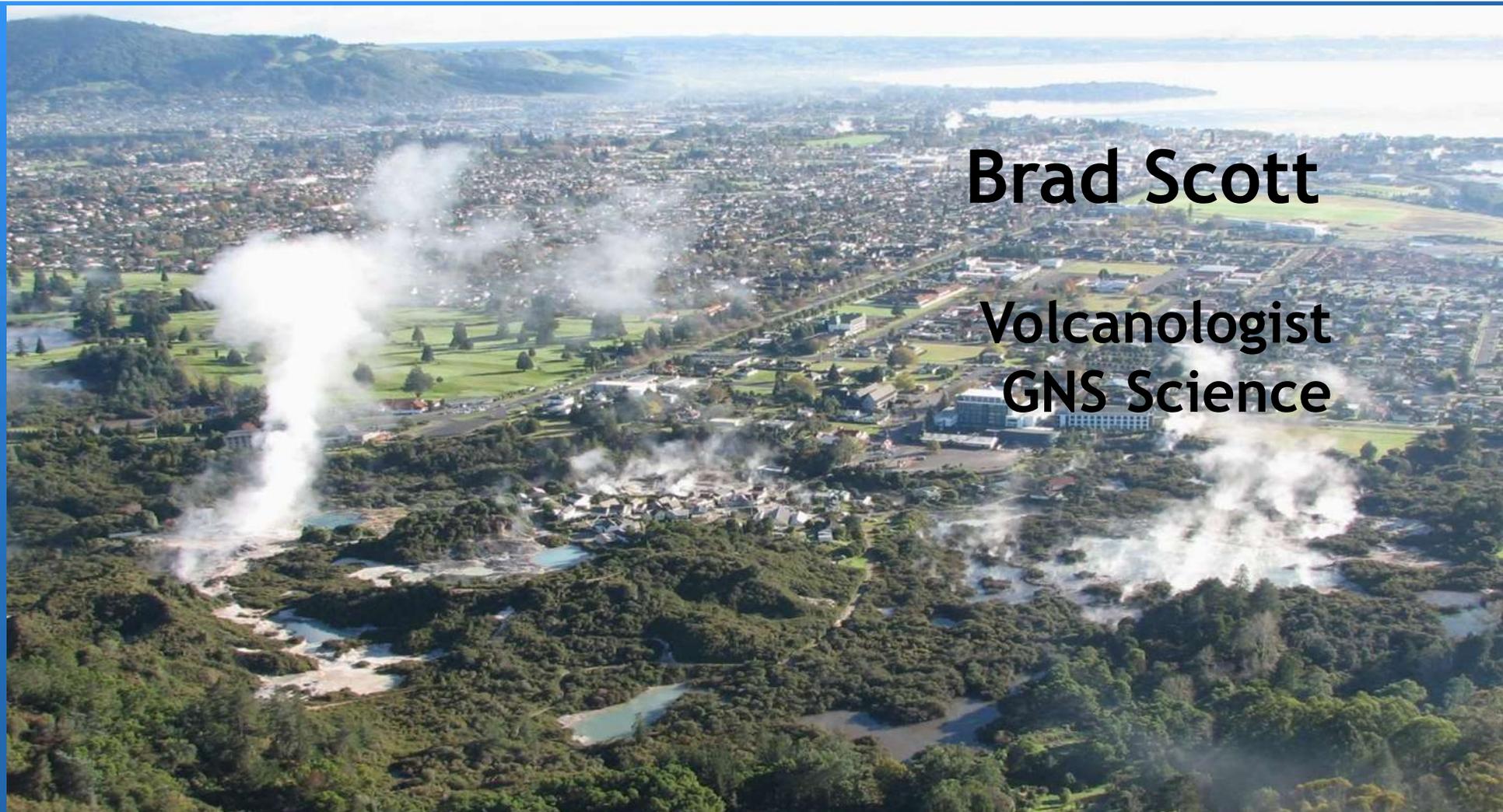




Sustainable Communities  
Sharing Knowledge

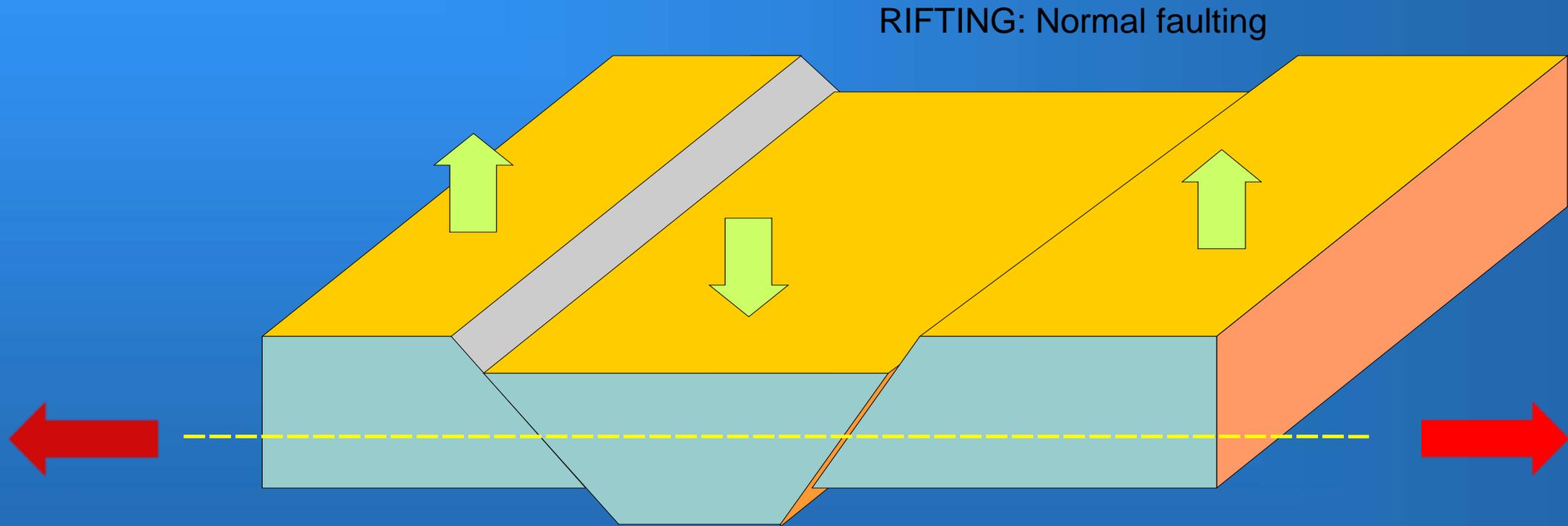
## Rotorua City, life in a geothermal system



**Brad Scott**

**Volcanologist  
GNS Science**

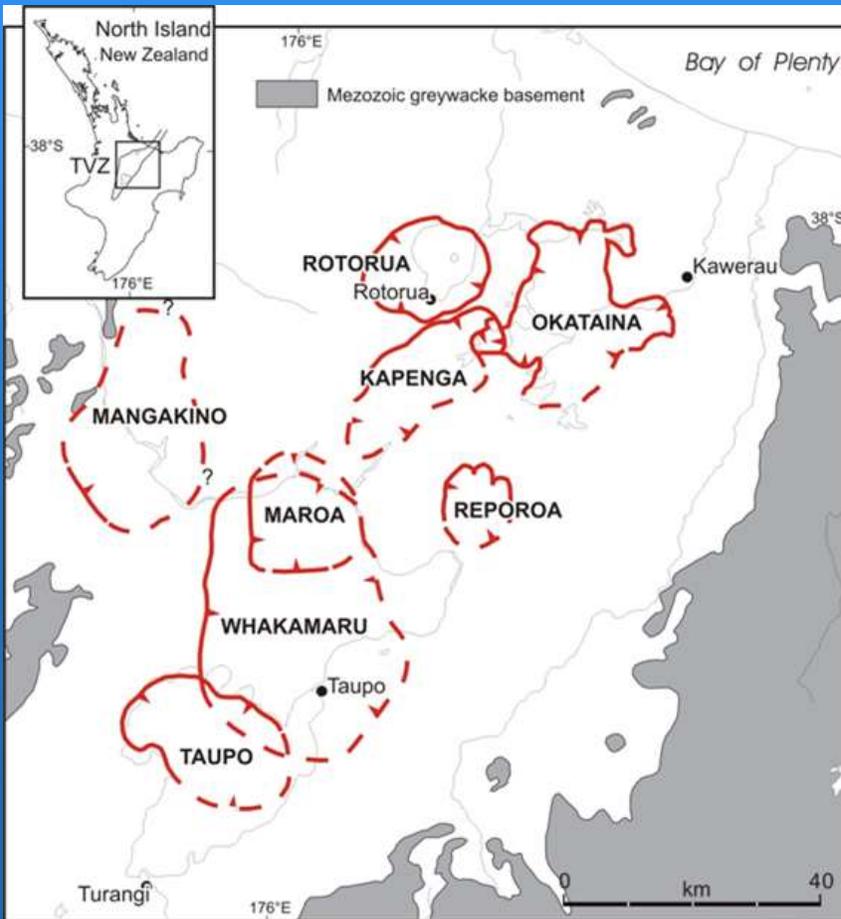
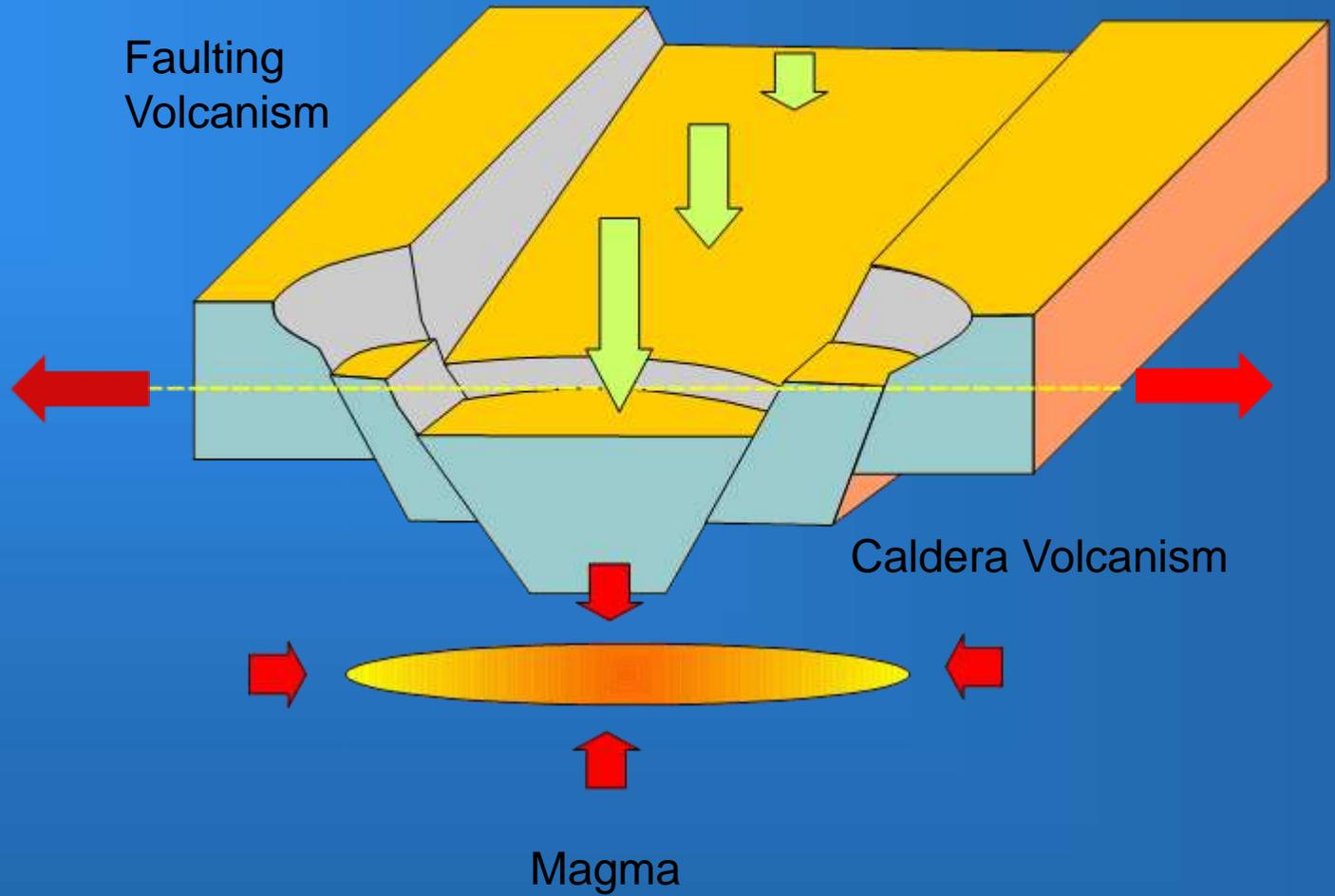
## Whakatane-Rotorua-Taupo-Tongariro; Geology Model



Taupo Volcanic Zone  
Taupo Fault Belt  
Taupo – Hikirangi Rift

# Rotorua City, life in a geothermal system

## Volcano-Tectonic model



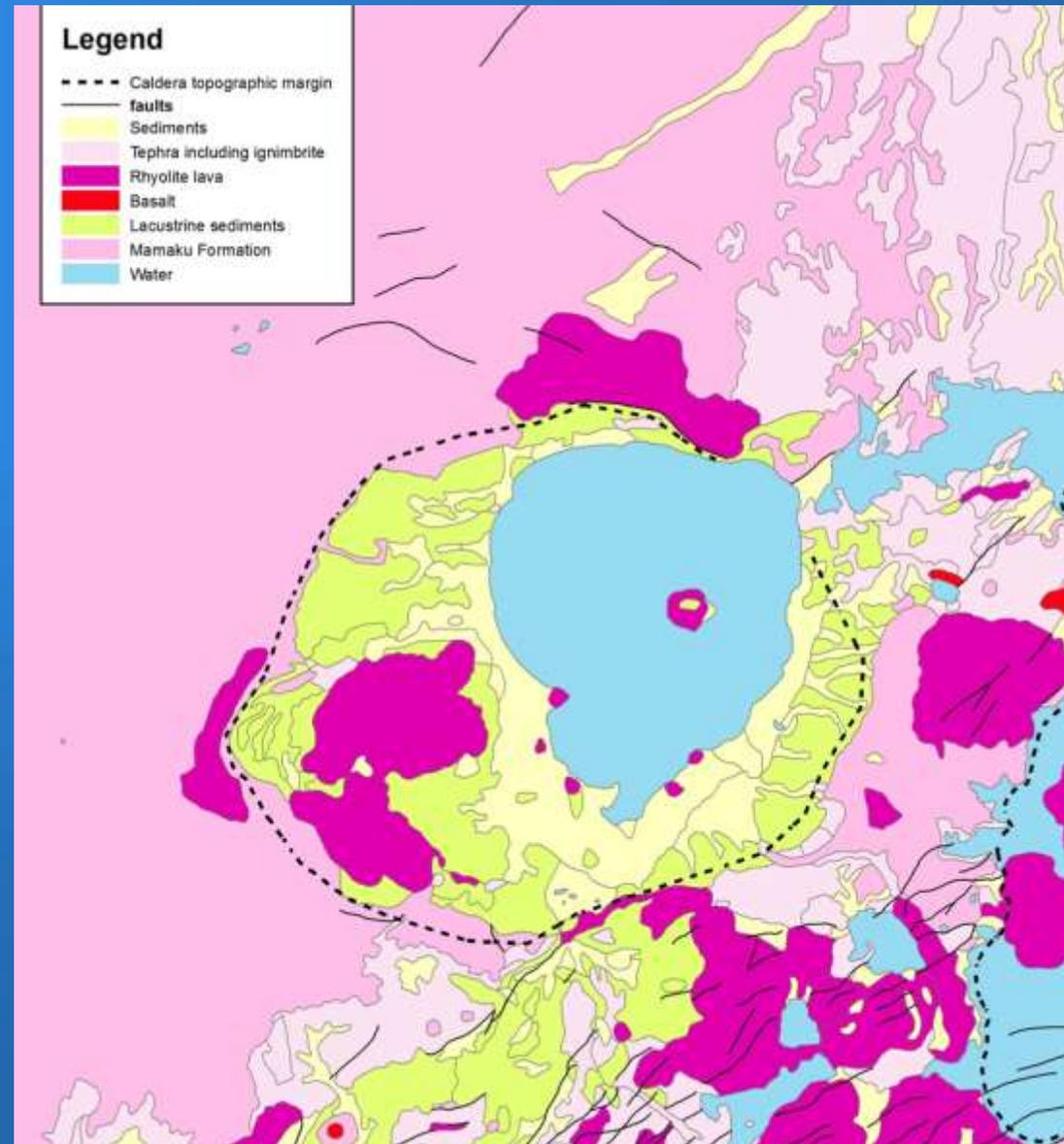
## Rotorua Geology

Large basin; surrounded by thick eruption deposit

Lava domes

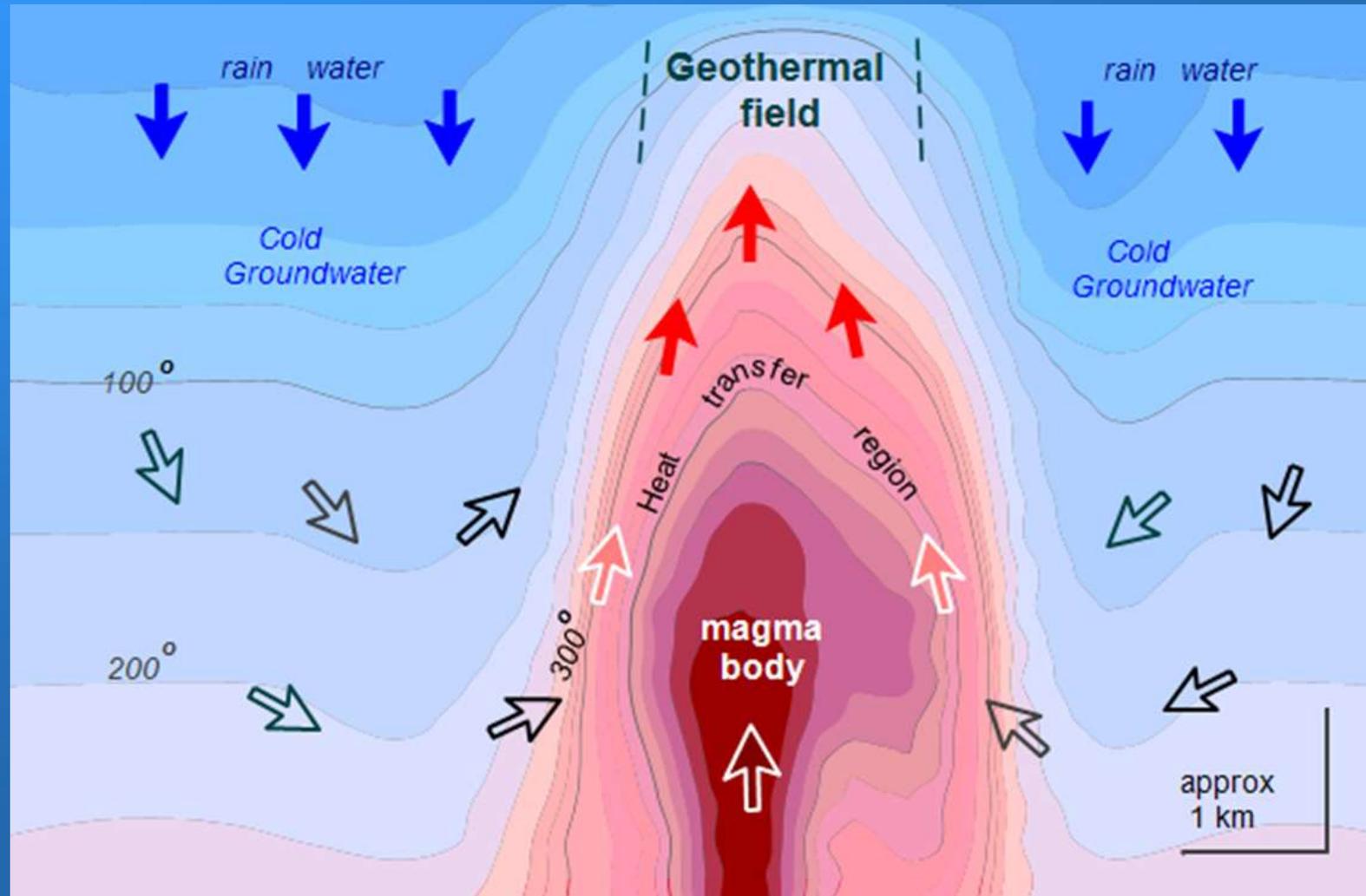
Thick sediments; variable properties

Complex rift and faulting to East and South



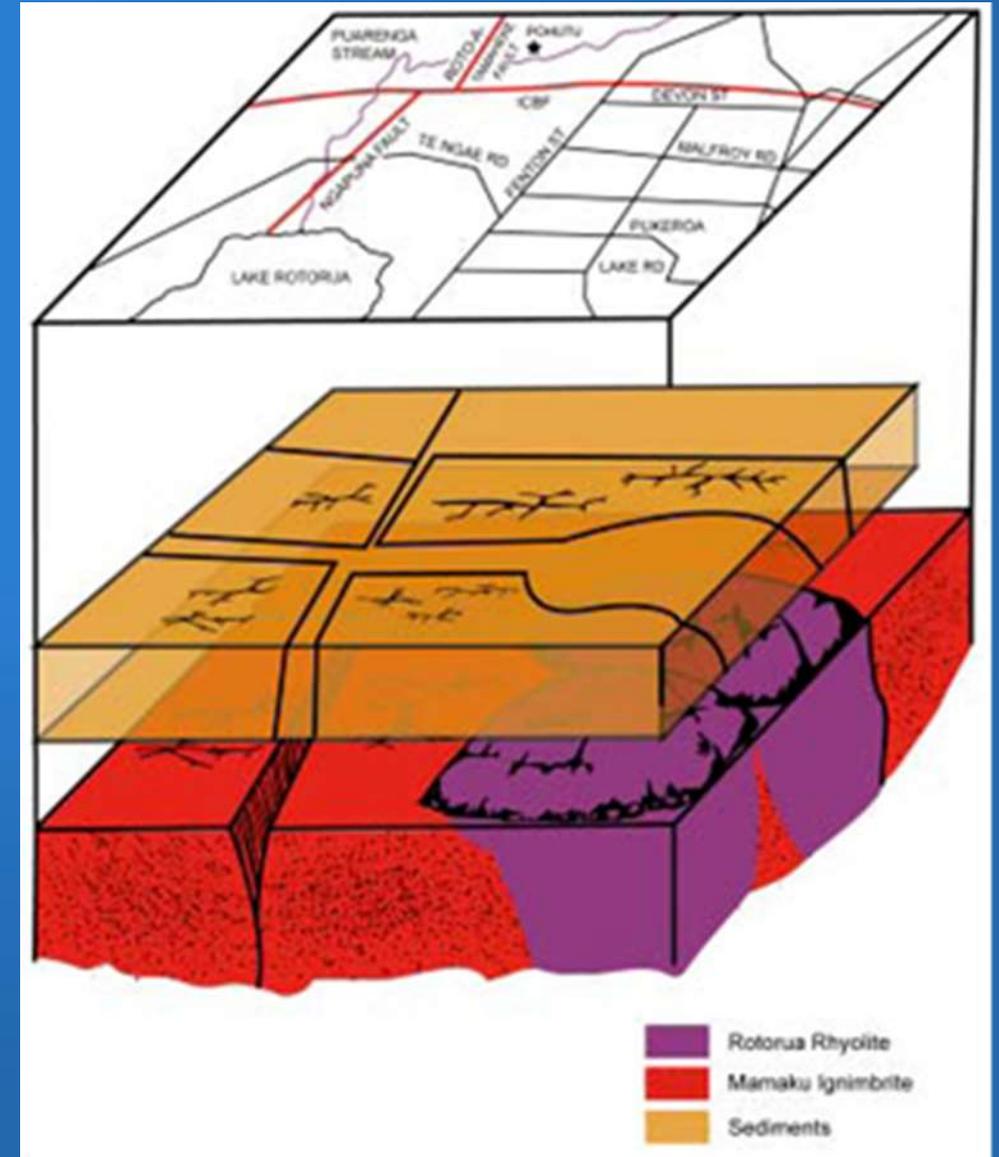
# Rotorua City, life in a geothermal system

## What is a geothermal system



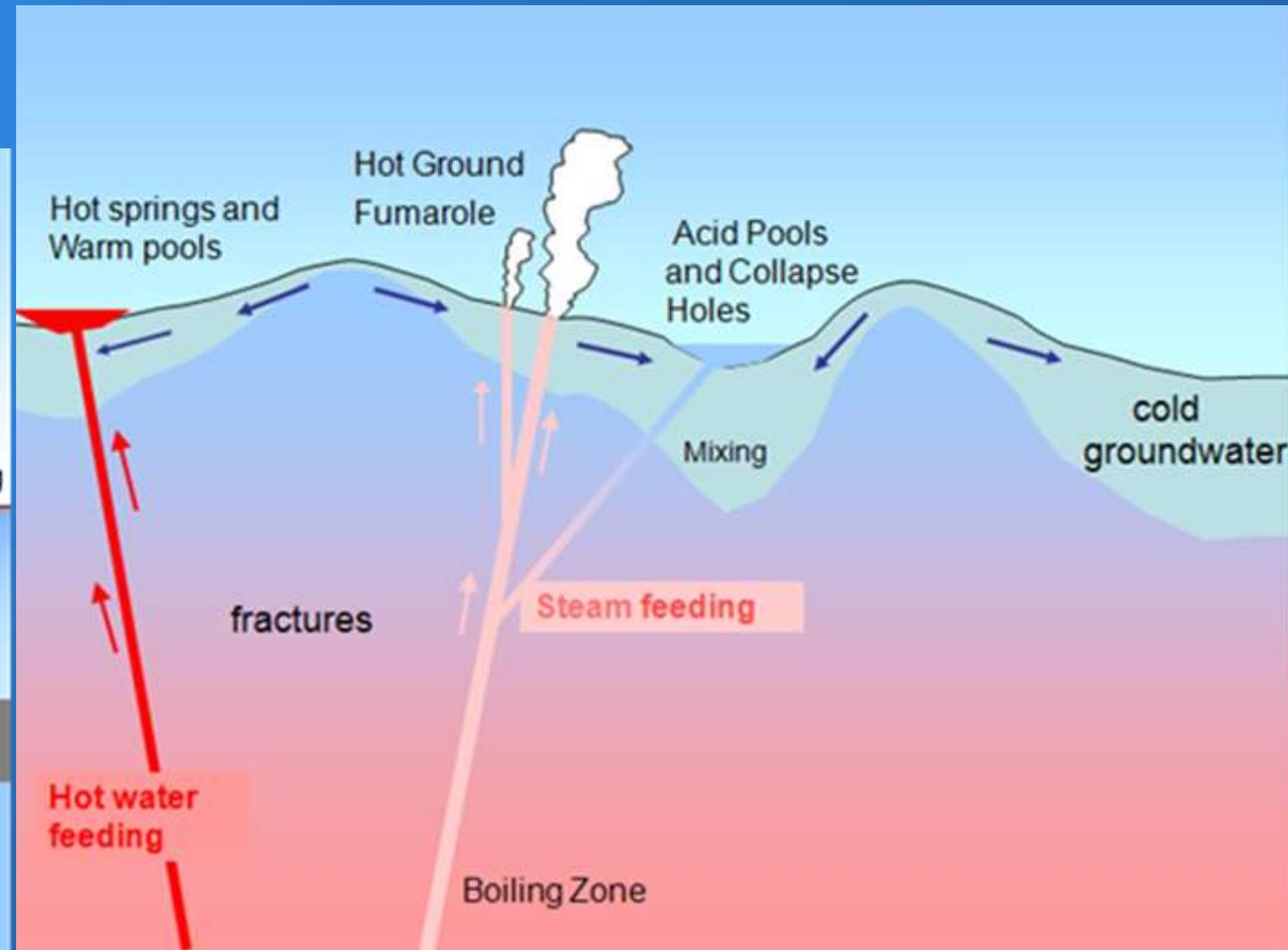
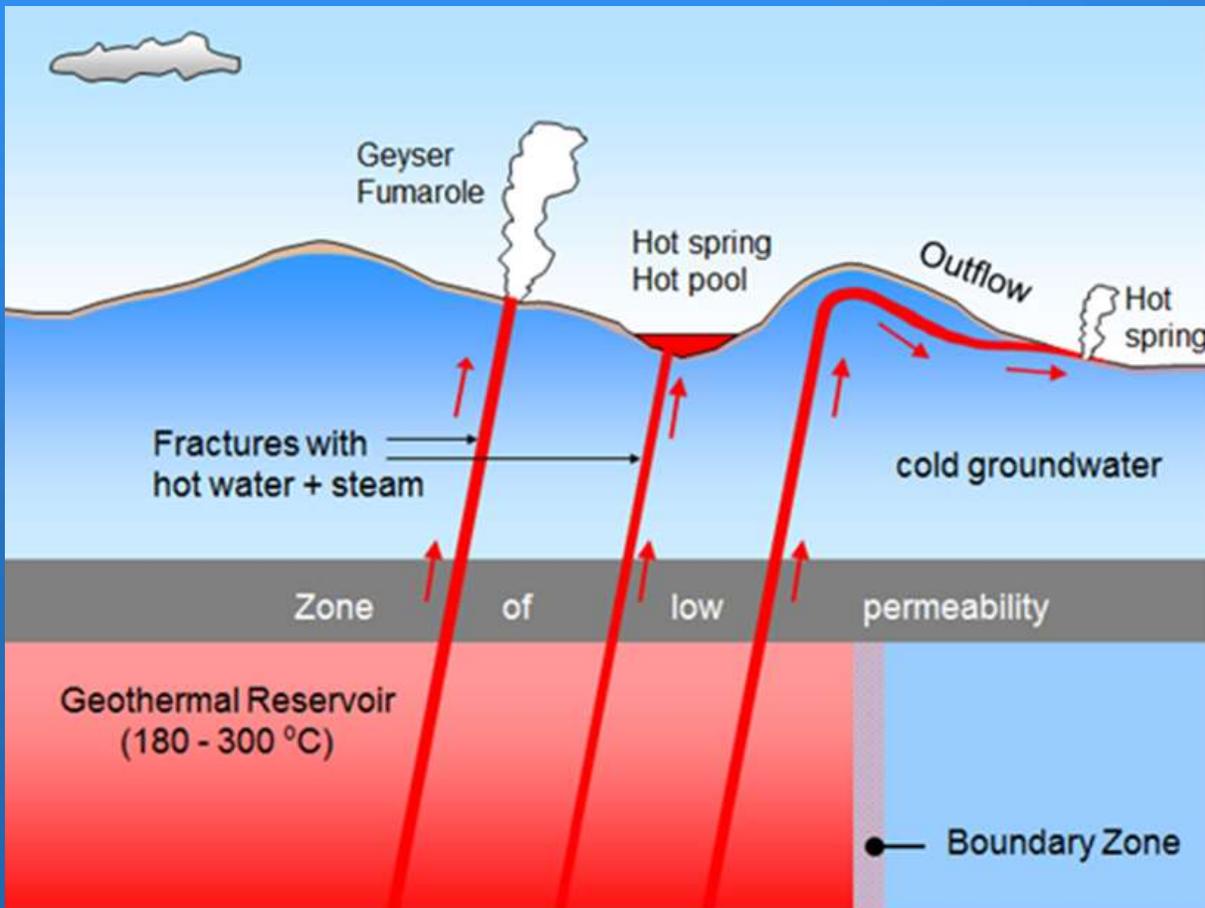
# Rotorua City, life in a geothermal system

## Rotorua Geothermal System (City Geology)



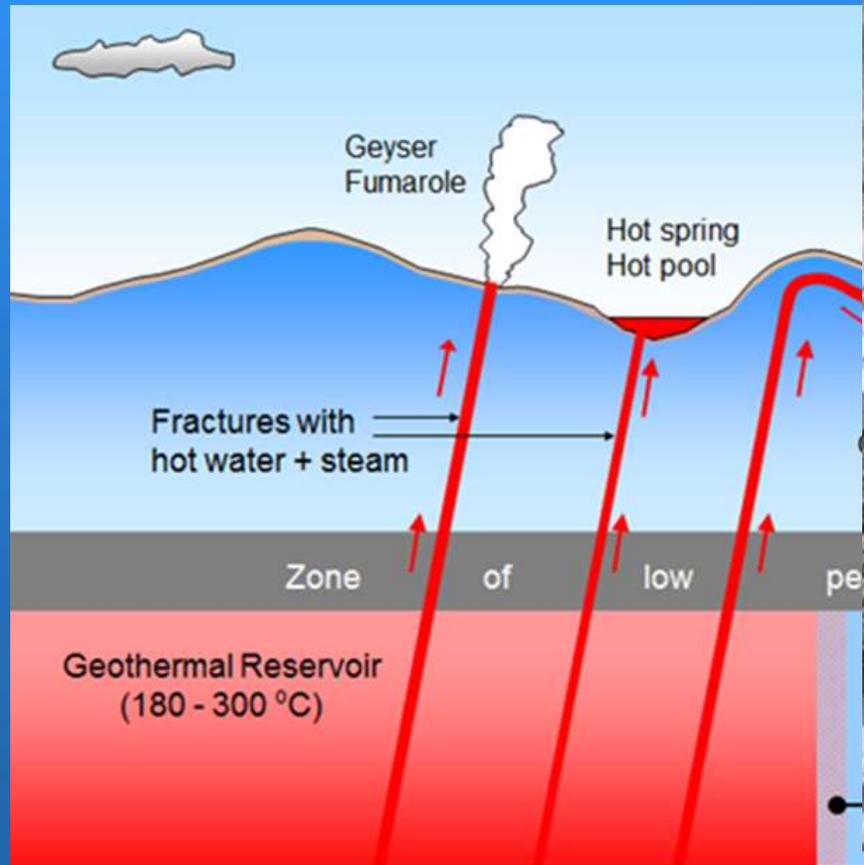
# Rotorua City, life in a geothermal system

## Some understanding how springs work



# Rotorua City, life in a geothermal system

## Primary Features (deep fluids)



ter

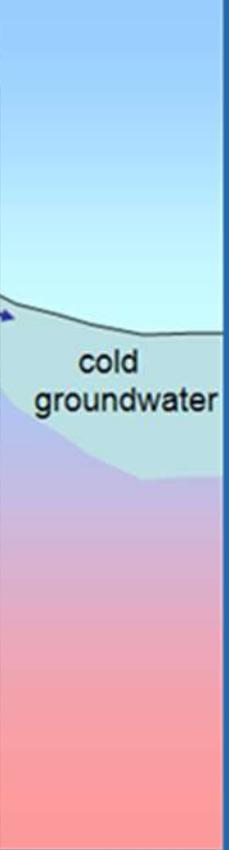
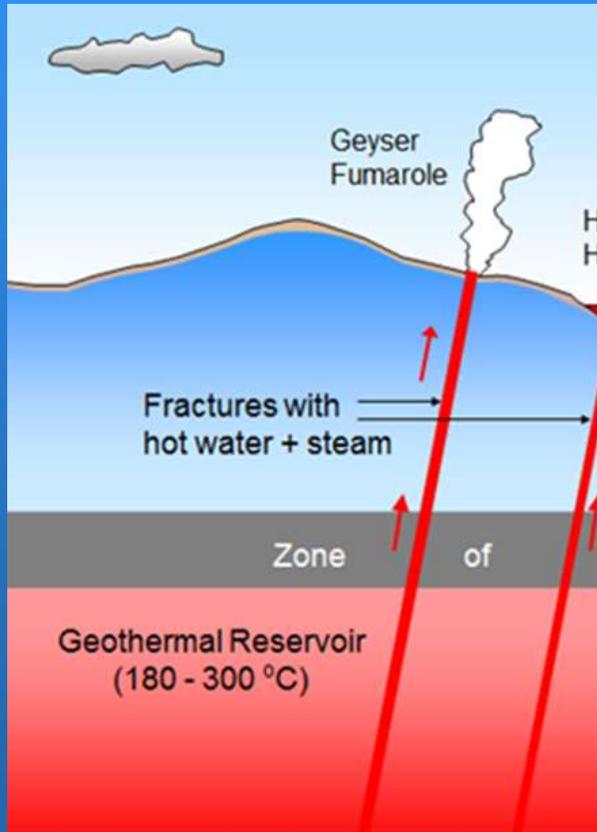
# Rotorua City, life in a geothermal system

## Mixed fluids



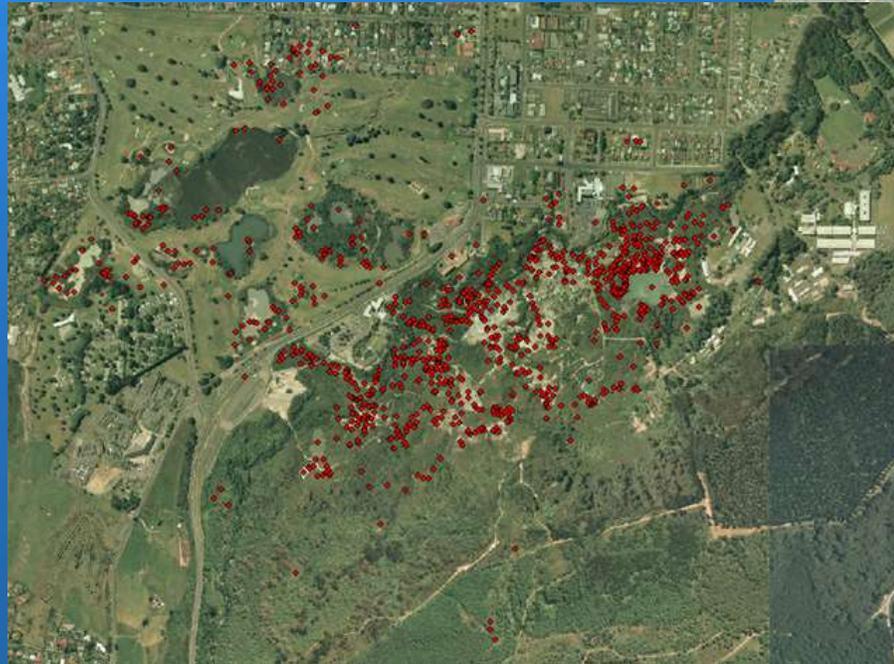
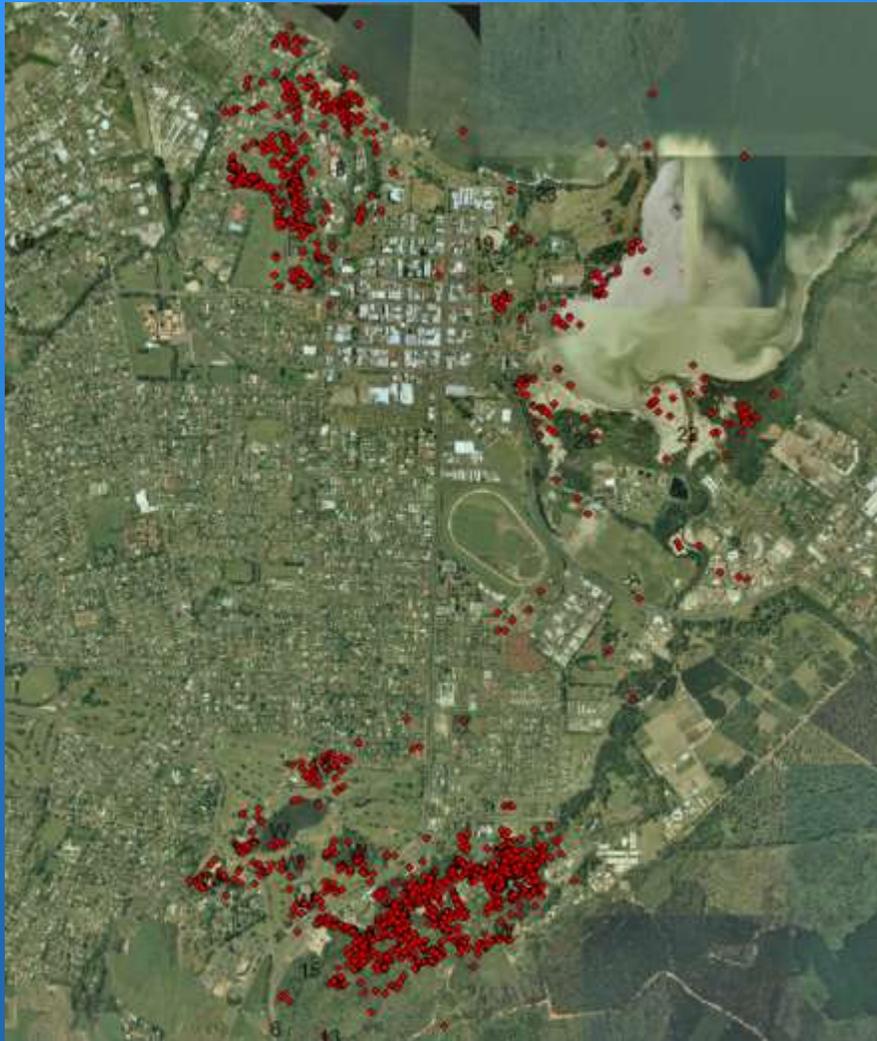
# Rotorua City, life in a geothermal system

## Steam feed features



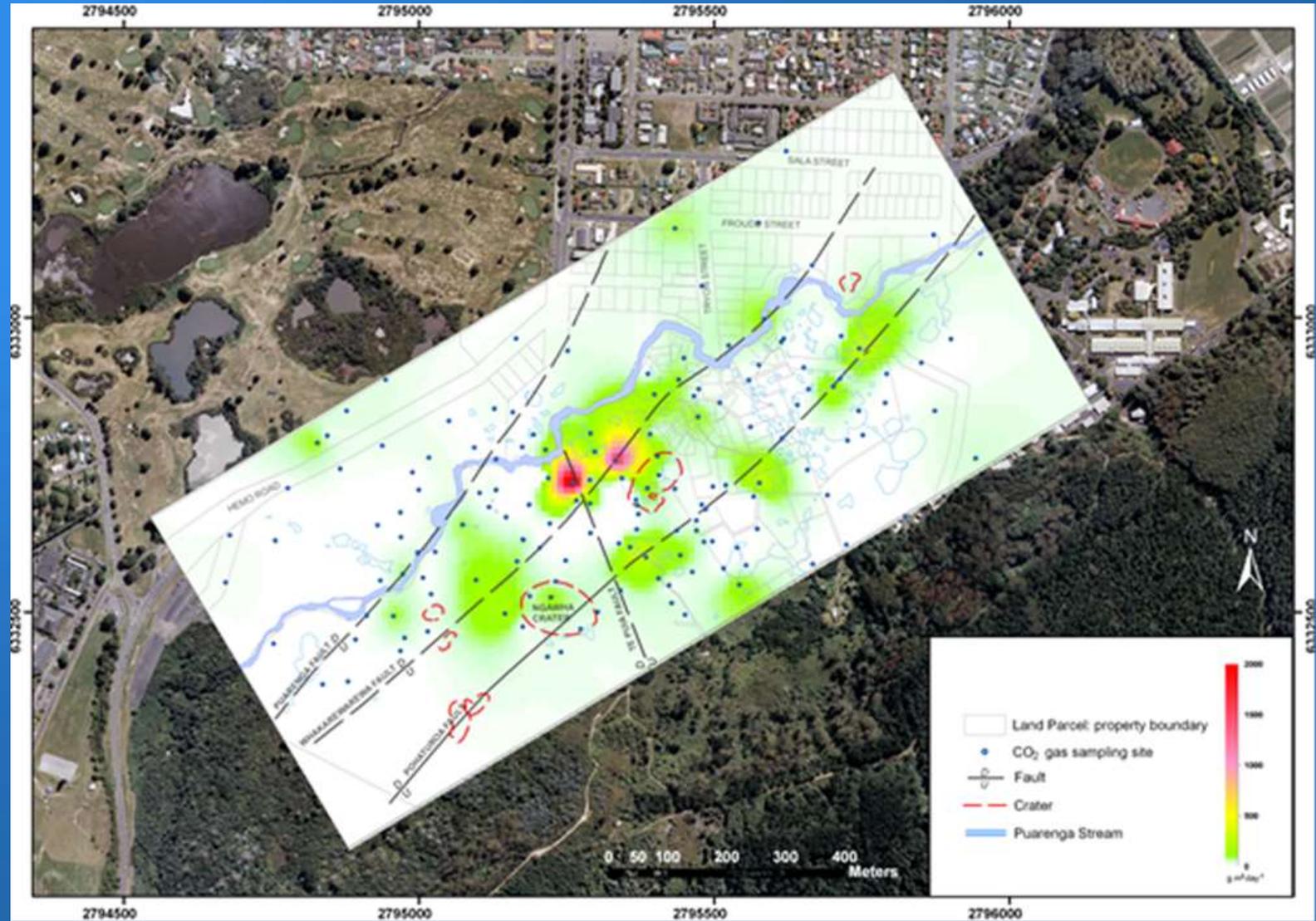
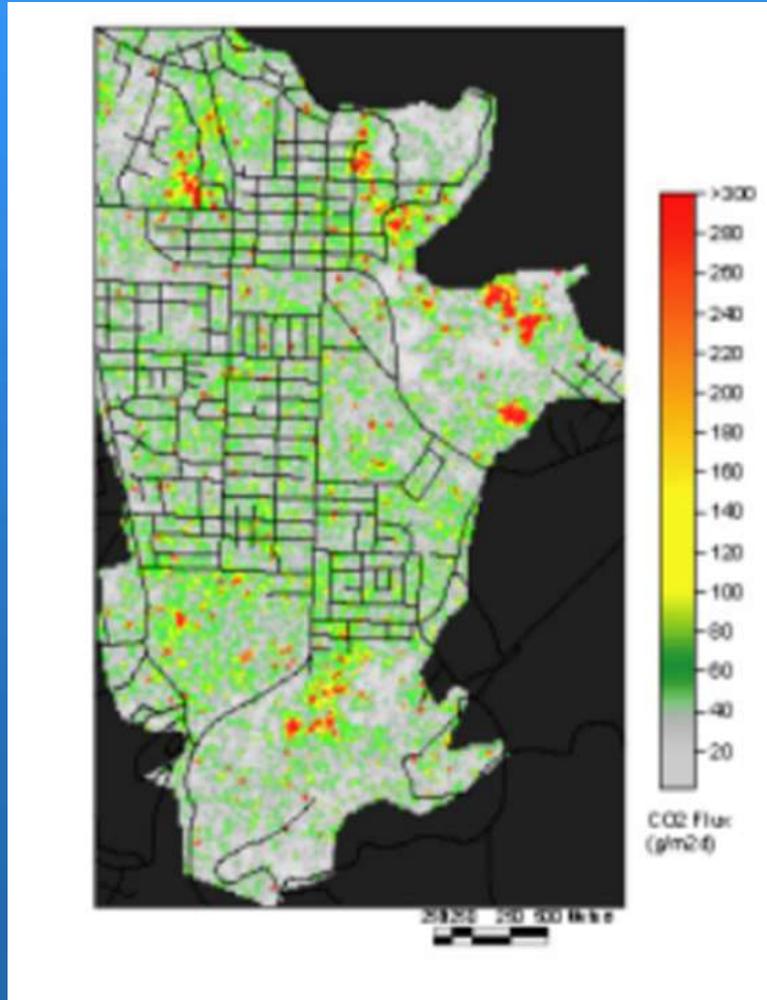
# Rotorua City, life in a geothermal system

## Location of surface features



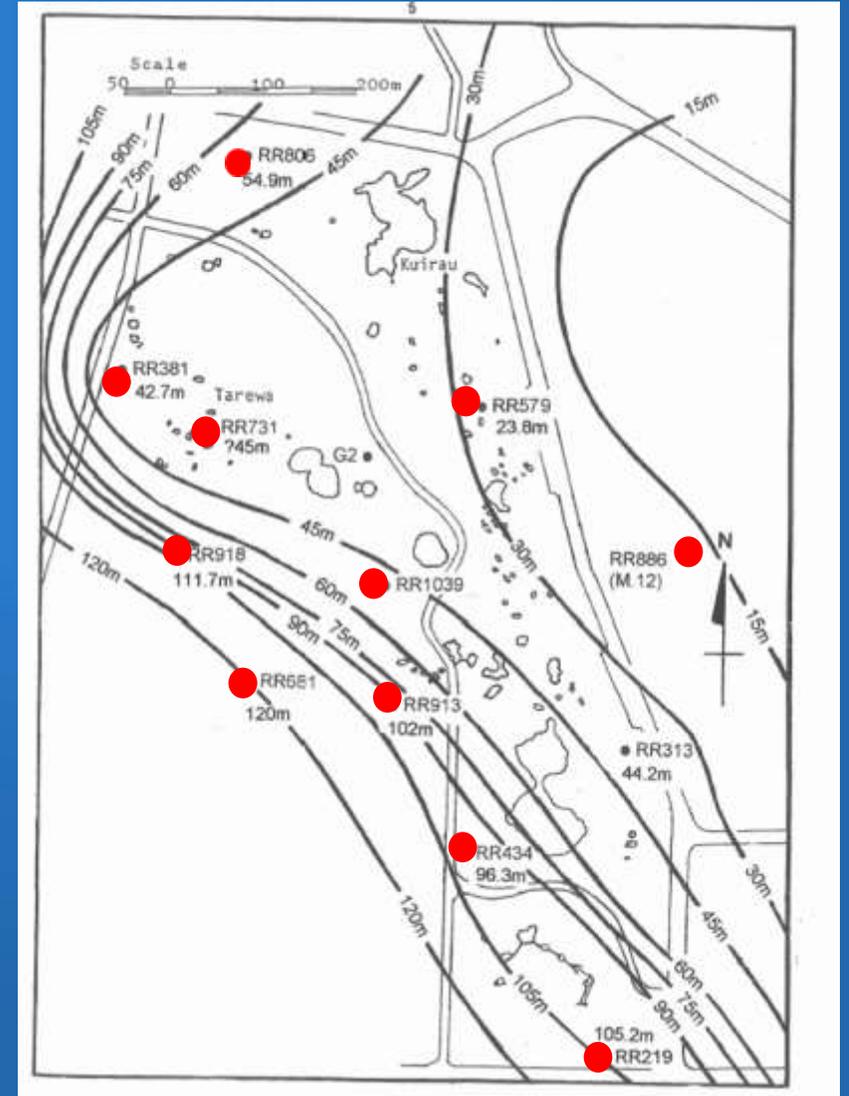
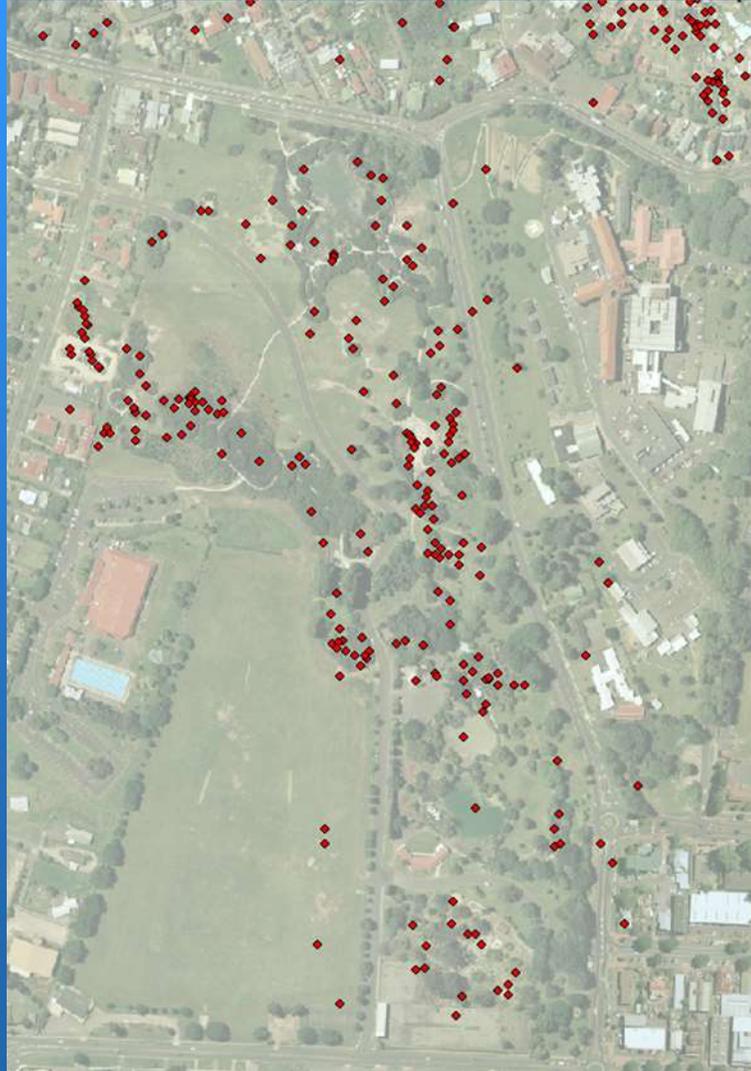
# Rotorua City, life in a geothermal system

## Gas, CO<sub>2</sub>



# Rotorua City, life in a geothermal system

## Combining Surface features with drillhole data



# Rotorua City, life in a geothermal system

## The Bore wars

MINISTRY OF ENERGY PROJECT GEOTHERMAL

P.O. Box 1943, Rotorua Telephone 71 235



CLOSURE OF THIS BORE IS BEING UNDERTAKEN BY THE GEOTHERMAL INSPECTORATE PURSUANT TO POWERS CONFERRED ON GEOTHERMAL INSPECTORS UNDER THE GEOTHERMAL ENERGY REGULATIONS 1961. UNLESS EXPRESSLY AUTHORIZED BY A GEOTHERMAL INSPECTOR NO PERSON MAY TAMPER OR INTERFERE WITH THIS BORE OR ITS EQUIPMENT IN ANY WAY.

ATTENTION IS DRAWN TO REGULATION 3(7) OF THE GEOTHERMAL ENERGY REGULATIONS 1961 WHICH MAKES IT AN OFFENCE TO WILFULLY IMPEDE OR OBSTRUCT AN INSPECTOR IN THE EXERCISE OF ANY POWER CONFERRED ON INSPECTORS UNDER THE GEOTHERMAL ENERGY ACT 1953 OR THE SAID REGULATIONS. ANY UNAUTHORIZED TAMPERING OR INTERFERENCE WITH THIS BORE SHALL BE CONSIDERED A BREACH OF THIS REGULATION.



## Geothermal battle won

AUCKLAND UNIVERSITY associate professor of physics Dr Ron Keam has won a lengthy legal battle to stop the Ministry of Works and Development taking water from the Waimangu geothermal field, southeast of Rotorua.

His victory has thrown into confusion the future of many geothermal steam users in the Rotorua area who do not hold water

right of Appeal judges - Mr Justice Somers and Mr Justice - made individual decisions in favour of overturning an earlier ruling.

The fight began in 1978 when he lost the granting of a right of appeal to the Ministry to take geothermal water for power purposes from Waimangu.

The area was unique because the geothermal system, created by the 1886

Tarawera eruption, was the only significantly sized one formed in historic times. This meant its complete history could be studied.

His successful appeal to the Planning Tribunal was later overturned by Chief Justice Sir Ronald Davison in the High Court on the grounds that the tribunal had gone outside their brief in seeking to control geothermal energy.

Disputing this interpretation the Court of Appeal said there was some overlap between the Geothermal Energy Act 1953 and the Water and Soil Conservation Act 1967 (now being replaced by the 1981 amendment) in their definition of water.

But it said, where geothermal testing involved the use of "specified natural water" the provisions of the Water and Soil Conservation Act must be complied with - that is, a water right was necessary.

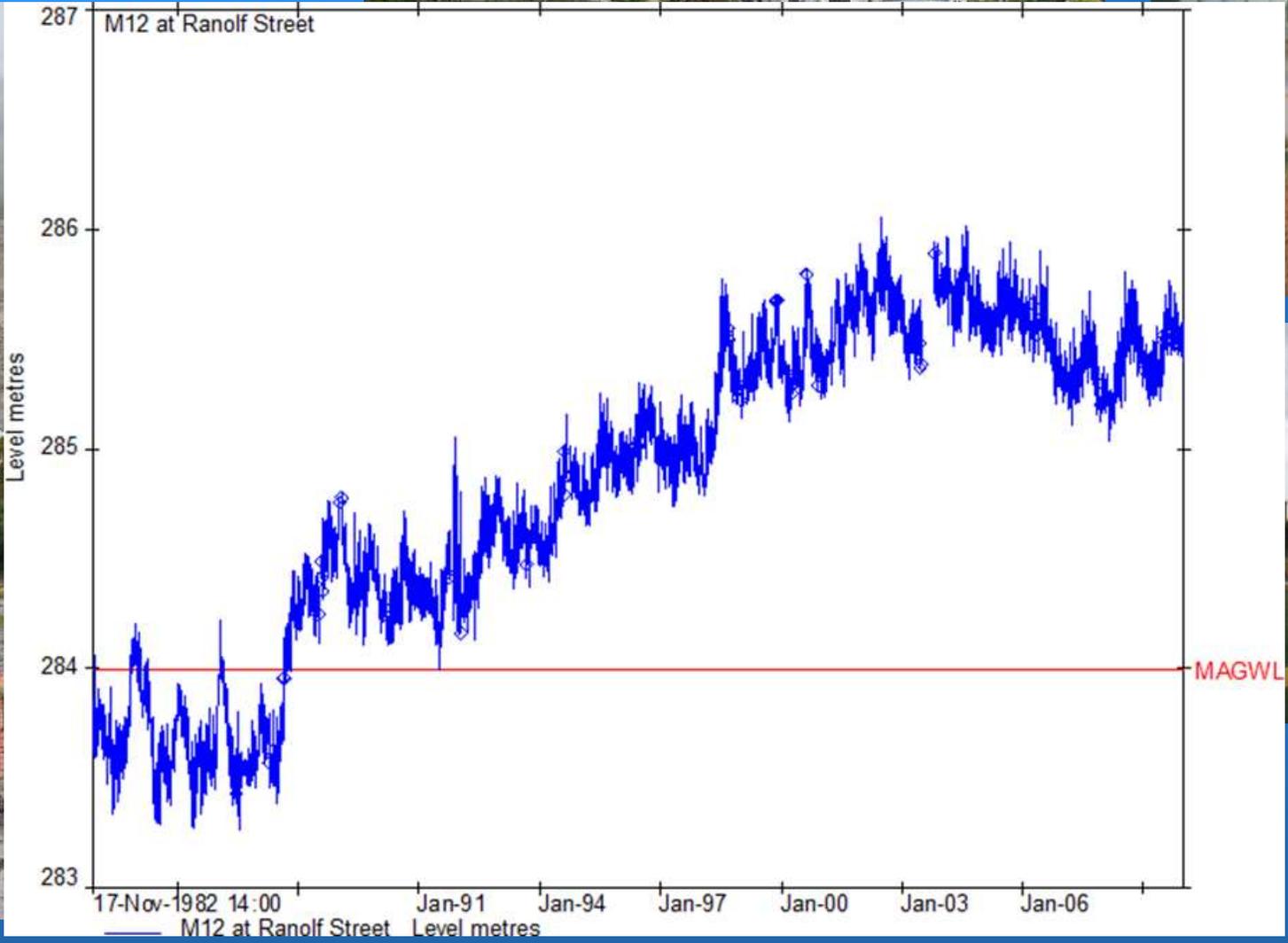
# Rotorua City, life in a geothermal system

## The Bore wars: the recovery



# Rotorua City, life in a geothermal system

## The Bore wars: the recovery



## Hazards

### Collapse holes

Downward percolation of ground water

Rising steam, acid fluids, long residence times

### Gas

### Steam eruptions

### Failed bores (grouted ones)

### Hot ground conditions



# Rotorua City, life in a geothermal system

## Response criteria



**Set backs**  
**No building over items**  
**Close off area**  
**Venting/back fill**