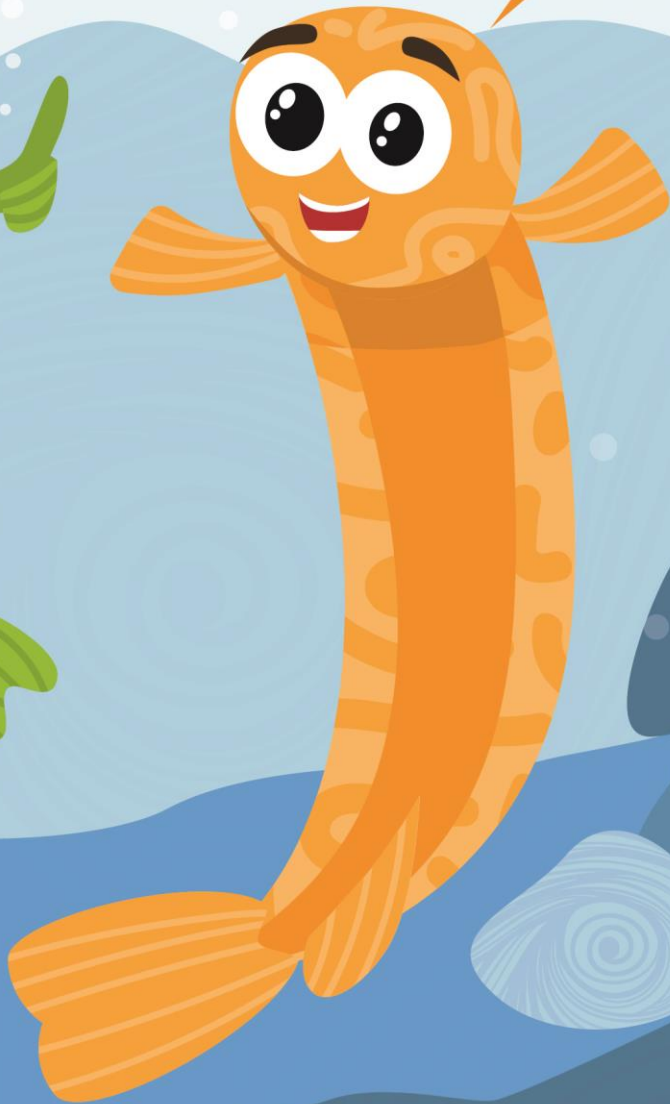


# HE PUNA WAI

Hi I'm Ian the  
Inanga



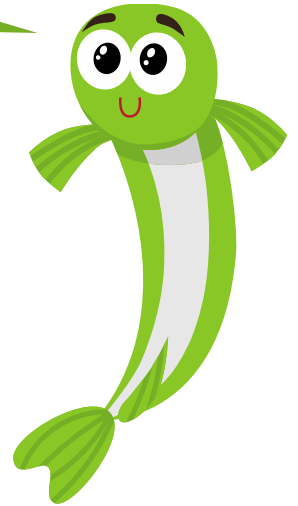
I'm Koro the  
Kokopu



Water to drink

# Water to drink

Let's learn about our drinking water!



Activity	Subject Areas	Inquiry Stage
3	Technology, Social Science	2. Pātai wai Ask about water

## Q Overview

Clean drinking water is essential for us to survive. Students learn about where their water comes from and are introduced to the treatment process. Drinking water goes through a process of treatment to make it safe to drink.

### Key Concepts

- Water sources for New Plymouth District.
- The general water treatment process.
- How water is distributed to homes and schools: the water network.

## 🔗 Curriculum links

New Zealand Curriculum

Learning Areas	Levels	Years
Technology		
Nature of Technology; Characteristics of technology		
Technological Knowledge: Technological products	3-4	5-8
Social sciences: Social studies		

## 🧠 Learning intentions

*Students are learning to:*

- Understand where their drinking water comes from and how it is treated.
- Explore the steps in the drinking water process.

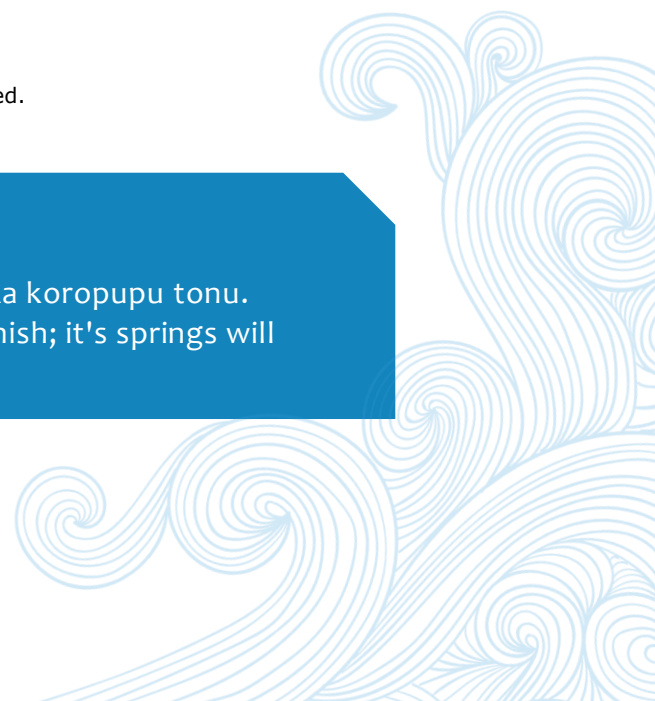
## 📖 Success criteria

*Students can:*

- Describe where their water comes from and how and why it is treated.
- Describe the basic steps in drinking water treatment.

## Whakatauki

Taranaki he puna wai e kore e mimiti: ka koropupu tonu ka koropupu tonu.  
Taranaki is the source of our water which will never diminish; it's springs will continue to replenish forever.



# Background information: Water to drink

Water treatment is necessary for public health, to make sure the community has healthy water to drink every day. Chemicals, bugs, animal waste and other substances in water can make it unsafe to drink. Some diseases can also be carried in water. It is safest to treat any water that we intend to drink. We are fortunate in New Zealand that we have drinking water provided to us through pipes and taps in our homes and schools. Some countries do not have that luxury. Most people in Taranaki get their water from a town supply but some collect their own rainwater to drink.

## What are springs?

Puna is te reo for spring. Springs are areas where water from the ground (groundwater) bubbles up from the earth. Water comes from deep in the ground and forms springs in many places around Taranaki, such as Kokowai Springs and Bubbling Springs near Dawson Falls: Te Rere o Noke.

## Ngā puna wai o Taranaki - The springs of Taranaki

Taranaki maunga, at the heart of our region, unites the eight iwi of Taranaki. The maunga is a symbol of the strength and endurance of our people. The 'springs' of Taranaki (sometimes a metaphor for the people of Taranaki) will continue to spring forth, never to be diminished, providing nourishment to the region and its people.



## Mountain to tap

Rain falls on Mount Taranaki and some of this rain makes its way down rivers or seeps into the ground to join the groundwater, creating springs or aquifers.

Some of this water is then piped into a water treatment plant. Here the water is treated to make it safe to drink. Water is then distributed to residents for use.

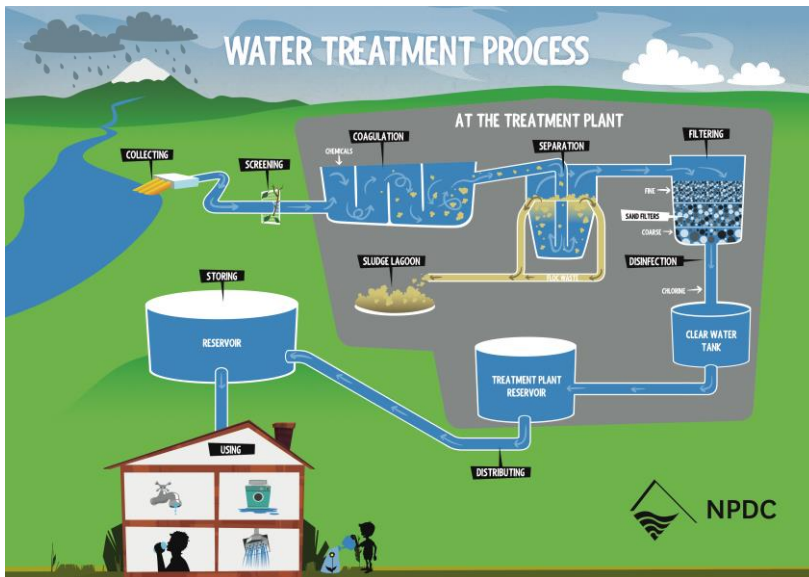
After being used, the water enters the wastewater system. Wastewater is treated at the treatment plant and the water is discharged back out to sea.

# The source of New Plymouth water

New Plymouth city's first public water supply was from the Waiwakaiho River in the early 1900s relying on diesel driven pumps to deliver the water to an elevated small open tank, from which the city was gravity fed through a limited network pipes. In 1971 the New Plymouth Water Treatment Plant was built, providing high quality treated water.

Today, water for New Plymouth, Lepperton, Waitara, Tikorangi, Onaero and Urenui is sourced from the Waiwhakaiho River via Lake Mangamahoe. This water is treated at the New Plymouth Water Treatment Plant.

## Stages in the drinking water treatment process



1. Collection and screening.
2. Coagulation.
3. Separating.
4. Filtering.
5. Disinfecting.
6. Storing and distributing.
7. Household use.



### Stage 1: Collection and screening

New Plymouth water is taken from Lake Mangamahoe via the Waiwhakaiho River. Water is screened before being sent to the water treatment plant. The screens trap twigs and large pieces of debris (branches, rocks, leaves) before they get to the treatment plant. Water from the lake has tiny particles of dirt and sediment in it, which makes it look cloudy and murky. There may also be bacteria, viruses and chemicals in the water attached to the dirt and sediment, which need to be removed. Carbon dioxide and lime are added to make the water the right acidity. The earthy tastes and odours are removed from the water by adding powdered carbon.

### Stage 2: Coagulation (clumping)

This stage is when fine particles of dirt and sediment are removed from the water. A special chemical is added to the water which encourages the suspended particles to clump together in a process called coagulation. The particles start to clump, and water moves on to the clarifiers.



### **Stage 3: Separation**

Water then settles in the clarifiers. This is where the heavy clumped particles in the water start to sink, forming a layer in the clarifier.

The tubes in the clarifier sit on an angle. This is to increase the surface area and allow particles to settle faster. You can visualise this process by using a glitter tube: if you shake the tube and then hold it upright, it takes a while for the glitter to fall to the bottom. However, if you do it again but this time hold the glitter tube on an angle the glitter falls a shorter distance (in suspension) and then hits the side of the tube and slides down much faster.

The clumped particles which settle in the clarifier are called sludge. This sludge is removed and taken to the sludge lagoons.

The clear water in the clarifiers is collected and taken to the next stage of water treatment.

### **Stage 4: Filtering**

Next the water travels to the sand filters. Water passes through layers of fine coal and sand in the filters, which trap and remove any remaining particles in the water. The water comes out the bottom of the filters. This is similar to the natural filtering process of water seeping through the earth.

Chlorine is added to the water to ensure there are no remaining bugs that could make people sick.

### **Stage 5: Distributing and storing**

Water from the water treatment plant is stored in big tanks called reservoirs that are located around New Plymouth and nearby towns. Pipes under the ground carry water from the water treatment plant to our houses. There are 120km of what are called 'trunk mains' (larger pipes) and 560km of service mains (smaller pipes). The pipes go above the ground to cross over rivers and are usually attached to the underside of road bridges. If all the water pipes in New Plymouth District were laid end-to-end, they would be as long as the distance from New Plymouth to Kaitaia (in Northland).

### **Stage 6: Household use**

Treated water is then available from the reservoirs to use in homes, businesses and schools. This water is used by many people every day. All water that is delivered to your home in water pipes is treated, drinkable water. This includes water used for garden hoses, toilet flushing and kitchen taps.

## **Water supply in other areas**

### **Inglewood water**

The original water supply for Inglewood was constructed in 1911 from the Ngatoro Stream. There was no treatment of the water until the 1950s. Water is taken from under the riverbed in what is called an Infiltration Gallery to the Inglewood Water Treatment Plant. The process for water treatment is similar to the New Plymouth supply, however, the process is enclosed in a building and there is no open water. Once the water has been treated it is stored in one of two reservoirs onsite, each with a capacity to hold 3.6 million litres.

### **Okato water**



Okato water has been sourced from the Mangatete Stream since 1971, which flows from the Pouakai Range on Mount Taranaki. The water treatment process is slightly different in Okato, where there are four cartridge filters that look a bit like a collection of pool noodles. These filters remove the fine particles and tiny bugs in the water, like protozoa. Okato water is treated with ultraviolet (UV) light, which is an extra barrier to protect from protozoa and bugs. Chlorine is also added to disinfect the water. There is one reservoir which can hold up to 1.2 million litres of water.



### *Oakura water*

Oakura water comes from an underground aquifer which originated in the Pouakai Range about 300 years ago. To get the water up from ground there is a deep pipe, and a pump that drives the water to the surface. The pipe and pump are called a bore.

Because the water has been filtered through the deep earth there are no particles of dirt in the water. The water is treated using cartridge filters, ultraviolet (UV) light and chlorine similar to Okato water. There are two reservoirs in Oakura to store the water. Each reservoir can hold 1.2 million litres of water.

### *Who is responsible for providing water for New Plymouth residents?*

New Plymouth District Council (NPDC) has the responsibility to provide the community with clean, safe drinking water for the city. The council must ensure that this water is safe to drink at all times. Staff at the council do this by regularly testing and monitoring the water going through the treatment plant at different stages.

New Plymouth District Council has permission (through a consent) to take water from the environment. There is a limited amount they are allowed to take. This ensures there is enough water left over for the streams and rivers.

# Learning experience:

## Water to drink

*Note: These are suggestions only and are intended to be altered to suit your students and their needs.*

### Resources

Poster:	From mountain to tap
Poster:	Water treatment process
Presentation:	Waters journey to our taps
Student Activity Sheet 3:	Water's journey to our taps page 8

### Looking after precious drinking water

#### *Introduction:*

Show students a bucket of dirty water with a range of floating objects in it (from a local stream, if possible).



Share ideas about how you could go about cleaning this water to make it safe to drink and use. Ideas may include: screening, filtering, boiling, adding chemicals, settling, and more! The process at the treatment plant is similar to some of these ideas.

#### *Where does our tap water come from?*

- Students can share their ideas about where their tap water comes from. Note that this may vary as some households will have tank water or bore water.
- Discuss how and where water is treated before getting to their taps. See background notes for guidance. Acknowledge that some students may have a supply of water from tanks or bores.
- Why is it important to look after water? Revise the concept of 'te mana o te wai' (see Activity 6: How much water are we using?).
- Safe drinking water is vital to the whole community. Emphasise that effort and resources must be used to treat water. This costs money, time and energy.

### *From mountain to tap*

- Talk through the journey of water from the mountain to our homes.
- Show students the 'From mountain to tap' poster.

### *The treatment process: describing water's journey*

- Discuss how water is treated before it is distributed to homes and organisations.
- To show the steps in this process, view the slideshow: Water's journey to our taps:
- Students can then complete *Student activity sheet 3: Water's journey to our taps* describing the steps in the process, see page 8

### *Making decisions about how water can be used*

- How do we make decisions about how we use water? Why is it important to use water carefully? Discuss what needs to be considered when making decisions about taking water from the environment, e.g. the needs of animals in the stream, te mana o te wai, maintaining a healthy habitat for the animals, the quantity of water taken, and where it is taken from.
- Conduct a class discussion or debate about how water is shared in the community. How can the needs of the river and natural world be balanced with the needs of people? Divide students into three groups:
  1. Heavy water users  
*These users need to use lots of water for growing food, construction and irrigation.*
  2. Gardeners, farmers and conservationists.  
*These people want to look after the river and stop people from using too much water.*
  3. Decision makers  
*This group must decide how water should be managed.*

## Reflecting on learning

Students can share and discuss why they think that drinking water needs to be treated. What are the methods of water treatment which make it safe to drink?

## Extending learning

- Visit the New Plymouth Water Treatment Plant to find out more about the treatment process and to see it in action. Contact New Plymouth District Council's Three Waters Education Officer on (06) 759 6060 or email: [edthreewaters@npdc.govt.nz](mailto:edthreewaters@npdc.govt.nz)
- Are there any current water issues in your community? Who is involved in making decisions about these issues? Find out about a current water topic and find out how decisions are being made about water. An example would be the impact of Cyclone Gita on the New Plymouth water supply in 2018.

Did you know the New Plymouth Water Treatment plant treats on average 32,000 million litres of water a day

## Other resources

Videos: LEARNZ video: Wellington water field trip: From source to tap <https://vimeo.com/218612085>  
New Plymouth District Council webpage about water treatment:  
<https://www.newplymouthnz.com/en/Residents/Your-Property/Water/New-Plymouth-Water-Treatment-Plant>



# Student Activity Sheet 3

## Water's journey to our taps

Explain the water treatment process in your own words. Describe the technology and processes which treat water to make it safe to drink.

