what the professionals do

Scientists and Technicians

Note: The following activities are the types of things that are done by these people. Where the equipment they use is not available to schools, the method described is usually one they may have used in the past, or a simplified version.

Key Words:

Water quality	how good or bad the water is
Laboratories	a place where scientists carry out tests to find things out
Water samples	a small amount of water which can be used for testing back in a laboratory
Macroinvertebrates	small water animals that can be seen without microscopes

Background

Scientists are constantly measuring the **water quality** so they know what is happening to it. If it shows signs of being unhealthy, they need to do something about it quickly as water animals may die and people may get sick.

The scientists carry out several very complicated tests, and often send the **water samples** they gather to laboratories for testing to make sure the results are as accurate as they can be. Obviously some of their tests are hard to do at school for equipment and safety reasons, but the following ones will give you an idea of the procedures they follow to gather the information.

Procedures

1. Temperature

Equipment: thermometer

a. Test the water from the middle of the waterway.
b. Leave the thermometer in the water for 3 minutes.
c. Read and record the temperature.

2. Clarity (or Turbidity)

i) Shallow water (River or stream)

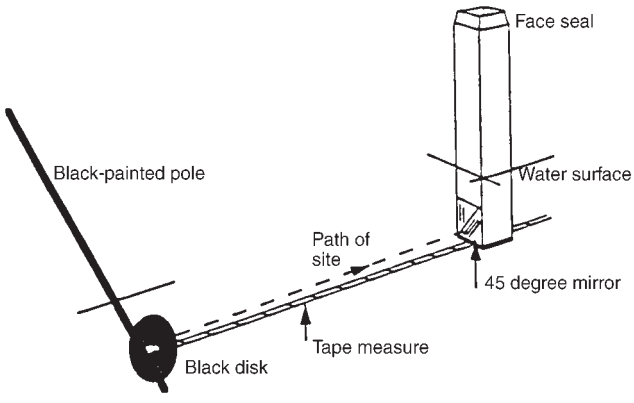
Equipment: black disk, two people.

Description: There are two parts to the black disk.

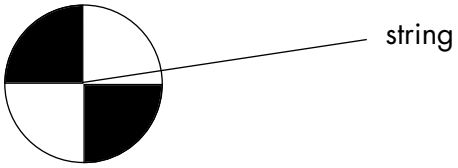
- A periscope that allows you to look beneath the water.
- A black disk (size of a dinner plate) attached to the end of a pole.

The two pieces of equipment are attached to each other with a tape measure. See diagram.

a. ***A*** looks through the periscope and finds the black disk held in the water by ***B*** standing downstream.
b. ***B*** walks slowly away until ***A*** can not see the disk any more.
c. ***B*** moves back until ***A*** can just see it again.
d. Measure the distance between ***A*** and ***B***.
e. Record.



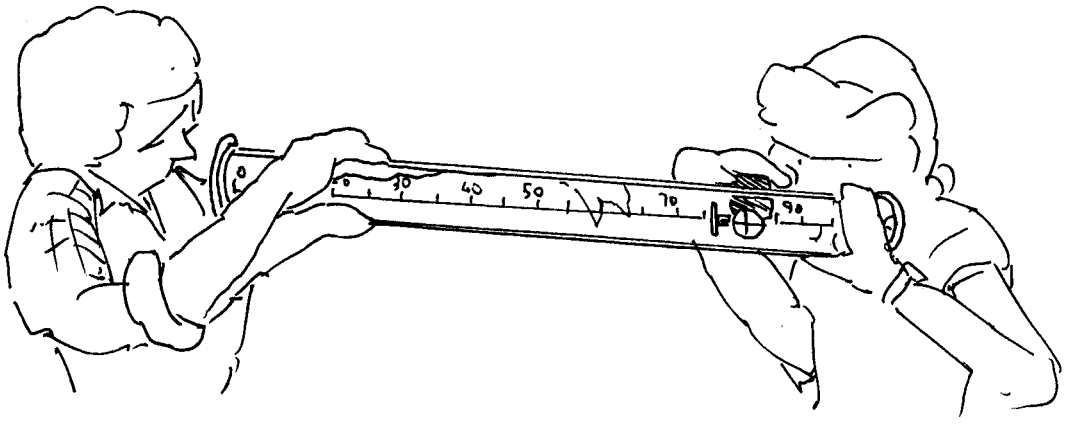
ii) Deep Water (Lake or deep still water)
Equipment: Secchi disc. **See diagram.**
Description: A disk divided into quarters and painted black and white. A string is attached to the middle so it can be lowered into the water and the distance measured.



Secchi Disk

a. Lower the black and white disk into the water until it can no longer be seen.
b. Pull it up to the point where it can just be seen.
c. Measure the length of the string attached to the disk to the top of the water.
d. Record.

iii) Any Water
Equipment: Clarity Tube **(see diagram)**
Description: Metre long acrylic tube with magnetised black disk inside. Note this test needs to be done in good light.
a. Collect 2 litres of water from the waterway without disturbing the bed.
b. Pour it into the clarity tube and fill to the top.
c. Place the black disk magnet on the inside in the water, and other magnet on the outside under the black disk. Put bung in the end.
d. Hold tube up to eye and move the magnet slowly away until the black disk cannot be seen.
e. Return it to the point where it becomes visible again.
f. Measure the distance on the side of the tube
g. Record.



3. pH
Equipment: pH strips.
a. Collect a sample of water from the middle of the waterway.
b. Place a strip in the sample and leave for 3 minutes or according to strip instructions.
c. Read the colour against the chart.
d. Record.

4. Macroinvertebrates (Water bugs)

i) Bed sampling method.

Equipment: containers, e.g. ice cream containers or lab trays, macroinvertibrate identification charts.

a. Locate a point in the river that has a fast flowing section (riffle) if possible.

b. Collect 3-5 samples across the section from one side to the other (transect line).

- If the stream bed is rocky, pick up a rock and put it into the container with some water. Carefully scrape the rock clear of macroinvertebrates and identify what is there.
- If it is sandy or silty, pick up a handful of the material and put it into the container along with some water. Allow the sample to settle then identify what is there. Watch carefully for at least 2 minutes, as macroinvertebrates take a while to start moving again.

c. Record the types of macroinvertebrates found. Sometimes the numbers of them found are also recorded.

Identifying macroinvertebrates

ii) Kick net or surber sampler method

Equipment: kick nets surber sampler of sieve, **(see diagram)** containers e.g. ice cream containers or lab trays, identification charts.

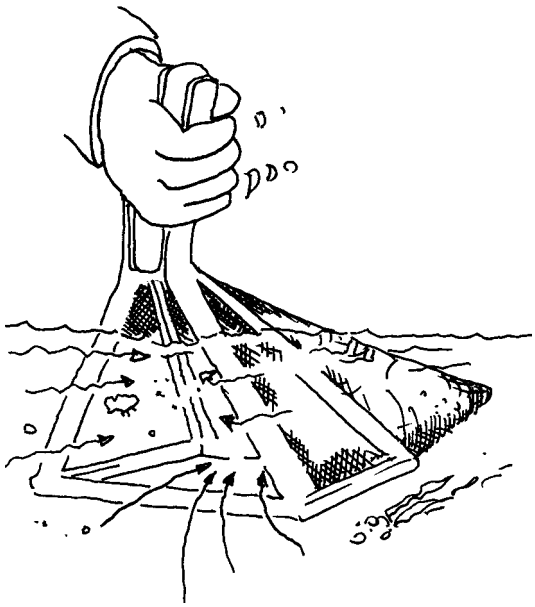
a. Locate a point in the river that has a fast flowing section (riffle) if possible.

b. Place the net into the waterway with the open side facing upstream.

c. Stir up the river bed in front of the net for 30 seconds by kicking the bed or, if using a surber sampler net, stir up the area inside the net base.

d. Empty the contents of the net into a container with some water. Carefully remove any twigs or leaves, searching them thoroughly first. Let the water settle and identify the macroinvertebrates. Watch carefully for at least 2 minutes, as they take a while to start moving again.

e. Record the types of macroinvertebrates found. Sometimes the numbers of them found are also recorded.



Hydrologists

Note: The following activities are the types of things that are done by these people. Where the equipment they use is not available to schools, the method described is usually one they may have used in the past, or a simplified version.

Key Words:

Hydrologist	someone who gathers information about the amount (quantity) of water that is in the area above and below ground
Discharge	the amount of water flowing down a waterway
Quantity	the amount
Aquifer	a natural supply of water that is stored underground. This is the water you drill a well to get at
Turbidity	the cloudiness in the water, usually because of the amount of fine soil that is in the water
Irrigation	watering the soil to help crops, trees, etc., to grow

Background

Knowing how much water is in your area is important to many people. The **hydrologists** are people who measure the rainfall and flow or **discharge** of the waterways, as well as the amount of water underground in the **aquifers,** on a regular basis. They also measure water temperature and **turbidity,** along with other things to do with the climate. They use this information to do several things.

- warn of possible flooding danger
- monitor the use of **irrigation** taken from the waterways and aquifers
- help people to use the land appropriately considering the amount of water available
- predict what is likely to happen to the water levels during certain times of the year

Procedures

1. **Measuring discharge.** *Reference 'finding the discharge of a river' sheet, unit 3.*

a. Place a measuring tape across the river. Secure it on each side above the water.
b. Take measurements at several points across the waterway. At each point:
   - Measure the depth of the water on a measured rod
   - Record the distance across the waterway on the measuring tape
   - Measure the speed of the water
c. Continue until the other side is reached.
d. From all this information the area of the cross section of the river is worked out. This is multiplied by the speed of the water and gives discharge.

Measuring discharge

2. Rainfall

When rainfall is measured, two systems are used.

Manual Read by people (often farmers) every day. Records are kept and sent in to Hawke's Bay Regional Council monthly.

Automatic All automated sites have a 'tipping bucket' raingauge. This measures rainfall and automatically records the information. This information can be accessed at any time by the hydrologists from their computers back at Regional Council, or down loaded onto disk from the data loggers on the site and taken back to the computers to be read.

Tipping bucket raingauge

Data logger

Engineers

Key words:

reticulation	moving water around from storage to place of need
reservoir	large tanks that hold the water for the city
dwellings	homes and other similar buildings where people live
aquifer	large source of water that runs in underground gravels and is fed by rivers
wells	holes drilled into the ground to get at the aquifer. Water may flow naturally or be pumped to the surface
consumption	the amount of water used

Background

The City Council water engineers are responsible for making sure that all dwellings, businesses and industries have an adequate continuous water supply.

Napier and Hastings get their water from underneath the Heretaunga Plains where there is an underground **aquifer** (Refer Background Information section, The Aquifer). There are many **wells** drilled into the aquifer and the water is pumped from these to large reservoirs closer to where the water is needed. The stored water in the reservoirs is then **reticulated** to the houses and industries where it is needed through a maze of underground pipes.

Water engineers have to carefully watch how much water is being consumed, because if people use too much then the pumps can't keep up with the demand and we could interrupt the supply of water to our homes. The engineers' job is to gather lots of information about daily, weekly, seasonal and yearly **consumption** rates, so they know about possible problems before they happen. When they see a potential problem they can put water restrictions in place, like watering the garden every second day.

Part of the engineer's job is to design a **reticulation** system that uses the correct sized pipes, **reservoirs,** and **wells** to allow enough water to get to your homes. If they didn't use the correct sized pipes for instance, it could affect the amount of water you had available in your home. They also need to know how much water a city uses to be able to work out the storage requirements. Then they know how big the reservoir needs to be.

Engineers look for leaks and other problems so that the water doesn't get wasted. They conduct surveys to see if any unusual amounts of water are being used, so they know if there is a possible leak. It is important that leaks are found and dealt with quickly, as they can also cause problems with ground subsidence.

The City Council ensures that the public water supply meets Health Department standards. They regularly test water supplies so that these requirements are met so that the water will not make us unwell.

Contact Napier City Council if you want more detailed information about what the engineers do.