



Pohutu geyser, Rotorua

Issue 66 – April 2016

Geothermal

Kia ora Pollution Busters

Welcome to our first newsletter of 2016!
We hope you had a fun and safe summer break.

Daylight saving is over, it's getting dark earlier and it's definitely cooler... autumn is here and winter is coming. We are starting to think about keeping warm, and what better time then now to visit some steaming hot pools!

So in this issue we are going to explore our geothermal resources.

Enter the colouring competition on page 11 and go in the draw to win a family pass to Hell's Gate.

Keep up the good work caring for our environment.
Tiakina tona a Ranginui raua ko Papatūānuku
– keep protecting our sky father and earth mother.

From BuzzBOP and the Pollution Busters team at Bay of Plenty Regional Council.

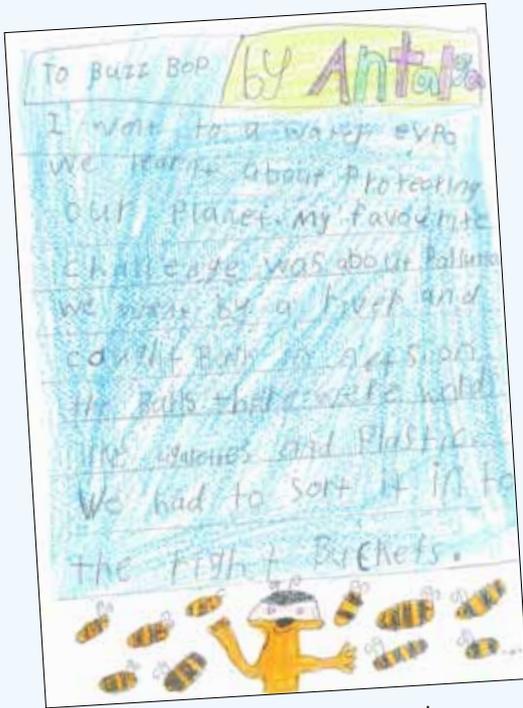




BuzzBOP's MAIL

Thanks for the mail Pollution Busters!

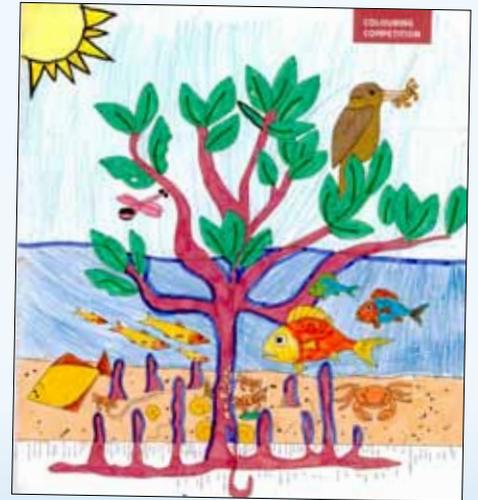
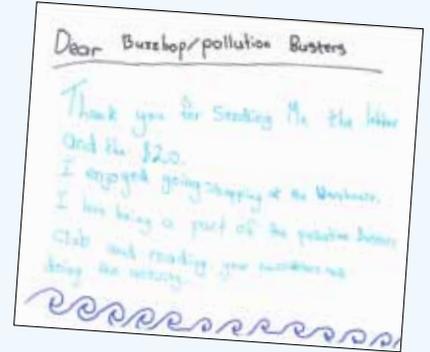
Keep sending us your photos, stories, and art!
Remember to include your name, age and address on the back of your artwork!



Antalya Dougla - Mount Maunganui



Connor Hedderwick - Whakatāne



Edén Price - Tauranga



Michael Howard - Whakatāne



Bodhi and Tait from Ōhope had lots of fun making shell critters!

WIN

Win a family pass to Hell's Gate, Rotorua! Check out the competition on page 11. Send your entries in before 27 May 2016 and go in the draw.



Send your drawings, photos, letters and competition entries to:

POST: Bay of Plenty Regional Council
Pollution Busters Club
Freepost 122076
PO Box 364
Whakatāne 3158

EMAIL: buzzbop@boprc.govt.nz



What does geothermal mean?

geo  thermal 

the earth heat

so... the **heat** of the **earth!**

Some geothermal resources we can see (and smell!), and some are under the ground!

Geothermal resources (the heat of the earth) can be used in lots of ways like:

- tourism
- energy (heating, power generation)
- cultural activities
- bathing, cooking, healing

Our geothermal resources are a taonga (treasure) and need to be managed carefully.

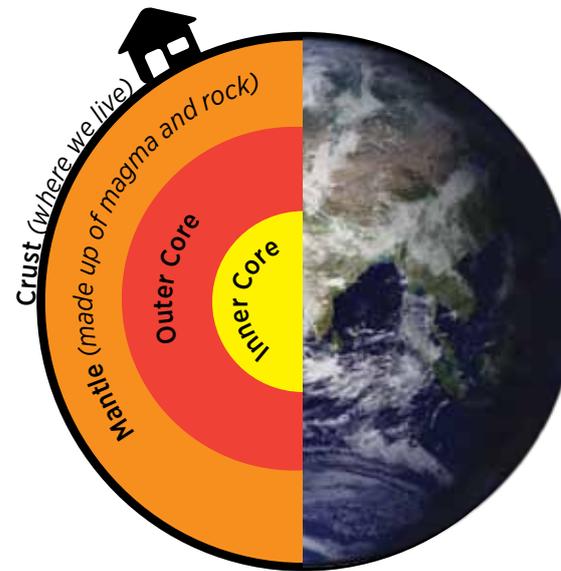


Did you know?

The earth is like an onion!

Just like an onion the earth has layers.

Beneath the Earth's crust is a layer of magma (hot liquid rock). Where the magma is closer to the Earth's surface it can create a geothermal field.



Unscramble these words:

TSRUC _ _ _ _ _

ROCE _ _ _ _

GAMAM _ _ _ _ _

LENTAM _ _ _ _ _

RATEH _ _ _ _ _

Answers: crust, core, magma, mantle, earth

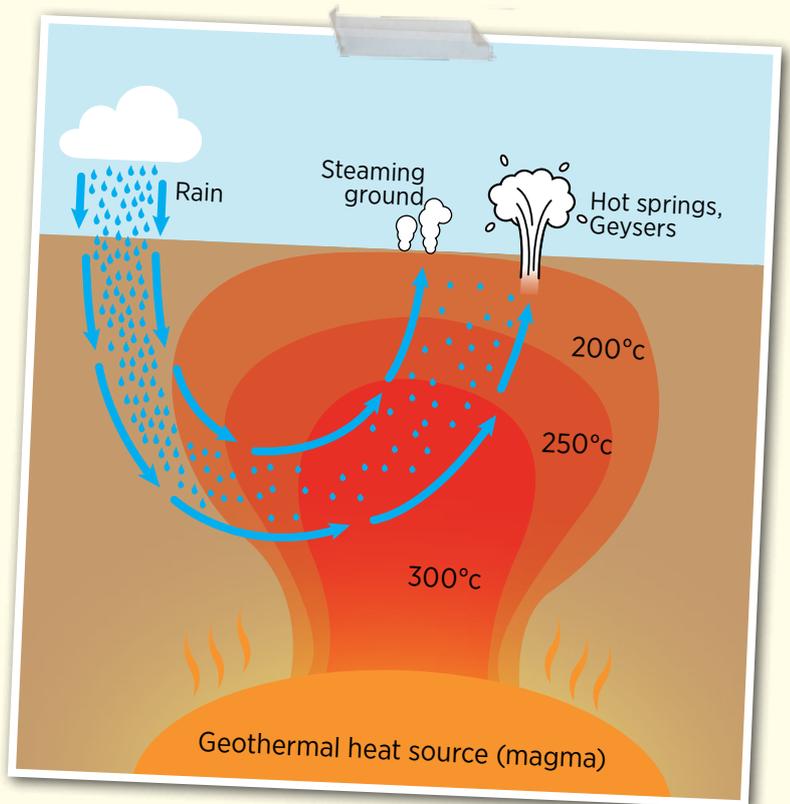
How does a geothermal system work?

Geothermal systems are from the natural heat within the earth.

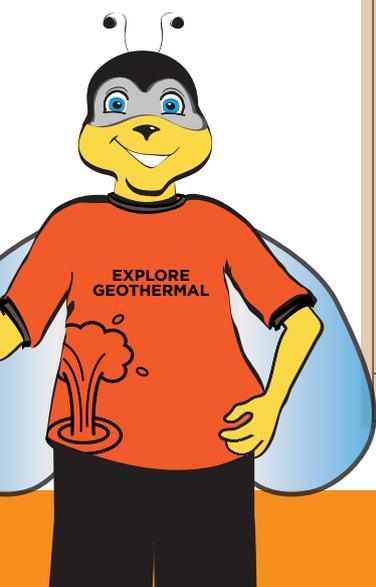
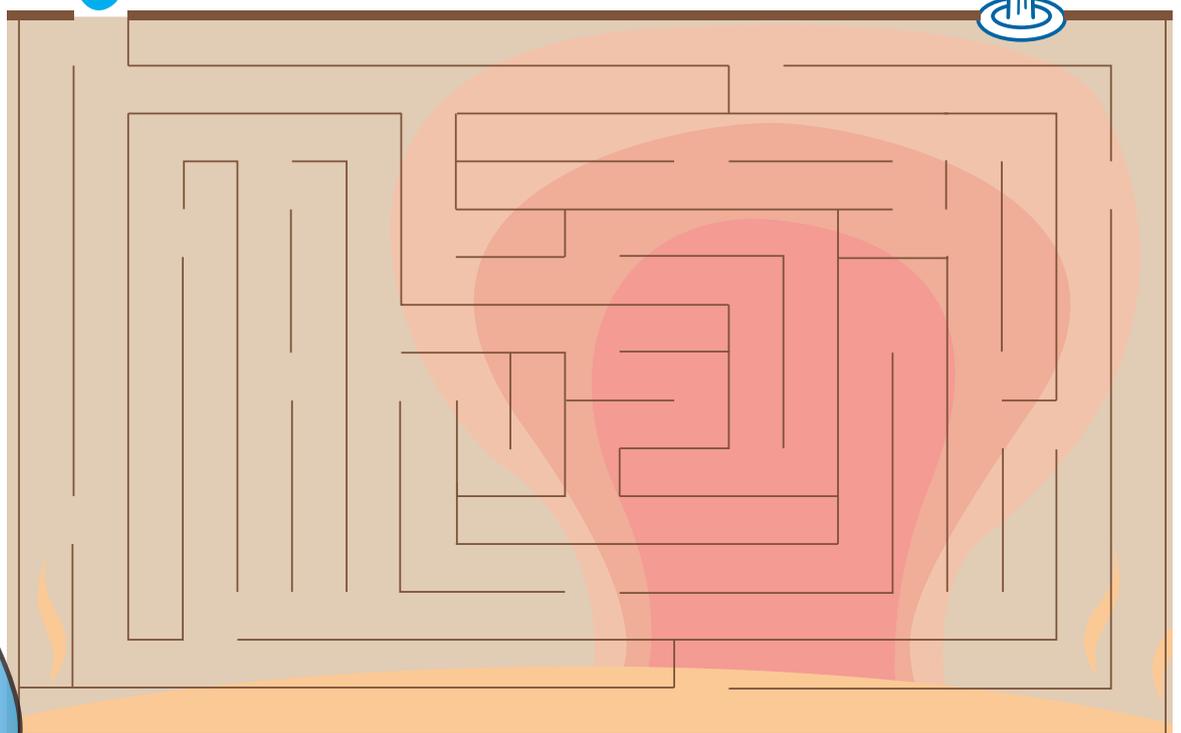
A geothermal field (area) is made when the cool groundwater (from rain, snow melt, rivers or lakes) comes into contact with hot rocks underground.

As the water is heated, it becomes less dense and rises to the surface through faults (like cracks) to come out as geysers, fumaroles, hot springs and other thermal features (find out more about these surface features on page 6).

Think of it a bit like the water in a jug – when it is heated, some turns to steam and rises.



Help the water find its way through the maze (geothermal system) to discharge (come out) as a geyser!



Geothermal Bay of Plenty

We have lots of hot stuff! Check out our geothermal systems on the map below. Most of them are within the Taupō Volcanic Zone between Mt Ruapehu and Whakaari (White Island), and form part of the 'Ring of Fire'.

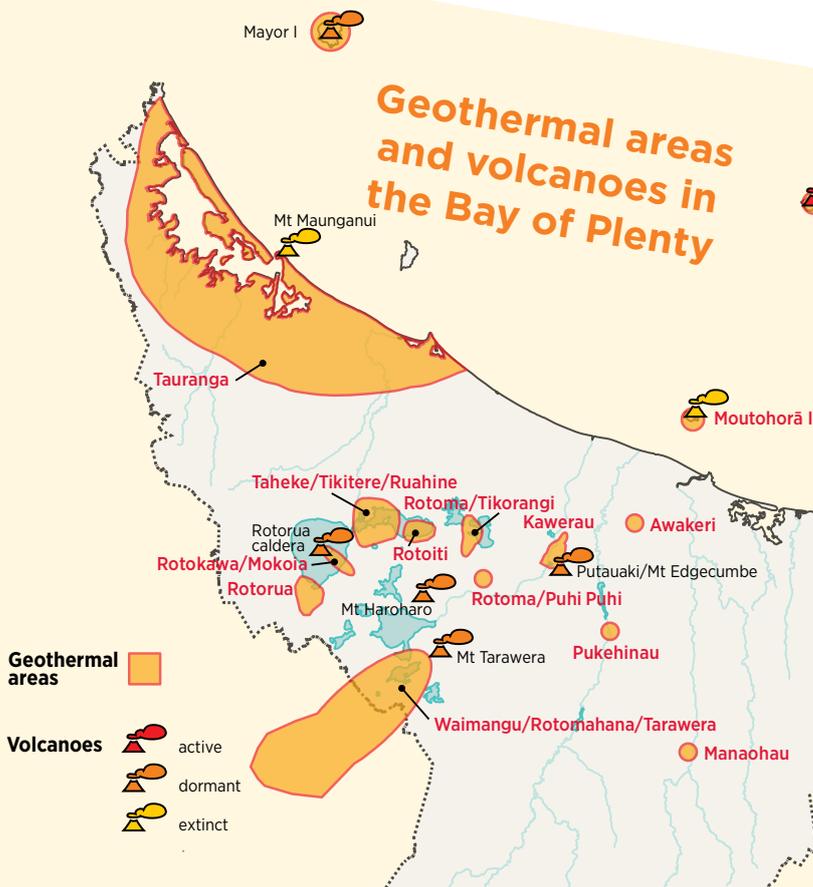
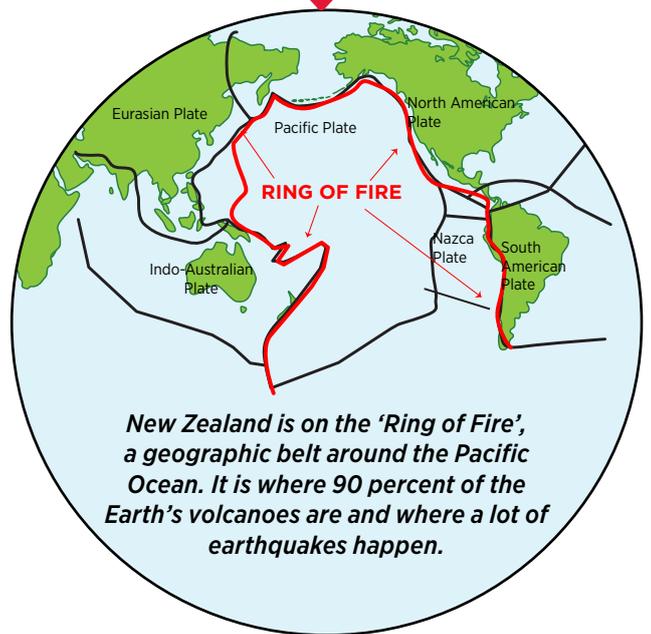
Three very important systems in the Bay of Plenty are:

Tauranga – a large low temperature system. To access it people bore (dig down) into the earth to get to the hot water to heat homes and pools, and to use in horticulture for frost protection.

Rotorua – a hot system with lots of surface features! Its features (like Pohutu geyser) are thought of as a national treasure and attract lots of people to the region.

Kawerau – A deep, very hot, system used to generate electricity and for use in industry.

The Bay of Plenty Regional Council is in charge of making sure all our geothermal resources (and the land around them) are used sustainably (learn about threats to geothermal systems on page 8).



Which geothermal area is closest to where you live?



Geothermal surface features

Match the photos to the descriptions

Geothermal surface features are what we can see on the surface!

Some of the features in the Bay of Plenty are sinter deposits, mud pools, geysers, fumaroles, hot springs and pools.

It's the earth's way of releasing energy.

POO - What's that smell? It smells like rotten eggs!

It is from hydrogen sulphide gas being released from the earth into the atmosphere.



MUD POOL – forms where steam and gas rise to the surface under ponds of rain water. The acidic gases turn surrounding rock into clay which mixes with water to produce a muddy, steam-heated slurry, or mud pool.



SINTER DEPOSITS – cones and terraces made from layers of silica (a mineral), created when geothermal water pours out of a spring or geyser and cools leaving behind the silica on the nearest surface.



GEYSER – a hot spring that when the pressure builds under the ground it erupts steam and water into the air through a narrow vent.



FUMAROLES – steam and gas vents. They are formed where water boils underground but only steam reaches the surface.



HOT SPRING – water that comes from deep within the earth traveling through super heated rock to the surface. They can be different temperatures, many are boiling hot. Not all are good for bathing!

1 Fumarole, 2 Mud Pool, 3 Sinter Deposits, 4 Geyser, 5 Hot Spring



Learn more about surface features by watching this video: <https://youtu.be/CdNi43qQa7o>

Lots of unusual plants, animals and micro-organisms (extremophiles) live in our geothermal areas. They have adapted to be able to live in really hot temperatures and either acidic or alkaline water and soil.



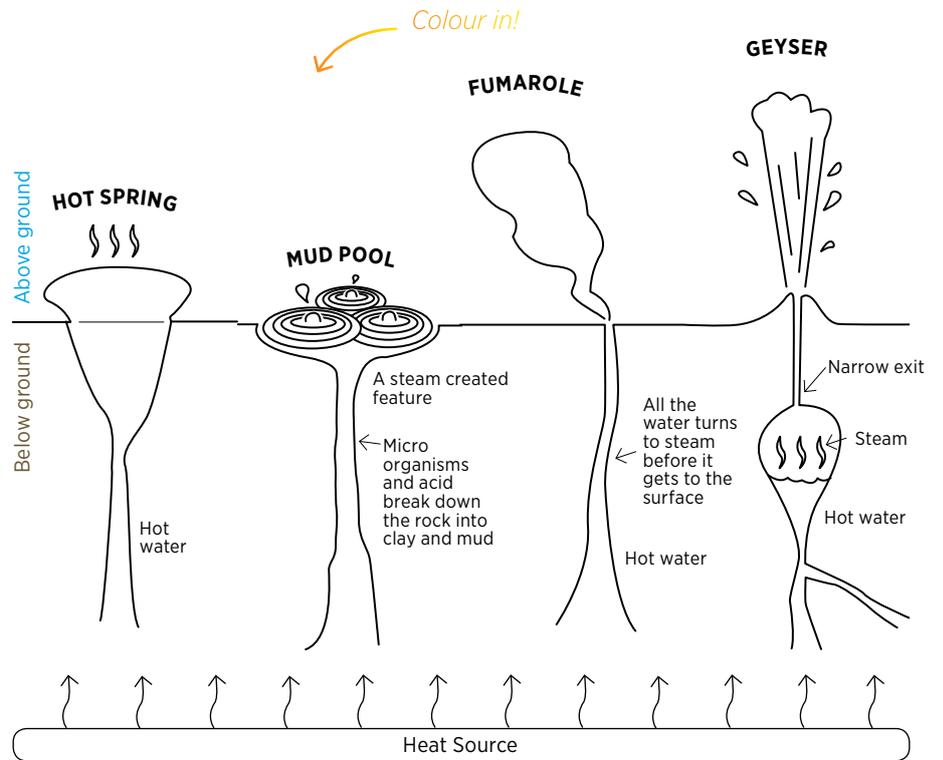
The features are made by heated water and steam coming through the Earth's surface.

Lots of different gases and minerals can be released.

So the surface features are a bit like the taps of Earth's hot water plumbing system - there is a lot going on under our feet!

The type of surface feature depends on lots of things like:

- fluid temperature (how hot)
- pressure
- the type of rock the water passes through
- different gases and minerals from within the earth
- how old the geothermal system is



Bubbling Mud!

(You may need an adult to help with this)

You will need:

- Packet gravy mix
- water
- saucepan

If you don't have gravy it also works with porridge, and the great thing is you can eat them at the end!

What to do:

- Mix the gravy with water in the saucepan (follow the packet instructions).
- Put the saucepan on the stove
- Heat it up and see what happens!

As the heat builds up in the gravy, steam builds up and rises through it and out into the air. As it escapes and bursts through it makes a 'plop' like a mudpool! This is the way geothermal mudpools work.

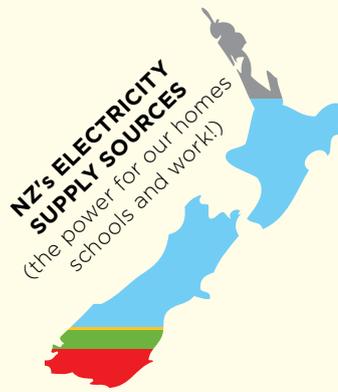
Why do geothermal areas sometimes have brightly coloured rocks and soils?

Because of hot acidic gases and fluids interacting with rock to make colourful minerals.

Next time you are in a geothermal area look out for these colours:

- **Pink** = cinnabar (mercury sulphide)
- **Orange** = realgar (arsenic sulphide)
- **Yellow** = sulphur
- **White** = silica

Geothermal Energy



Check out this video that explains geothermal energy: <https://youtu.be/5FURZu-HuXO>

- non-renewable
- hydro
- solar
- wind
- geothermal

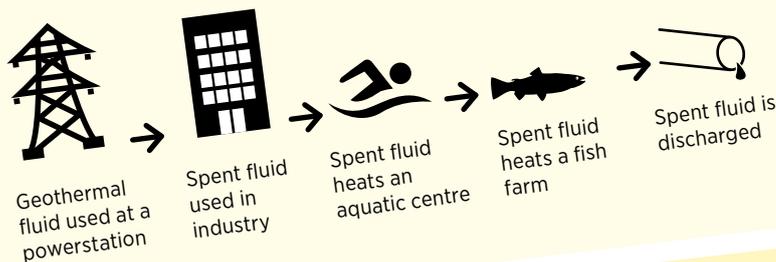
Geothermal energy is a clean form of energy, thought of as **renewable** and a **finite** energy

The earth produces rain and magma all the time.

Limited amount available - if too much is used from a system it can be damaged.

The region's geothermal resources are used in lots of different ways like energy generation, aquatic centres, aquaculture and horticulture, and in homes (heating, swimming pools).

One way to use geothermal energy is by using the same fluid lots of times. Sometimes geothermal fluid is used and then put back deep in the ground so the resource lasts longer.



WORD FIND

I H B E M E R O C Y G O
 V O L C A N O D G E R K
 S H C I N H H R O S E O
 W E U Q T B E T L F T M
 Y U L F L N H O K W N U
 Y I P O E E O E S L I A
 S G N I R P S T O H S U
 X F Y M D A E P E J S R
 U P A U P A M C R U S T
 W L M Z M B X U A U F I
 R E S Y E G L S F H X R
 J O N O M Z H N G X X V

CORE
 CRUST
 ENERGY
 FUMARoles

GEOThERMAL
 GEYSER
 HOT SPRINGS
 MANTLE

MUD POOLS
 RUAUMOKO
 SINTER
 STEAM

Threats to our geothermal resources

Geothermal features are fragile and can be damaged easily by things like:

- Taking too much water and energy from underground (this can make the surface features - like geysers disappear)
- Land use and building in geothermal areas
- Making tracks and roads over geothermal features
- Pest plants
- Rubbish dumping
- Taking mud (for therapeutic and cosmetic uses) from active geothermal features. Mud pools do not regenerate quickly.
- Natural processes like earthquakes, volcanic and geothermal activity. They can change the pressure and temperature.

Māori and geothermal

Ahi tipua - geothermal activity

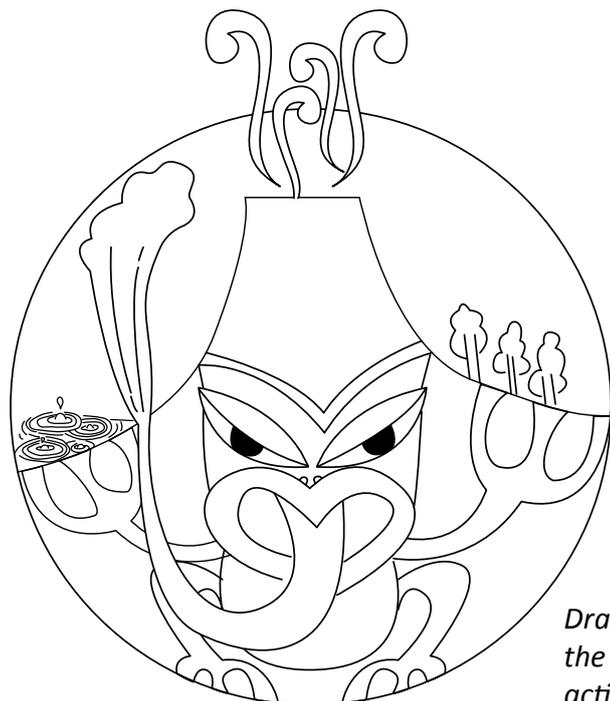
Māori have lived in thermal areas for hundreds of years. They are rich in cultural history; the geothermal resources are a taonga.

Māori use geothermal resources in lots of ways, like:

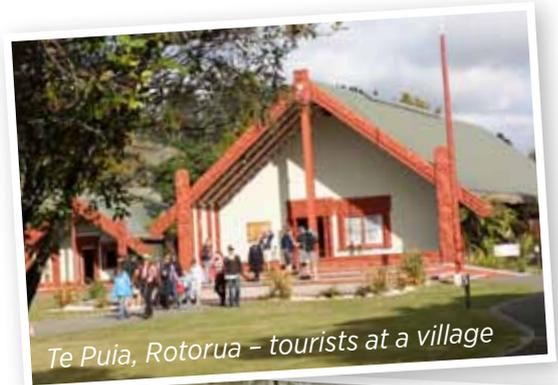
- Cooking
- Preserving
- Bathing
- Healing (some pools have mud that has medicinal properties. Like kupapa or sulphur that are used to treat skin, joints and muscles.)
- Paints (minerals such as kokowai / red ochre), wood preservatives, and dyes.
- Ceremonial use
- Tourism - Māori culture and history within the geothermal areas have been attracting tourists to Rotorua since the 1800's

The types of hot springs that Māori use include:

- puia - geyser
- ngāwhā - boiling pools
- waiariki - thermal pool



Draw or paint a picture of Rūaumoko – the Atua (God) of volcanoes, geothermal activity and earthquakes.



Te Puia, Rotorua - tourists at a village



Māori cook in springs that are too hot for bathing.

Our geothermal resources are a part of Māori oral tradition, a gift from Ngatoro-i-rangi.

The legend explains the beginning of the geothermal resource in Aotearoa.

Ngatoro-i-rangi came to Aotearoa on the Te Arawa waka (canoe). He explored Taupō and was climbing Mount Tongariro when he was struck by the extreme cold.

He called to his sisters, Kuiwai and Haungaroa, in Hawaiki to send fire to warm him. They sent the fire gods Te Pupu and Te Hoata and their journey to Aotearoa created all the geothermal resources in a direct line from Whakaari (White Island) to Tongariro as they travelled across the land.



Watch this legend:
<https://youtu.be/rG4zdNp0I-0>

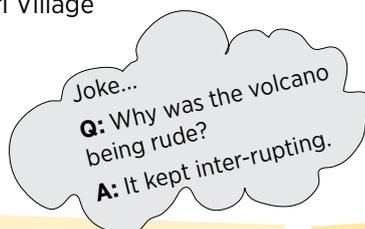
Geothermal tourism

We love our hot stuff and others do too! Our geothermal resources attract tourists from all over the world, and that creates jobs and brings money to the region.

In the Bay of Plenty there are lots of thermal tourist attractions to see – parks and reserves, hot springs, geysers, thermal mineral pools and even an active volcano!

Some great places to visit are:

- Whakaari/White Island
- Hot springs like Awakeri Hot Springs, Waitangi Soda Springs, Sapphire Springs, Athenree Hot Springs
- Whakarewarewa The Living Māori Village
- Kuirau Park
- Te Puia
- Hell's Gate (*enter our competition and go in the draw to win a family pass*)



Make a Volcano!



You will need:

- Play dough (*there are lots of play dough recipes online if you don't have any*)
- Empty small container (*like an empty pill bottle or small plastic jar*)
- Tablespoon of baking soda
- Tablespoon of vinegar
- Food colouring

What to do:

- Make the play dough the shape of a volcano.
- Make a hole in the top of the volcano so the small container can fit into it.
- Put the container in the hole.
- Add the ingredients to make the flowing lava (an adult may need to help you with this).
- First add a tablespoon of baking soda, then the food colouring. Now add the vinegar.
- Step back and watch your volcano come to life!



Geothermal tourism brings
\$136 million
to the Bay of Plenty (2013)

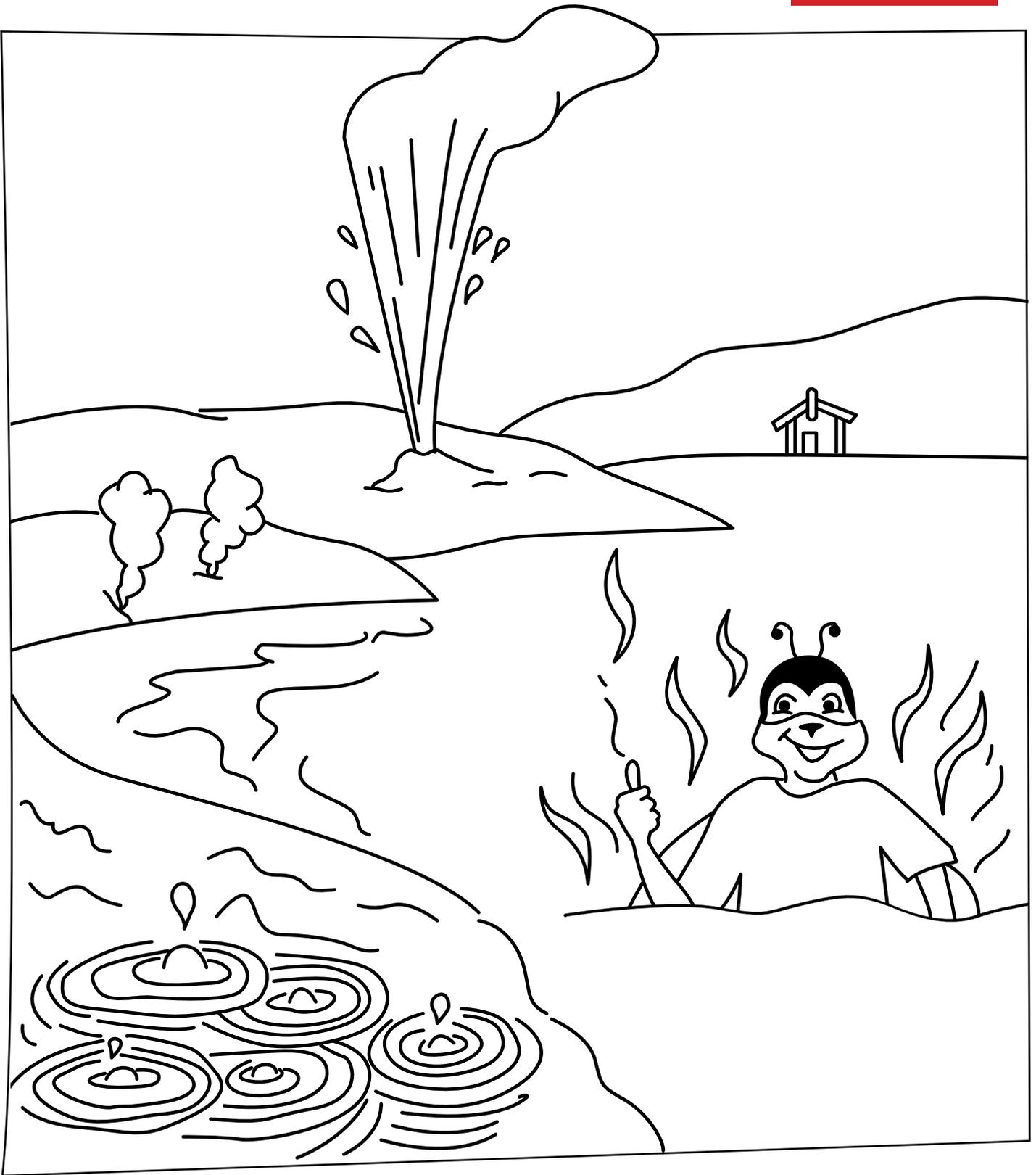
Source: Valuing uses of the Bay of Plenty Regional Geothermal Resource
– Conroy and Donald Consultants Ltd

Geothermal tourism supports
3000 jobs in the
BOP and this is expected to increase

Whakaari (White Island)

- Whakaari is an active marine volcano.
- Most of it (70%) is underwater
- More than 10,000 people visit it every year!
- People get there by tourist boats and helicopters.
- It is one of the few places in the world where you can walk into the crater of an active volcano!





Name: _____

Address: _____

Age: _____

Post entries to:

Bay of Plenty Regional Council
Pollution Busters Club
Freepost 122076
PO Box 364
Whakatāne 3158

Or email to:

buzzbop@boprc.govt.nz

Entries close 27 May 2016



Hell's Gate have kindly provided one Hell's Gate Combo Family Pass as the prize for this issues competition. Check out their website - www.hellsgate.co.nz

BuzzBOP's Friend

Mike Collins

Bay of Plenty Regional Council Pollution Prevention Officer

What do you do in your job?

My job is to encourage sustainable use of the geothermal resource and to enforce any regional rules and consent conditions around how the resource is used. Some use requires wells to be drilled in the ground to bring hot geothermal fluid up to the surface. I work with well owners to make sure these wells are safe and to check how much of the geothermal resource is being used.

What is the best part of your job?

Working outside and with lots of different people in the community. I also like to feel that what I do makes a difference to how our natural resources are cared for.

What is special about the Bay of Plenty's geothermal resource?

In our region we can visit an active volcano, bathe in mineral pools, be mesmerised by plopping mud pools, watch geysers erupt, cook kai in hot springs and also use the resource for heating and to generate energy.

Oh and don't forget that lovely rotten egg smell – that's pretty special.

What is your message to pollution busters?

Encourage your family to plan a weekend trip to explore and experience our regions geothermal wonders.

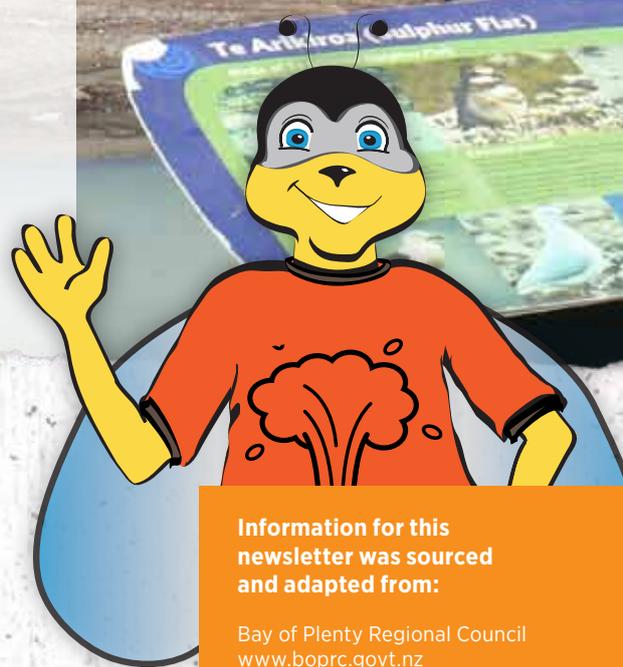
Here's some suggestions:

- go camping at Hot Water beach on Lake Tarawera
- walk around Kuirau Park (it's free!)
- visit one of Rotorua's many thermal attractions
- go for a geothermal swim (there are quite a few hot springs around the region e.g. Awakeri Hot Springs, Waitangi Soda Springs, Sapphire Springs)



Top: Te Arikiroa (Sulphur Flat) a geothermal area on the shores of Lake Rotorua.

Bottom: Rachel Spring/Whangapipiro in Government Gardens Rotorua. Mike is reading the temperature of the spring using a laser thermometer.



Information for this newsletter was sourced and adapted from:

Bay of Plenty Regional Council
www.boprc.govt.nz

Department of Conservation
www.doc.govt.nz

Te Ara – The Encyclopedia of New Zealand
www.teara.govt.nz

Waikato Regional Council
www.waikato.govt.nz

GNS Science
www.gns.cri.nz



JOIN POLLUTION BUSTERS!

Do you have friends or family aged 3-15 years old and live in the Bay of Plenty?

Are they interested in learning about the environment and sustainability?

Get them to join the Pollution Busters Club by sending BuzzBOP the following:

Name, address, phone number, birthday and school.

Post to:

BuzzBOP and Team
Bay of Plenty Regional Council
Freepost 122076
PO Box 364
Whakatāne 3158

Email:
buzzbop@boprc.govt.nz

