# Watercare's dams supplying water to Auckland





# Supplying water to Auckland

Each day, we provide lifeline services to 1.7 million people in the Auckland region. Watercare is New Zealand's largest company in the water and wastewater industry. Typically, we supply more than 400 million litres of water to Auckland every day.

Our dams in the Waitākere Ranges are providing around 20 per cent of Auckland's water supply while the dams in the Hūnua Ranges are providing around 60 per cent.





# Waitākere Ranges dams

There are five dams in the Waitākere Ranges; three are made from concrete and the rest compacted earth. These were built between 1906 and 1971.

Each dam is named after the stream that feeds into its lake. Raw water from these dams is piped to treatment plants in Huia, Titirangi and Swanson, where it's turned into high quality drinking water.

Aside from holding sufficient supplies of water, another benefit of dams is that when water is stored in lakes, the quality improves. This is because sediment particles settle on the lakebed and bacteria levels reduce. Capturing water during heavy rainfall also minimises the likelihood and impact of downstream flooding.

The Waitākere Ranges have a high elevation and normally receive about 1.8 metres of rain each year. The elevation also makes it easy for water to flow to the city by gravity. The two compacted earthfilled dams are located just above sea level and this water must be pumped up to the Huia Water Treatment Plant.

#### Waitākere Ranges -water catchment areas



# Waitākere Dam

Waitākere Dam is the oldest of the water supply dams in the Waitākere Ranges. Before it was built, Auckland's water came from springs in the Auckland Domain and Western Springs and from the Nihotupu Stream.

Before construction of the dam could begin, a gang of workmen had to build a tramway from Swanson Railway Station to the dam site. The tramway was needed to cart hundreds of tonnes of aggregate and cement, tools, heavy machinery, food and other supplies through the rugged country to the construction site.

To alleviate the city's water shortages while the concrete dam was being built, a small temporary wooden dam was built in 1907, upstream of the main dam site.

Demand was so great that a larger wooden dam was built a year later, just before the foundations of the concrete dam were laid.



Teams drag supplies from the Swanson Railway Station up to the men building the dam.







# Upper Nihotupu Dam

Building the dam was challenging, with sand, cement and coal transported by barge from Onehunga, across the Manukau Harbour to Big Muddy Creek. Materials were then hauled four kilometres up the Nihotupu Valley along a tramline, and lifted by steam winch up the 640 metre-long incline. Finally, they were hauled by locomotive to the dam site.



Construction material was hauled up the 640 metre-long incline by steam winch.



Opening day of the dam, 14 April 1923.



# Upper Huia Dam

Upper Huia Dam was the last of the three concrete dams to be built in the Waitākere Ranges in the early 1900s.

The decision to dam the Upper Huia Valley was made in the wake of Auckland's extreme water shortages in 1919 and 1920. By 1923, the population of 121,000 people was consuming on average 25 million litres of water a day. Construction started on the six-kilometre tramline connecting Huia Bay to the dam site. Workers and equipment were shipped from Onehunga to Huia Landing. It was laid by hand and took two years to complete.



Workers and equipment were shipped from Onehunga to Huia Landing by launch.



Upper Huia Dam during construction, 1928. The dam itself is 36.6 metres high with a crest length of 166 metres. It contains 29,000 cubic metres of concrete.





Construction completed: **1929** 

What is the dam made of? Concrete



Dam height above foundation: 41.1 metres



Lake capacity: 2.2 billion litres



### Lower Nihotupu Dam

Lower Nihotupu Dam was built as the answer to the spike in Auckland's water demand during World War Two. The city's water demand had increased significantly with the establishment of several large military bases and two aerodromes for New Zealand forces, as well as six camps and two hospitals for U.S. troops. The two military institutions were using more than 3.2 million litres of water a day.



Lower Nihotupu Dam site foundations looking from east to west, showing the cut-off wall along the centre line of the dam.

#### Combating algae

All waterways are susceptible to blue/green algae in the summer months. At Lower Nihotupu Dam we use ultrasonic technology to monitor and control the algae. You may see one of the five solar powered devices, which look like small houses, floating on the reservoir. The ultrasonic emitters create a sound – undetectable to the human ear – that cripples the targeted algae, causing them to sink and perish. The devices are harmless to humans, animals and all marine life.





### Lower Huia Dam

Lower Huia Dam was the last of the five Waitākere dams to be built.

Lower Huia Dam is an earth-filled dam with a clay core. As the dam is at sea level, it has a pumphouse at its base which pumps water to the Huia Water Treatment Plant. The dam also has a small treatment plant at its base, which treats the water supply for the local Huia community.



*Construction of the valve tower, walkway bridge and spillway, 1969.* 



Lower Huia Dam site showing offices, workshops and workers' huts, 1966.



# Hūnua Ranges dams

Auckland's population growth and industry boom in the wake of World War Two meant demand for water was outstripping supply.

When it became clear that the existing dams in the Waitākere Ranges could no longer meet growing demand, the city's water engineers looked to the Hūnua Ranges. The ranges had the benefits of high rainfall and elevation, which would allow water to flow by gravity to the city. Cosseys Dam – the closest catchment to the city – was the first of four dams to be built in the Hūnua Ranges.





### **Cosseys Dam**

The earth-fill for the dam structure was placed over three consecutive summers before finishing touches were applied to the embankment, spillway and valve tower in 1955.

The dam went through a massive upgrade between 2001 and 2004. The downstream face was temporarily removed and a drain and filter blanket laid against the core, abutments and downstream foundation to control internal erosion.

Water from Cosseys Dam is fed by gravity to the Ardmore Water Treatment Plant, before it is safely distributed to Auckland homes and businesses.



An aerial view of the construction works at Cosseys Dam. December 1954.



Cosseys Dam dissipator wall under construction. March 1955.



# Upper Mangatawhiri Dam

Upper Mangatawhiri Dam is the second largest dam in Auckland.

More than a million cubic metres of rolled earthfill was placed on the embankment at an impressive rate. Good weather, and staff with past experience working on Cosseys Dam, meant it was completed in record time.

As well as supplying water, we can generate electricity at Mangatawhiri Dam. Our hydro generator can produce up to 170kw per hour. We then sell this back to the national grid to offset our costs.



In the background the diversion culvert along with a bulldozer working on the core material. The foreground shows the filter drain. 1962.



Upper Mangatawhiri Dam showing the reservoir approximately a third full. February 1965.



### Wairoa Dam

Completed in 1975, Wairoa Dam was bumped up in the Hūnua water supply programme when it became apparent that serious delays to Mangatangi Dam's completion were inevitable.

At the time, Auckland's water demand was increasing at a rate of five per cent a year and residents faced water restrictions during the dry summer months. A new source was badly needed. Work to clear the Wairoa Dam site and build the diversion tunnel began in 1971.



A view of the Wairoa Dam construction site, 1973.



The valve tower bridge piers and beams, 1973.



# Mangatangi Dam

Mangatangi Dam is by far the largest of all our dams.

Mangatangi is ancestral land of the Ngāti Tamaoho and Ngāti Pāoa tribes. The iwi share descent from the Tainui canoe which arrived in the Hauraki Gulf in the 14th Century. In pre-European times, settlement was on the southern and eastern banks of the Mangatangi catchment. The Mangatangi valley was used seasonally as a source of food.

Land purchases for the dam were completed in 1946 with the remaining land for the catchment area bought in the mid-1960s.



Preliminary work in the dam area. Auckland engineer, Eric Scanlen surveying at the portal entrance to the Mangatangi No.1 tunnel at Holmes Creek in early 1961.



Mangatangi Dam construction site, 1975.



### Hays Creek Dam

Hays Creek Dam, located in Papakura, is a small water source in comparison to some of Watercare's other dams. Originally built for Papakura City, it was transferred to Watercare in November 1989.

The dam was taken out of service in 2005 because significant upgrades were needed at the Papakura Water Treatment Plant. When 2019/2020's drought saw Auckland's dam levels drop below 50 per cent for the first time in 25 years, we brought forward plans to build a new Papakura Water Treatment Plant and return the dam to service.



Hays Creek Dam.



Hays Creek Dam, valve tower and gantry.



### The Hūnua Regeneration Programme

#### What we're doing

In 2017 we bought a forestry right in the Hūnua Ranges to give us greater control over the activities in our most significant water catchments, and bring an end to forestry activities decades earlier than they otherwise would have.

Over the next 30 years we are progressively regenerating more than 2000 hectares of forestry land in our catchments by planting millions of native trees and plants. No more pine trees will be planted, harvesting areas have been minimised and after any remaining harvesting, we get to work replanting native forest.

Great care is being taken to emulate the natural biodiversity of the ranges. We eco-source seeds from existing native vegetation in the area and then use select nurseries to grow the plants until they are ready to be put in the ground. Ecosourced plants are better adapted to the local conditions and have a greater chance of surviving.

#### Why we're doing it

Our primary goal is to protect our water sources. Forestry land is more susceptible to landslips, which can deposit silt into our dams and

muddy the raw water. We saw the impact of this during the Tasman Tempest weather event in March 2017, when two months' of rain fell in our Hūnua catchments in 24 hours and hundreds of landslips sent tonnes of dirt into our reservoirs.

With no more forestry activity in high-risk areas, we are protecting the water quality of our supply lakes.







# **Trap and Haul Programme**

We trap elvers (juvenile eels) and galaxiids (whitebait) in our downstream river systems and transfer them upstream. The tiny fish are scooped into buckets and carried to neighbouring dams to be released, where they will feed and grow, to continue the lifecycle in a protected environment. This happens from October to March.

Adult eels – which can live beyond 100 years – start migrating to Tonga from anywhere between the ages of 15 to 80 years to breed. This generally happens between March and June. We trap the adult eels in our dams and release them downstream so they can continue their journey to Tonga.



(L to R) Watercare dam technician, Gareth Whittington and water quality and environmental scientist, Matthew Hubrick with native whitebait and elvers.



Trapping adult eels at Lower Nihotupu Dam for release further downstream.

#### Did you know?

New Zealand longfin and shortfin eels breed only once at the end of their lives, so helping the eels from our dams to reach the ocean is essential for the survival of this declining species.

