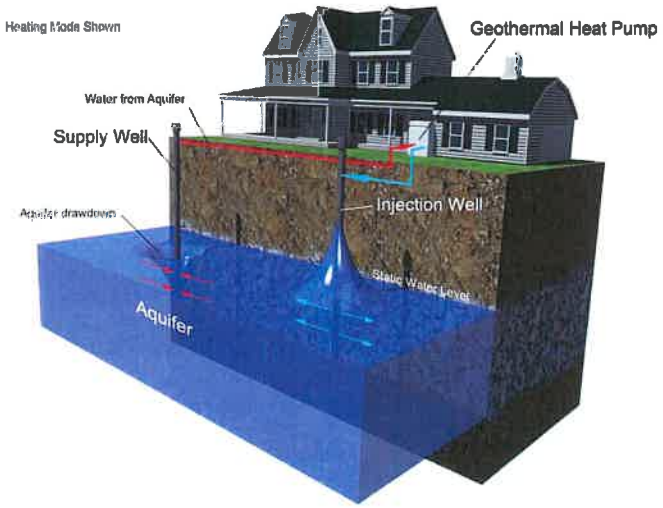
Tabled at Hearing 12/03/2013

Central Heating New Zealand

Ground Water Heat pumps for heating, cooling and hot water

Submission to Ecan hearing

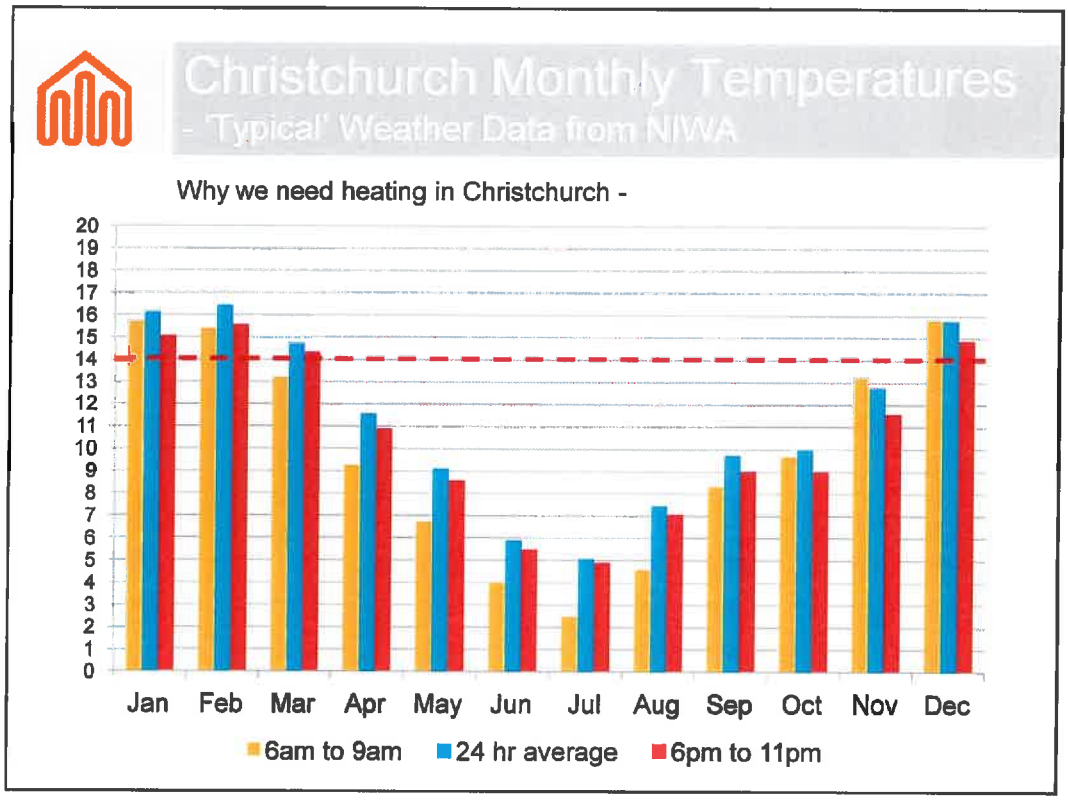


The aim of this presentation is to tell you who we are, why heating is important in Christchurch, the solutions we provide and why ground source heat pumps that use ground water as the heat source are an important option.

Central Heating New Zealand

- Install and sell equipment for hydronic central heating
- Based in Christchurch
- Started 2002
- 30 employees
- Leading specialist central heating company

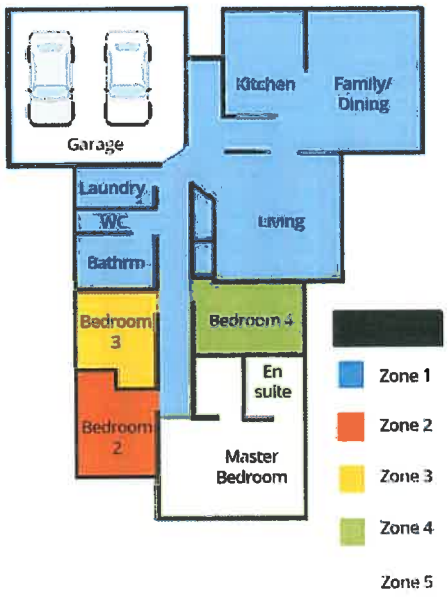
Who are we?



Why is heating so important in Christchurch? Because it is so cold. According to the New Zealand Building Code any month when the average temperature is below 14°C is considered a heating month; this is April to November inclusive.

Central Heating

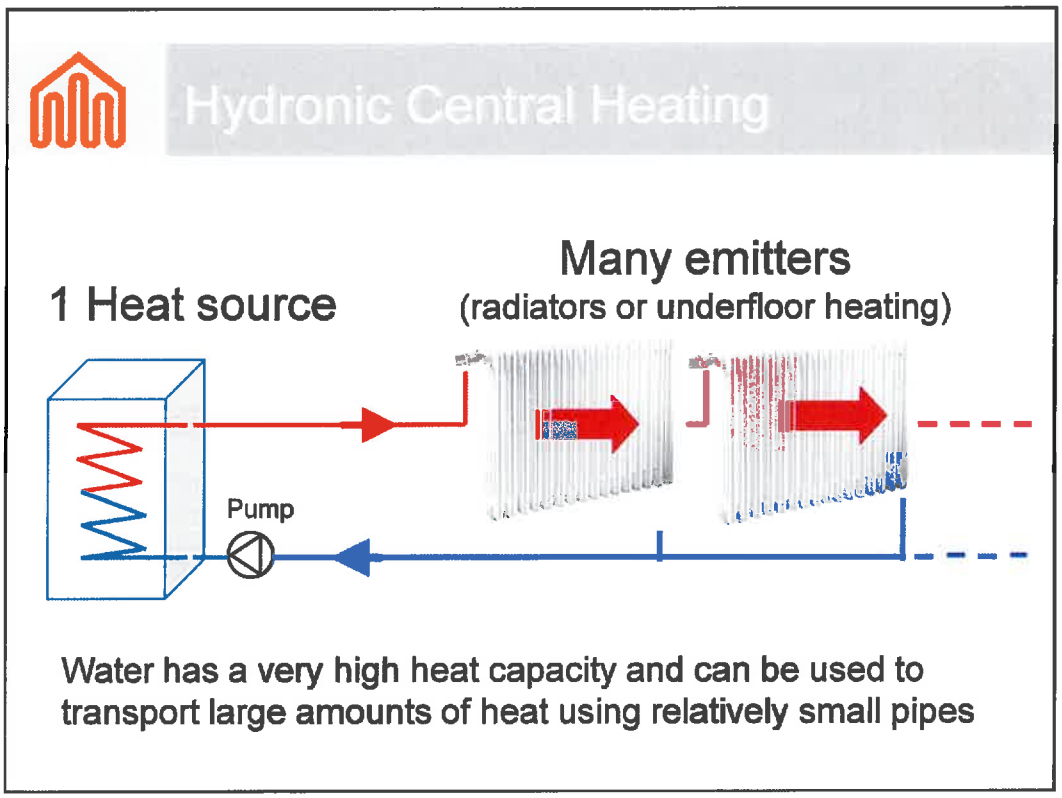
- New Zealanders mostly used to heating only the living area
- Inside temperatures recognised as a health issue
- Many Kiwis have experienced central heating abroad and now have higher expectations for home heating



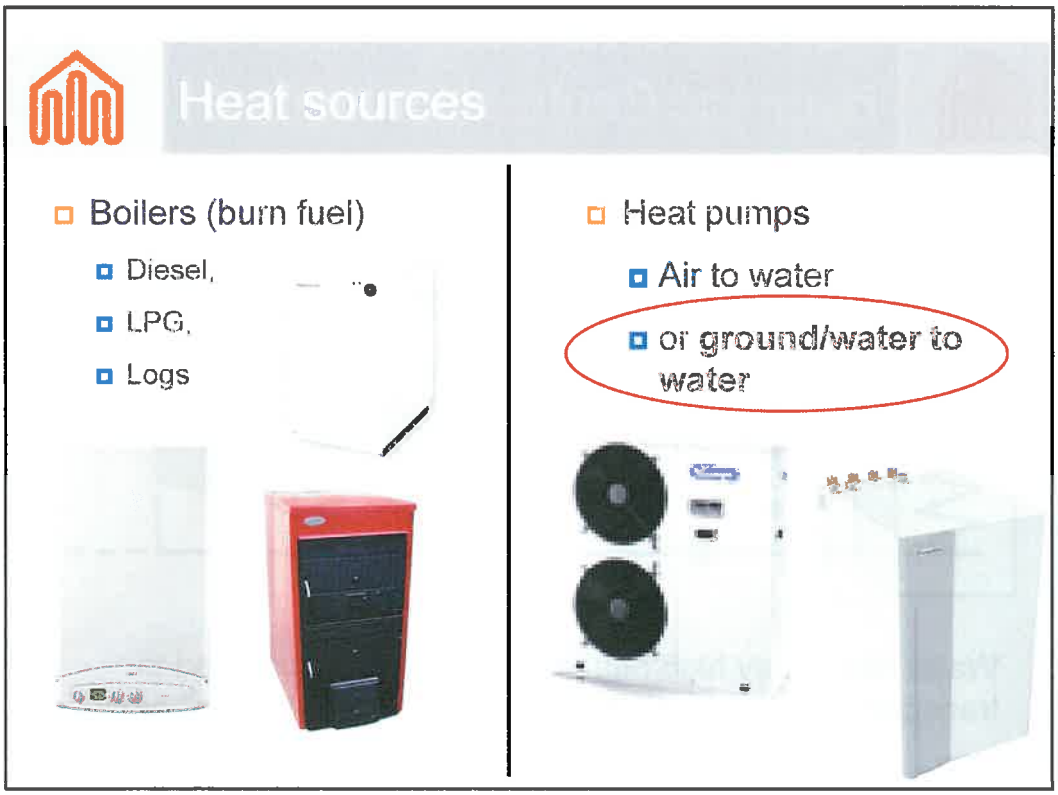
Central heating aims to provide adequate heating in all rooms of a house to agreed temperatures at agreed times. Although this is common in other parts of the world it is still unusual here, but growing rapidly.

Pipes carrying hot water set into a floor slab is the most common way to do provide central heating as shown in this picture, but largely limited to new houses though is possible for retrofits. (Pipes tied to mesh prior to concrete being poured.)

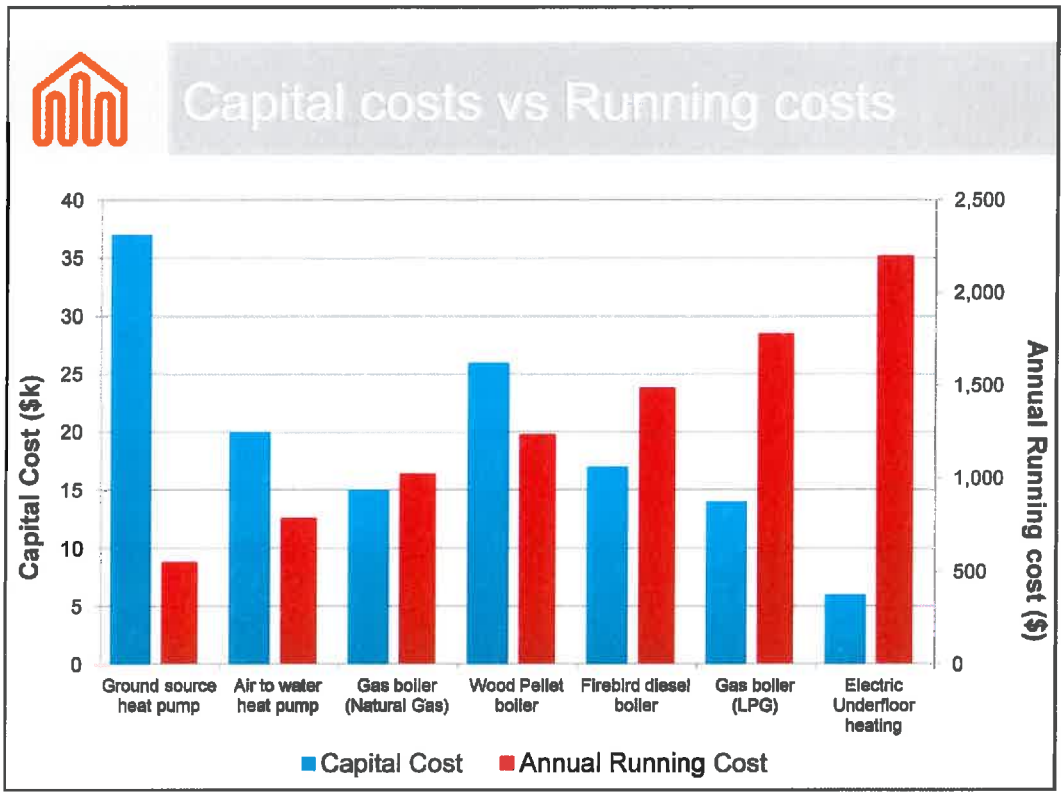
Radiators are not as popular as underfloor but still commonly used. European immigrants would mostly be used to radiators which are the standard method of heating with gas boilers in most of northern Europe.



Hydronic central heating uses water to transfer heat from one central heat source to heaters usually in every room of the building. As water has a very high heat capacity it is possible to move large amounts of heat through relatively small pipes. It also means heat can be directed to where it is needed using automated valves and pumps.



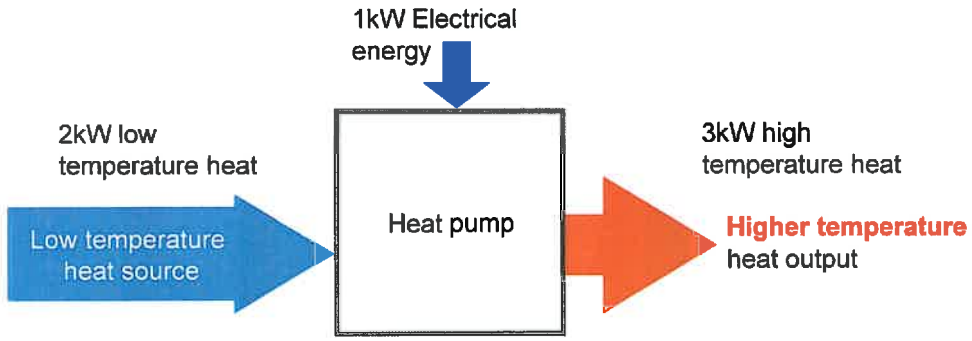
Heat sources include boilers that burn fuel, gas and diesel are commonly used in Christchurch even though they are not as cheap as heat pumps to run. Log boilers are difficult to install due to emissions regulations. Air to water and ground source heat pumps are growing in popularity every year.



Ground source heat pumps have the cheapest running costs but capital costs are high.

Heat pumps

- An appliance that uses a small amount of electrical energy to produce a larger amount of Heat Energy i.e. 1kW Electricity in & 3kW Heat out.



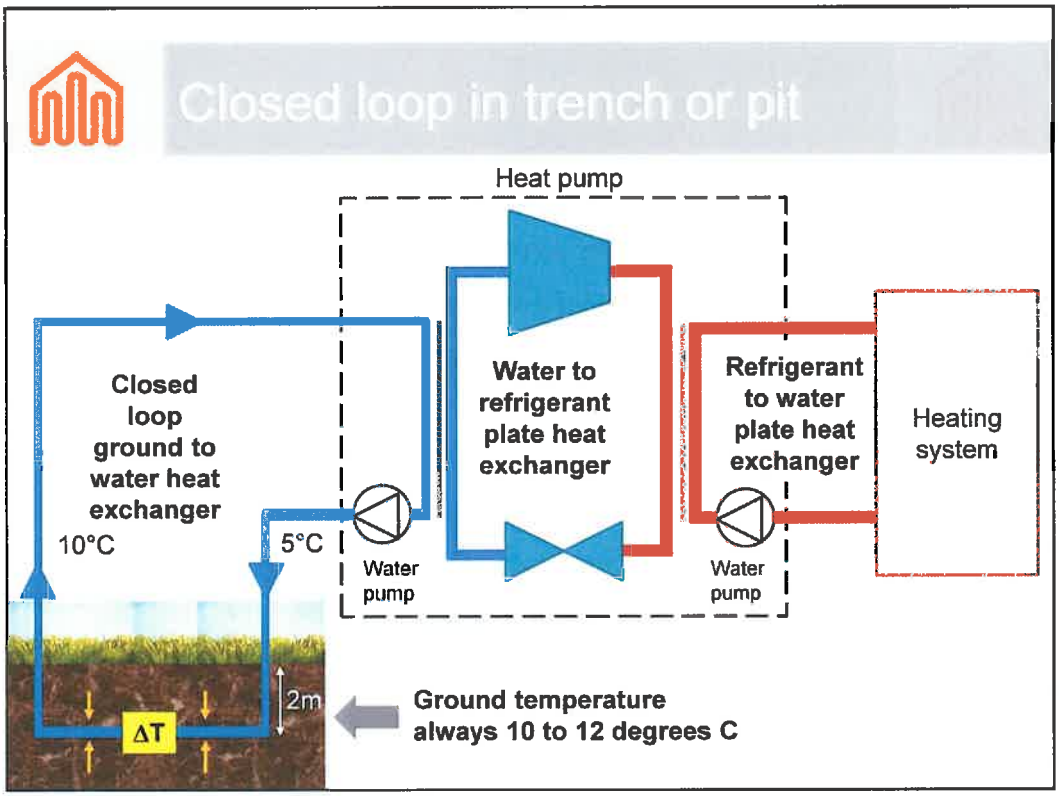
Heat pump efficiency and heat output is reduced by lower heat source temperatures

A heat pumps extracts large amounts of low temperature heat from the environment and concentrates it into a smaller amount of high temperature heat. Underground it is warmer in the winter than above ground where the air can be freezing, reducing efficiency and requiring defrost with reduces heat output of air source heat pumps.

Ground source vs Air source heat pumps

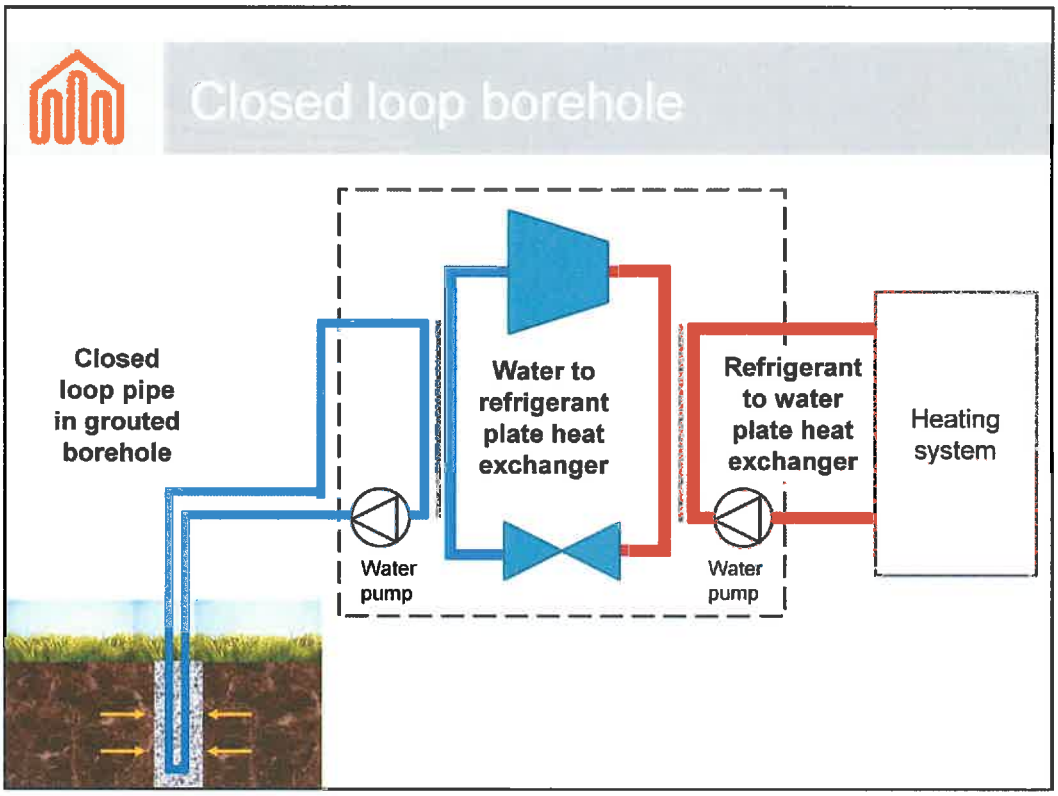
- Air source are cheaper to install, but
  - Are less efficient in colder weather – ground source not effected
  - Produce less heat in colder weather– ground source not effected
  - Need to defrost in cold weather – ground source doesn't
  - Can be a noise nuisance in certain circumstances
  - Can be a visual intrusion

VS

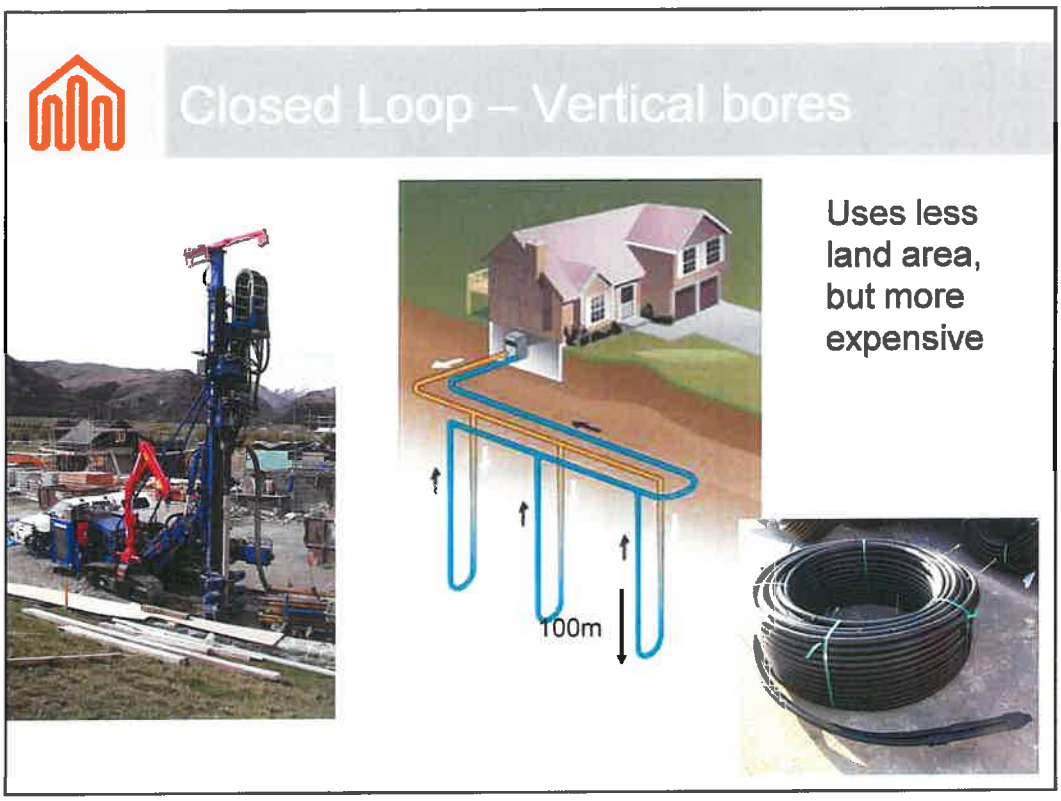


Pipe loops buried in the ground at a depth of 2m is the most common form of ground source heat pumps.

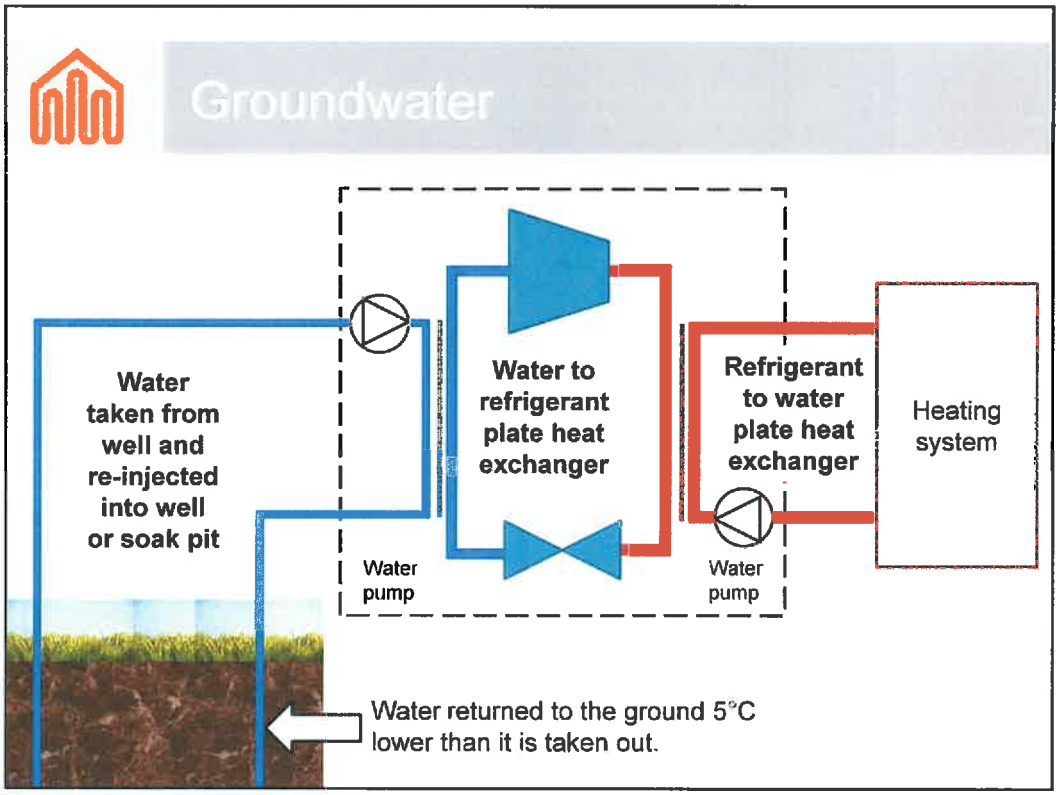
This has a cost to dig the hole, the cost of the pipes and laying them out and most of all you need space. This pit is in urban Christchurch and is now a tennis court. This was part of a brown field development but most people don't have this much room or wouldn't want to dig up their whole garden.



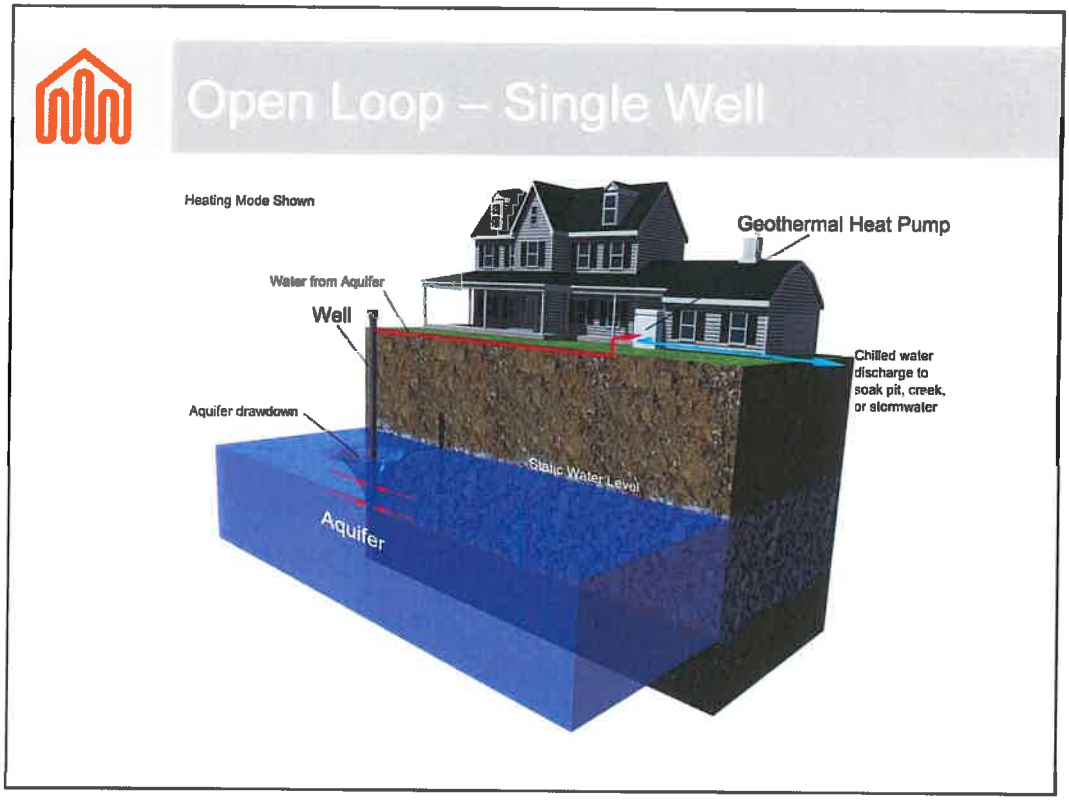
A variant of buried pipes it to put them in vertical bore holes which uses less land area but is expensive as the bores are 100m deep.



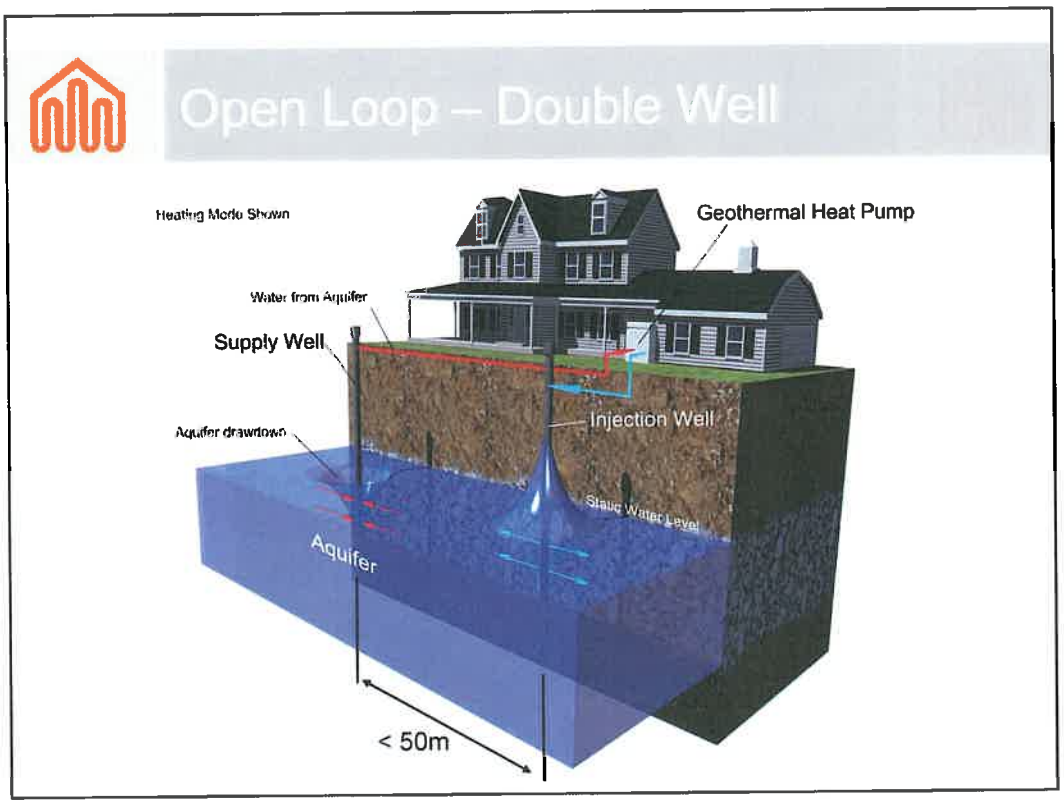
Bore hole installation in Queenstown.



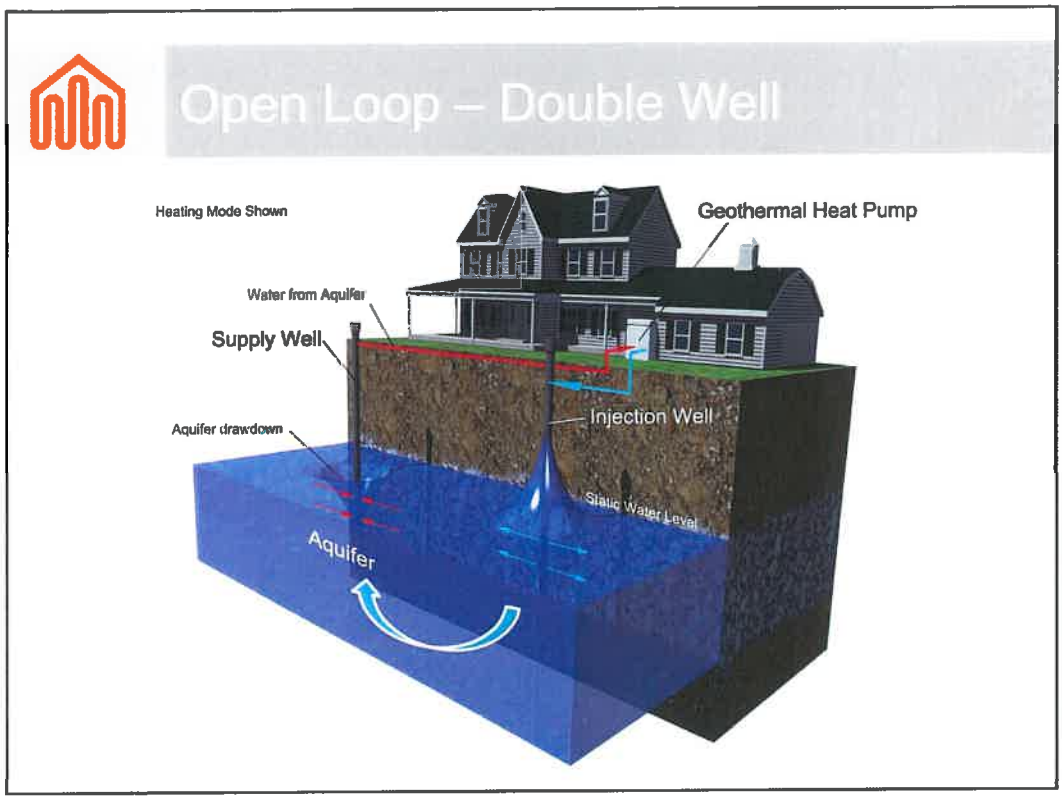
Using ground water is more cost effective as long pipe loops are eliminated and the groundwater is at a constant temperature of 10°C to 12°C.



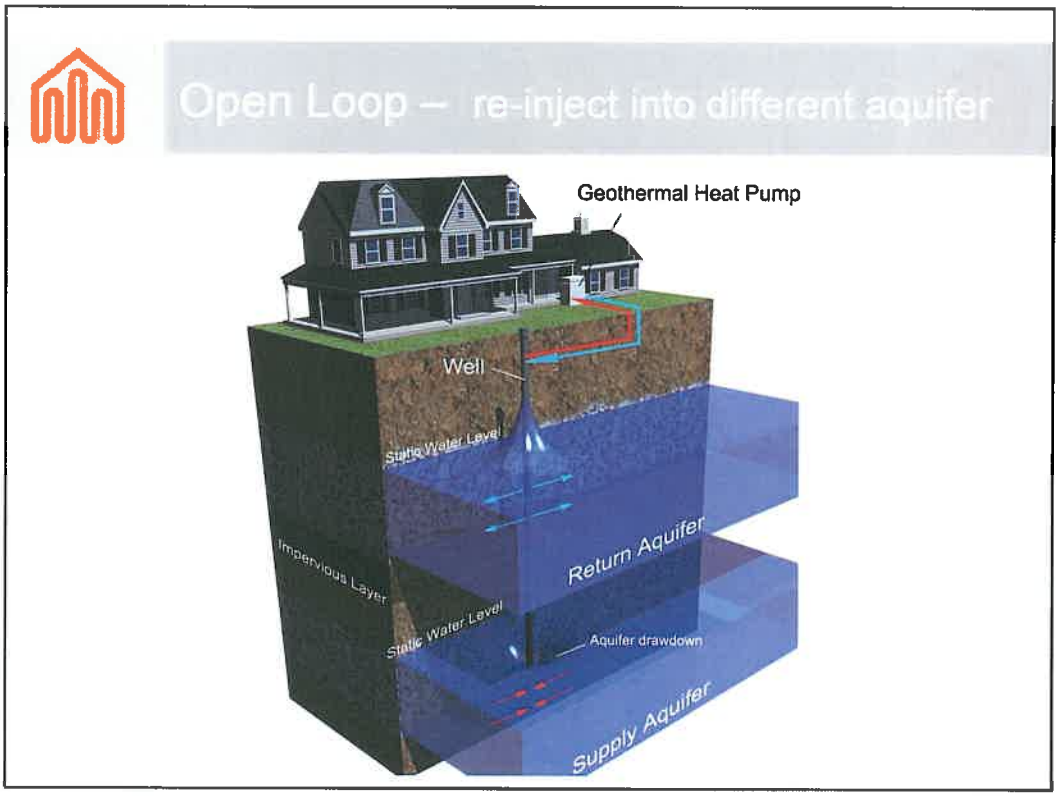
Some groundwater installations take the ground water from an aquifer and dump it into a drain or soak pit.



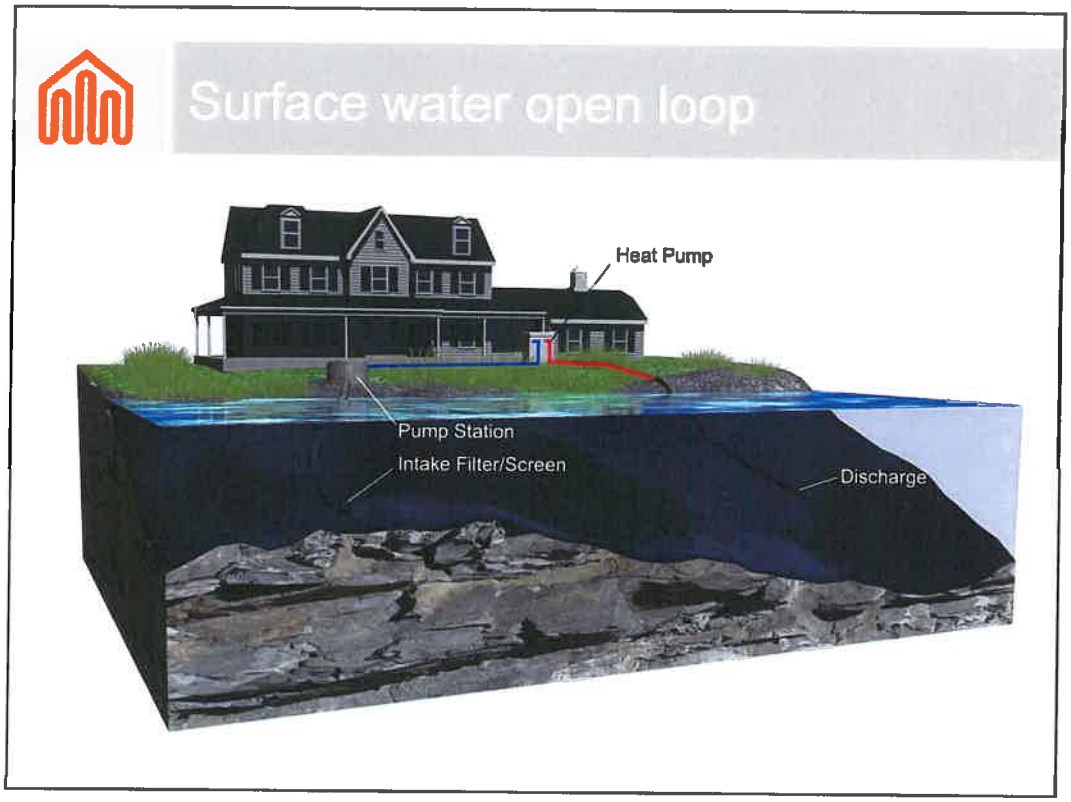
In the PLWRP taking from an aquifer and re-injecting at the same depth is regarded as non-consumptive and for domestic applications is a permitted activity provided the conditions are met.



A potential problem is that if the bores are too close together the ejected water can circulate back to the extract well and reduce the efficiency of the heat pump.



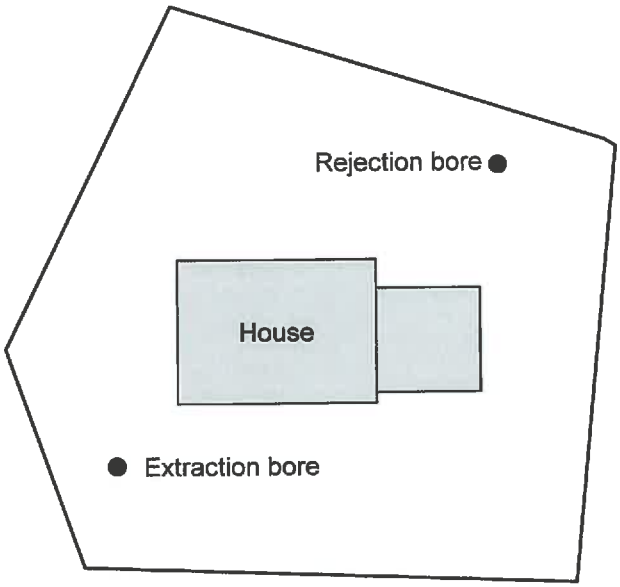
One answer to this, particularly in an urban environment is to have the water re-injected to a different depth.



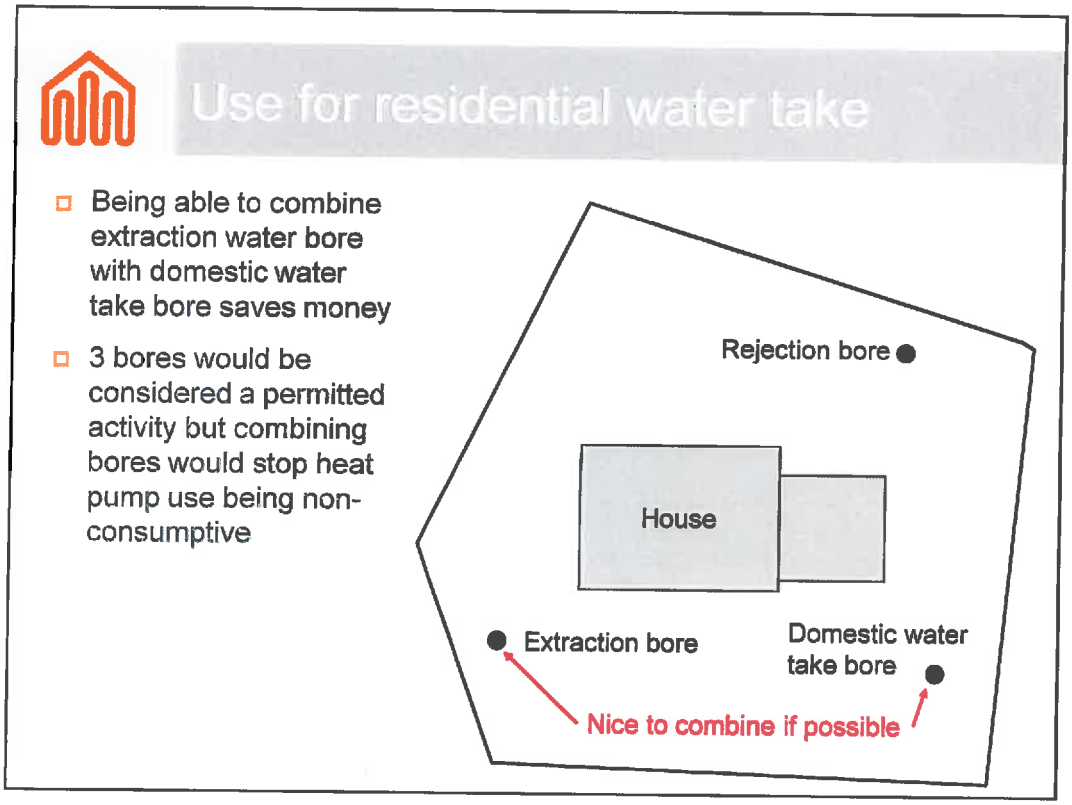
There are other methods including taking, and rejecting to, rivers and lakes of which there are a few examples in New Zealand.

Bore consent conditions

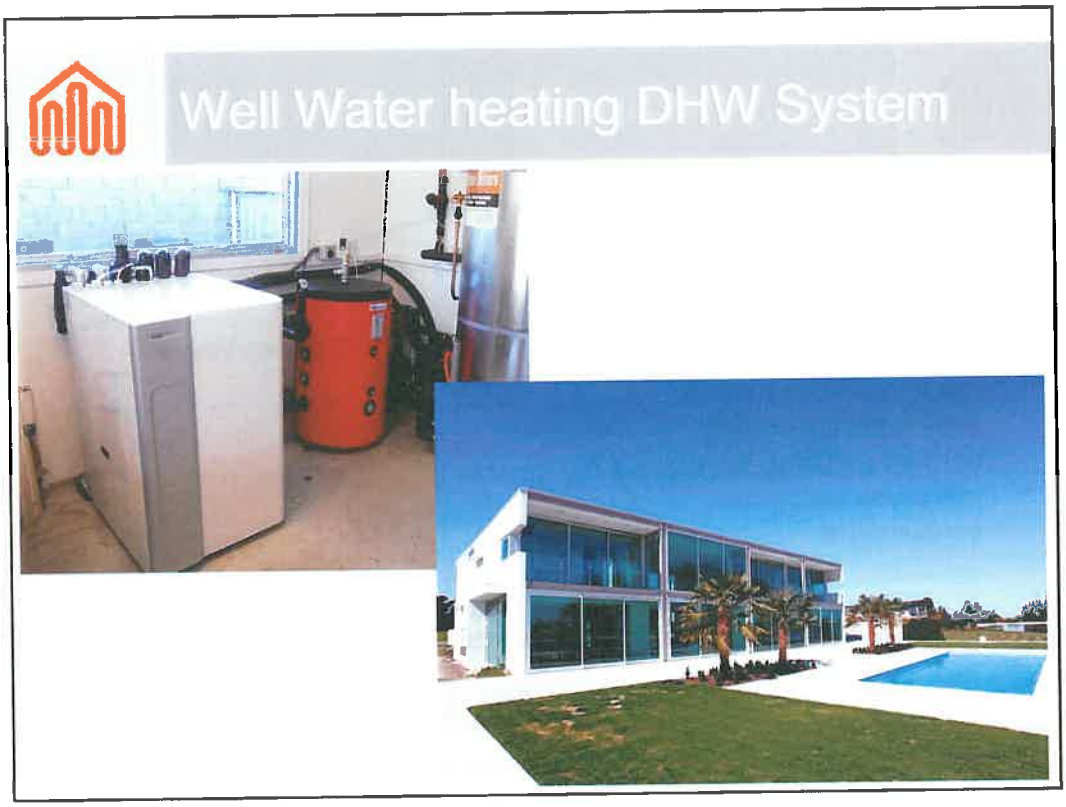
- Bores need to be reasonably far apart
- So may end up being near boundaries



Standard bore conditions such as being 20m from a boundary can be hard to meet in an urban environment.



Being allowed to use the extract bore for domestic permitted water take instead of having to a third bore reduces the overall costs which are important in residential heating applications.



An example of a ground water heat pump being used to heat a house in Canterbury, including the domestic hot water.

Examples of wells, the right hand picture shows the extract well being drilled for Central Heating New Zealand's new offices which are heated and cooled by a ground water heat pump.

CHNZs new offices with the

Ground source heating for Christchurch

- The most efficient and low cost form of heating – and low carbon
- Most suitable form of ground source heating in an urban environment
- Christchurch has vast resources of water at easily accessible depths

Summary – why we want to do it

Groundwater ground source heating is:

- Very efficient
- Considered renewable
- No visual and no noise impact on the local environment
- Emits no pollution other than cooling the water by a few degrees – usually about 5°C
- Meets central government, ECan and CCC policy objectives
- And is consistent with Tangata Whenau values

Summary – view of PLWRP

- Support policy and rule making domestic non-consumptive use of water for heating a permitted activity
- This avoided compliance cost is very significant for the overall cost of residential scale projects
- Bore consent conditions have to be workable
- Allowing domestic water to be taken from the extraction well would further improve the attractiveness of this technology for some people