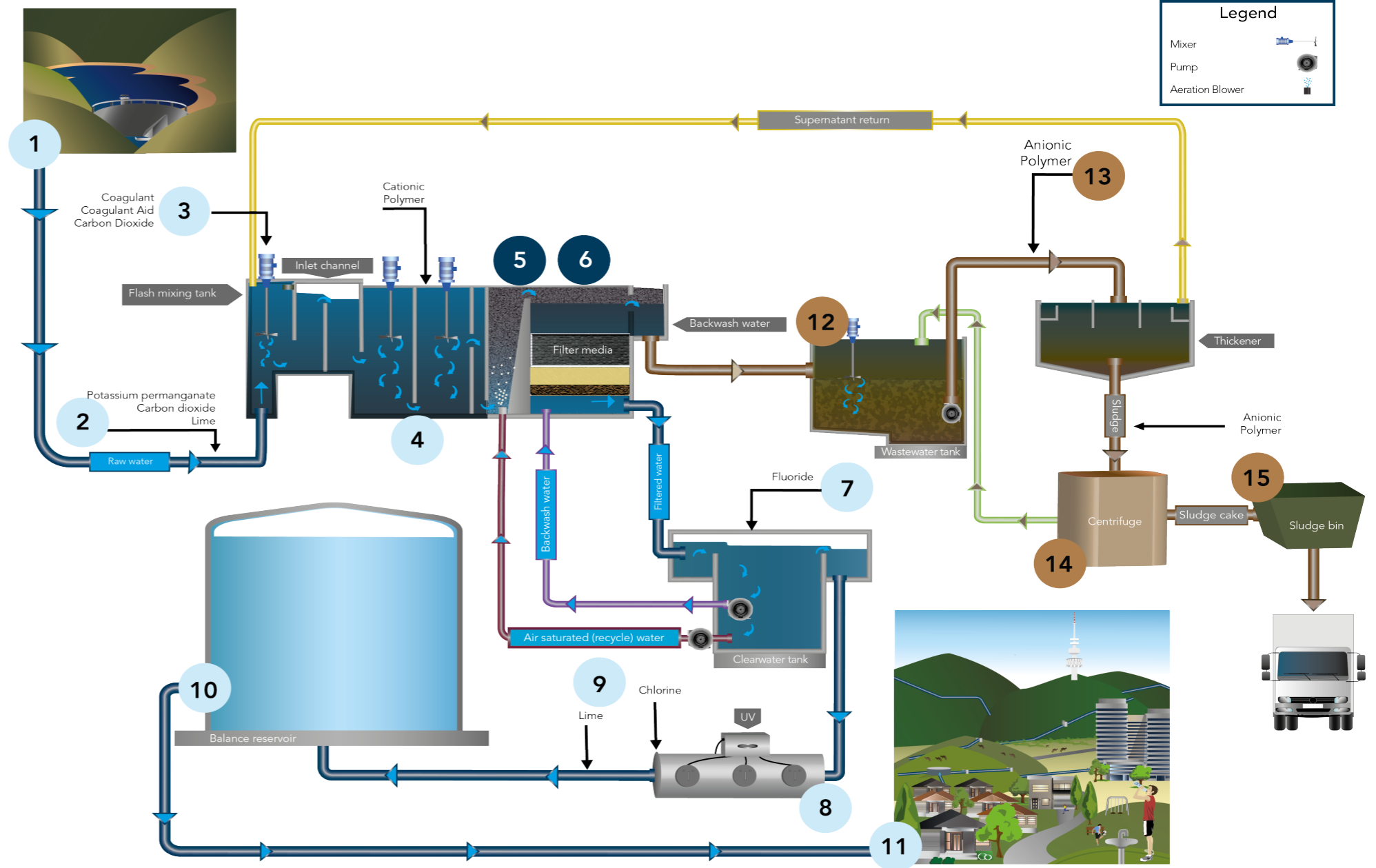
Direct filtration involves pumping the water through filters to remove the flocs and any remaining particles. The filters are over 2m deep and consist of 1.7m of crushed coal (anthracite), 0.25m sand and 0.2m gravel. Filters are backwashed every 24-25 hours to clean the filter media. Backwashing involves pumping water backwards through the filters at high pressure to remove particles trapped there.

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Fluoridation

The filtered water is now stored in the clearwater tank and is close to meeting drinking water requirements. From here it is also used for backwashing and DAF recycle purposes. Prior to exiting the clearwater tank, sodium silico fluoride is added for dental health (under direction from ACT Health).

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Ultraviolet (UV) disinfection

Exposing water to UV light kills or inactivates microorganisms, including *Cryptosporidium* and *Giardia*. The UV system contains three parallel treatment trains, each of which have three banks of high-intensity, medium pressure ultraviolet lamps. The power of each lamp is automatically regulated to ensure the required dose is maintained. Only two need to be used at all times, leaving one available as a back up.

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Corrected water dosing and chlorine disinfection

After UV disinfection, chlorine is added to kill remaining microorganisms in the water. Chlorine continues to disinfect as it moves through the distribution network ensuring high water quality. Lime is also added to stabilise the water and raise the pH levels to drinking water range to avoid corrosion occurring within the distribution system pipes.

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Balance reservoir

The balance reservoir holds 30 megalitres (ML) or 30 million litres of treated potable (drinking) water. The water stays in the reservoir long enough to allow for disinfection to occur and to allow for the distribution of the supply to Canberra to be managed effectively.

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Distribution

Once treated, water is distributed throughout Canberra (and a bulk supply to Queanbeyan) via a complex network of pipelines and service reservoirs.

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Wastewater collection

The wastewater tank collects wastewater from filter backwash, sludge particles from the DAF process, centrate (water recovered from the dewatering process) and other miscellaneous plant drainage. The wastewater in this tank is mixed into a more uniform product which is then sent to the sludge thickener.

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Sludge thickening

At this step, an anionic polymer is added to encourage floc reformation and incoming wastewater is held in the tank and gently moved to allow solids to settle to the bottom where sludge forms and is pumped out to the dewatering facility. The water separated from this process (called supernatant) is returned to the start of the plant to be treated again.

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Dewatering

Additional polymer is added to the thickened sludge and then dewatered in the centrifuge to separate water from sludge. The remaining sludge has no nutrient value and contains predominantly aluminium and polymer. The water separated out in this process is returned to the wastewater tank.

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Landfill disposal

The dewatered sludge contains at least 18 percent solids, which is acceptable for use as landfill (this still contains a high percentage of water). Trucks transport the sludge daily to landfill.

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Mount Stromlo Water Treatment Plant

Why do we need to treat water?

All untreated water contains small particles of soil, dust, pollen and other matter which may not be detected by the human eye. Attached to these particles are bacteria, viruses and other microorganisms that can be harmful to humans and our pets and farm animals. To remove the risk of harmful organisms in water, we process water at a water treatment plant. This ensures our customers, receive consistent and high quality water.

Hydro-electric power

Icon Water operates four mini-hydros to generate power from the water that runs throughout our network.

At Mount Stromlo WTP, the mini-hydro operates from water that runs through a gravity main from Bendora Dam to Mount Stromlo. The mini-hydro is designed to operate whenever the flow in the gravity main is within the turbine operating range. This is dependent on water demand from the balance reservoir on Mount Stromlo, which feeds our suburban reservoirs. Most of the time, the flow is sufficient.

Treatment changes over time

When it was first built, the Mount Stromlo Water Treatment Plant contained facilities for the chlorination, fluoridation and pH correction of all water drawn from the Cotter River system.

The 2003 bushfire damage to the Cotter River catchment meant that the existing water treatment plant was not adequate to treat the potentially turbid (cloudy) water drawn from the dams in the burnt-out catchment.

A substantial upgrade of the water treatment plant was undertaken to ensure the quality of Canberra's drinking water was protected during the Cotter River catchment's lengthy recovery. During the upgrade the treatment process was enhanced to include processes like dissolved air flotation to be able to treat lower quality raw water.

The new, more sophisticated Mount Stromlo Water Treatment Plant was commissioned in November 2004.

In 2007, UV disinfection was installed as an additional disinfection step to increase the ability to use water from the Murrumbidgee River for town supply. Before the UV system was in place, water extracted from the Murrumbidgee River needed to be restricted to ensure drinking water quality levels could be maintained.



Did you know...

- The original Mount Stromlo Water Treatment Plant was commissioned in June 1967.
- The water treatment plant can produce up to 250 megalitres (million litres) per day.
- Canberra water use averages anywhere from 100 to 250 megalitres per day depending on the time of the year.
- Icon Water operates, maintains and closely monitors 47 service reservoirs, 25 pump stations and over 3,300km of water pipelines to ensure Canberra receives high quality drinking water.
- The clean, green energy from the Stromlo mini-hydro saves over 3,600 tonnes of greenhouse gas emissions each year, by supplying electricity that would otherwise come from fossil-fuel power stations.

Mount Stromlo Water Treatment Plant

Producing quality drinking water for Canberra