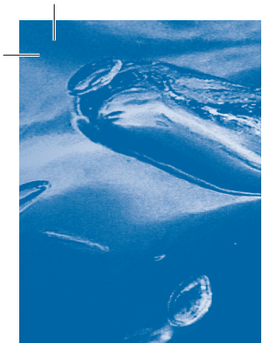

A guide to Hamilton's Water Supply

River to the Tap

WATER SUPPLY

As recently as 100 years ago many people in towns and cities worldwide were at high risk of becoming sick or dying from drinking contaminated water.

Today Hamilton's own water supply network uses a minimum of 10 separate lines of defence in its treatment, distribution and management systems to ensure that when the water reaches consumers, it is free of harmful organisms. The network is also designed to ensure all urban areas of the city are able to access enough water at the right flow and pressure to fight fires.

Every second of every day, Hamilton City Council (HCC) produces an average of 2385 glasses of high quality drinking water to over 51,000 homes and industrial premises. But only a very small percentage is used for drinking. The rest is used for bathing, washing, toilet flushing, watering the garden and swimming pools.

Each person in Hamilton uses on average 224 litres of water per day.

Water Treatment Plant

Hamilton City's Water Treatment Plant

The HCC Water Treatment Plant was built in 1971 on the banks of the Waikato River off Waiora Terrace. It was originally designed to produce 64 million litres per day (Ml/day). This has increased over the years with process improvements and upgrades resulting in the plant now being capable of producing 106 Ml/day.

TREATMENT PROCESS

Abstraction & Screening

Before water from the Waikato River enters the Water Treatment Plant, large and small pieces of debris must be prevented from entering the system.

This is done through the use of screens. The water flows through coarse grills into pipes of 1.8 metre diameter. These grills prevent entry of large debris. Narrower screens then remove any leaves, twigs and other small matter. The river water is pumped by 'low lift' pumps to the start of the sedimentation tanks for the next treatment step.

Coagulation and Sedimentation

Screened raw water from the Waikato River contains sediments, microorganisms, organic and inorganic material which can cause colouration and taste, and other small particles. Some of these naturally stay in suspension and are very difficult to remove by settling.

To assist in settling, chemicals called alum and polymer are added. A chemical called 'alum' breaks weak bonds that hold small particles in suspension. This along with the addition of another chemical called polymer assists the particulate matter to clump together to form bigger particles called 'floc'. This floc is heavy and becomes separated from the water and produces a sludge blanket. The excess floc is continually removed to maintain a balanced 'blanket'. The clearer water on top flows out for further treatment.

Coagulation and sedimentation removes nearly all of the material entering the treatment plant. Filters are left to 'polish' the water.

Sedimentation tanks

Filtration

The next step in the process uses sand filters to remove any 'straggler' floc that have not clumped together or settled in the sedimentation tanks. The water is gravity fed through the sand filters leaving remaining floc trapped on top and within the sand. These filters are cleaned automatically every 50 - 100 hours using a mixture of water and air.

Coagulation & Filtration are the primary defence against impurities found in river water (particularly Cyrptosporidium and Giardia).

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Granular Activated Carbon Filtration

Three submersible 'Relift' pumps each with a capacity of 60 Ml/day then lift sand filtered water up to the Granular Activated Carbon (GAC) filters.

The GAC filters while similar in operation to sand filters, serve a very different purpose. Activated Carbon has a huge surface area, with each grain of carbon being riddled with tiny gaps and holes. This structure is highly effective at absorbing organic (that is carbon based) chemicals that are not removed in earlier treatment processes.

The purpose of a GAC filter is to remove organic chemicals, some of which are created by algae and which can cause problems such as musty taste & odour. Some algae (known as Cyanobacteria or Blue Green Algae) can potentially create toxins and the GAC filters protect against that threat.

GAC & UV Building

UV Disinfection

The next barrier in the water treatment process is Ultra Violet (UV) light.

Protozoa such as Giardia and Cryptosporidum are highly resistant to Chlorine if not removed in earlier treatment stages. UV light is very effective in inactivating these organisms by penetrating their cell wall and permanently altering their DNA structure so they are unable to infect or reproduce. The HCC's three UV reactors provide an effective secondary barrier against these microorganisms.

Chlorine Disinfection

Treated water is made safe by the addition of Chlorine, which kills any remaining bacteria and viruses not removed or inactivated in previous treatment processes. To ensure maximum effectiveness, Chlorine dosed water is sent to a large clear water storage tank where the Chlorine is in contact with the water for over an hour.

Fluoridation

HCC also adds Fluoride to drinking water. The river water contains around 0.2 parts per million of Fluoride and this is raised to approximately 0.75 parts per million in the final water in accordance with Ministry of Health Guidelines for dental health

pH Correction

Adding alum decreases the pH of the water, so to protect the pipe work and fittings in the distribution network, Lime is added to raise the pH back up to normal levels

The water is now safe for drinking (potable) and ready for distribution around the city.

DISTRIBUTION NETWORK

There are over 1000 kilometres in pipes (mains) in the reticulation network, ranging from 40 mm diameter to over 600 mm diameter. Most of the pipes are relatively new, (less than 50 years old) although a few remain from early last century.

The supply is very reliable and flexible and in most areas water is supplied from two directions. The city ensures that there is a 10 metres pressure head and 25 litres of flow per second available for each house.

Bulk Mains and Reservoir Storage

From the Water Treatment Plant the treated water flows through a bulk water main that rings the city. This ring bulk main transports water to the distribution network and eight reservoirs, around the city.

All of the water that leaves the treatment plant is pumped at least twice. Pumping water a third time pushes water into or out of specific reservoirs and allows some areas that are more elevated to receive the same pressure and flow as lower areas.

The eight reservoirs have a total storage capacity of approximately 90 million litres. This is equivalent to approximately 1.7 times the average annual daily demand of the city. This storage capacity meets industry design standards. Having a large storage capacity allows the Water Treatment Plant to be shut down for an extended period to undertake repairs with little or no impact on the supply of water.

Reservoirs have a dual role of providing sufficient water for emergency storage, as well as assisting with the supply of water during periods of high water demand. This buffering of demand is important as it allows the treatment plant to operate more efficiently and economically by producing treated water at steady output flows.

Trunk and Reticulation Mains

Trunk mains distribute water from the bulk mains and reservoirs to each city area. The reticulation mains carry water to the taps of users.

Maintaining Water Quality in the Network

To ensure the water remains safe until it arrives at the consumers tap, a small residual of Chlorine is maintained in the water leaving the treatment plant. All new works and major repairs are disinfected and tested prior to commissioning.

Where there is a risk of contaminated water flowing back into the reticulation system, a backflow preventer is fitted.

FIRE FIGHTING WATER

Another important function of the water supply is to provide for fire protection. Fire Hydrants are provided in all streets. For industrial and commercial buildings direct fire main connections are provided from the mains.

Typical flows of 1500 litres per minute are available from over 6000 hydrants throughout the urban area. These comply with the Fire Service Code Practice standards for flow and pressure.

Most streets have two water mains, which also offer fire protection to the properties from the hydrants, however, in some larger streets such as Victoria Street, there are three or more larger mains.

Ruakiwi Reservoir - Hamilton's historic landmark

Network Management

To ensure the network operates effectively, reactive and preventative maintenance and renewal programmes are in place. Flushing of mains, particularly on those supplied from one end only, is ongoing and helps maintain water quality. Leak detection surveys are also undertaken annually to ensure the network remains in a watertight condition.

Treatment processes, pumping, reservoir and distribution network elements are continuously monitored. Scheduled major reviews ensure the level of service and quality targets are met.

Customer and Management Services

The City Waters Unit, with support from The City Delivery, City Development and Business Support Units, provide customer and management services. Responding to customers includes water supply connections, enquiries regarding pressures, flows, quality issues, location and giving general advice. Regular customer surveys are used to assess and improve council services.

Our technicians test Hamilton's water quality

Monitoring

The Ministry of Health is responsible for setting drinking water standards in New Zealand. The standards specify the maximum acceptable values (MAV) of microorganisms, organic and inorganic chemicals that are of health significance.

Some of the tests that are done by HCC's internal Internationally Accredited Laboratory and subcontracted Laboratories include Giardia, Cryptosporidium, Coliforms, E.coli, Algae, Fluoride, Chlorine, pH, turbidity and other various inorganic and organic compounds. These Laboratories along with water technicians test water from the treatment plant and check the distribution network to ensure that the water is safe for drinking.

Sophisticated 'online' technology also ensures water quality is continuously monitored and maintained. This includes parameters such as pH, turbidity, chlorine, fluoride, flow, pressure, transmissivity and UV intensity.

From a Ministry of Health grading system of A1 to E, Hamilton City and Temple View both have an 'A-a' grade. This means both our water treatment (A) and distribution (a) have maintained one of the highest grading since the system started in the 1960's.

CONSERVATION

With the mighty Waikato River flowing through the heart of Hamilton, there is a common misconception that the city does not have to think of water as a limited or precious resource. In reality there is a limit to the amount of water that can be drawn from the river each day and there are also significant financial costs to the city to treat and reticulate extremely high levels of water for extended periods.

In both the summers of 2007/08 and 2008/09, Hamilton was approaching the maximum levels of water it could take from the river and ongoing use of water at these levels was simply not sustainable. The city's Smart Water Use alert levels and their corresponding restrictions were developed to encourage proactive water conservation and help ensure a consistent supply throughout the warmer months.

HAMILTON'S WATER

FACTS OF LIFE

- Water that is safe to drink is call potable (pronounced po ta-bal)
- A person can live about a month without food, but only about a week without water.
- Nearly 97% of the world's water is salty or otherwise undrinkable. Another 2% is locked in ice caps and glaciers. That leaves just 1% for all humanity's agricultural, residential, manufacturing, community and personal needs.
- There is the same amount of water on Earth as there was when the earth was formed three billion years ago. The water from your tap could contain molecules that dinosaurs drank.
- A dripping tap can waste up to 7,600 litres of water a year.
- Hamilton uses only a small portion (less than 1%) of Waikato River flow even on high demand days.
- The original Water Treatment Plant is a "Patterson-Candy" plant, which is quite a common effective design used throughout New Zealand.
- On average, 50-70% of household water is used outdoors for watering lawns and gardens.
- A garden sprinkler uses 1000 litres of water per hour.
- On a peak summer day, each person uses over 700 litres of water compared to 224 litres on an average day.
- The oldest reservoir in Hamilton is the Ruakiwi Reservoir, which was built in 1935.
- For every 1,000,000 litres of water delivered to customers, 410 kWh of electricity is used.
- When commissioned in 2006, the UV disinfection facility at the Hamilton Water Treatment Plant was the largest in Australasia

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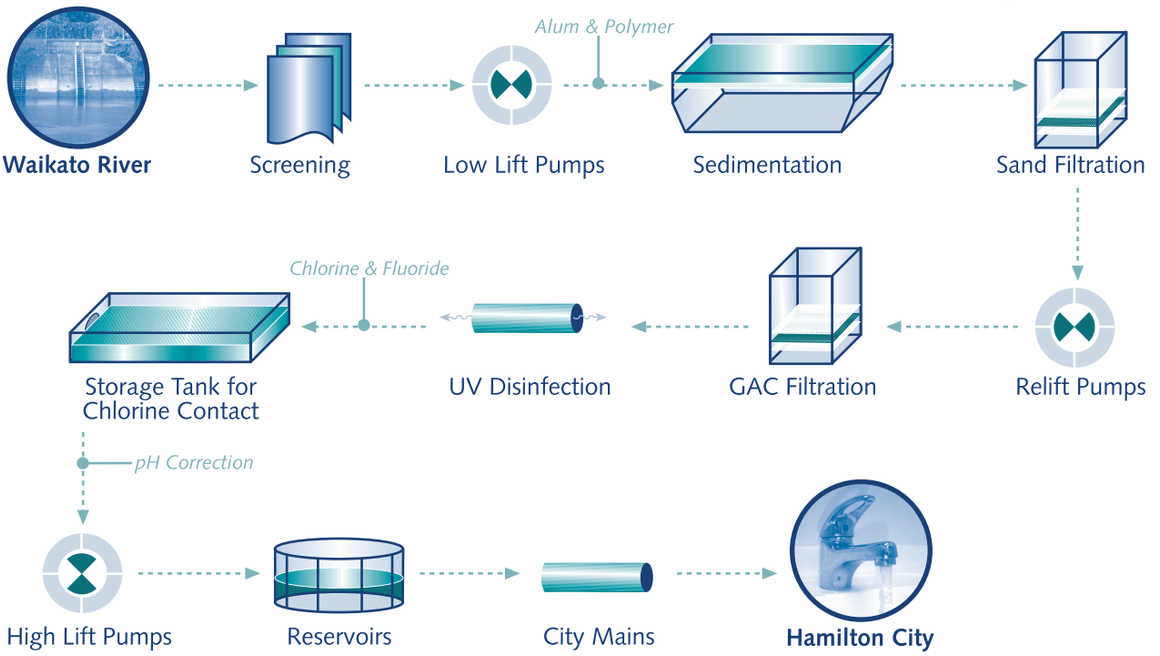
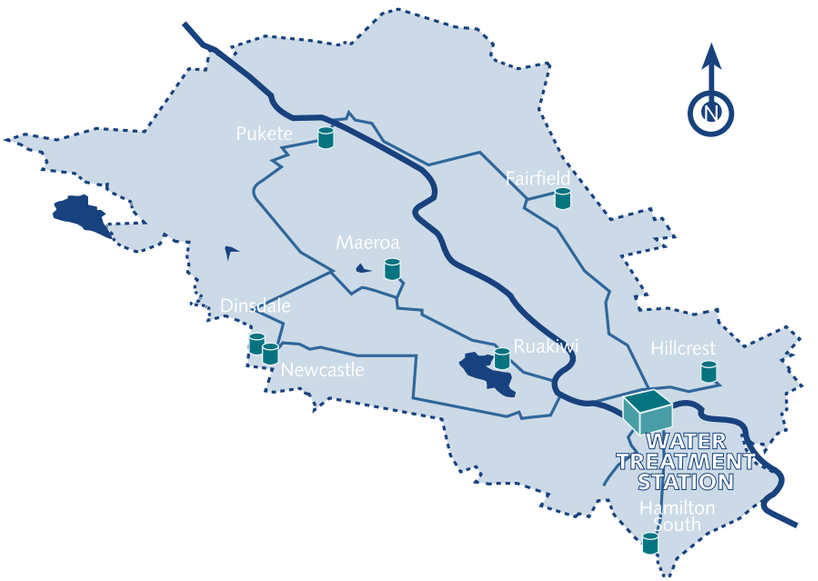
The Treatment Process of Hamilton's tap water



10 LINES OF DEFENCE

1. Screening
2. Coagulation / Settling
3. Sand Filtration
4. Carbon Filtration
5. UV Disinfection
6. Chlorine Disinfection & Contact Time
7. Residual Disinfection
8. Reservoir Storage
9. Backflow Prevention
10. Testing

Bulk main and city reservoirs



Hamilton City Council
Te kaunihera o Kirikiriroa