ARTESIAN HEATING AND COOLING IN CHRISTCHURCH

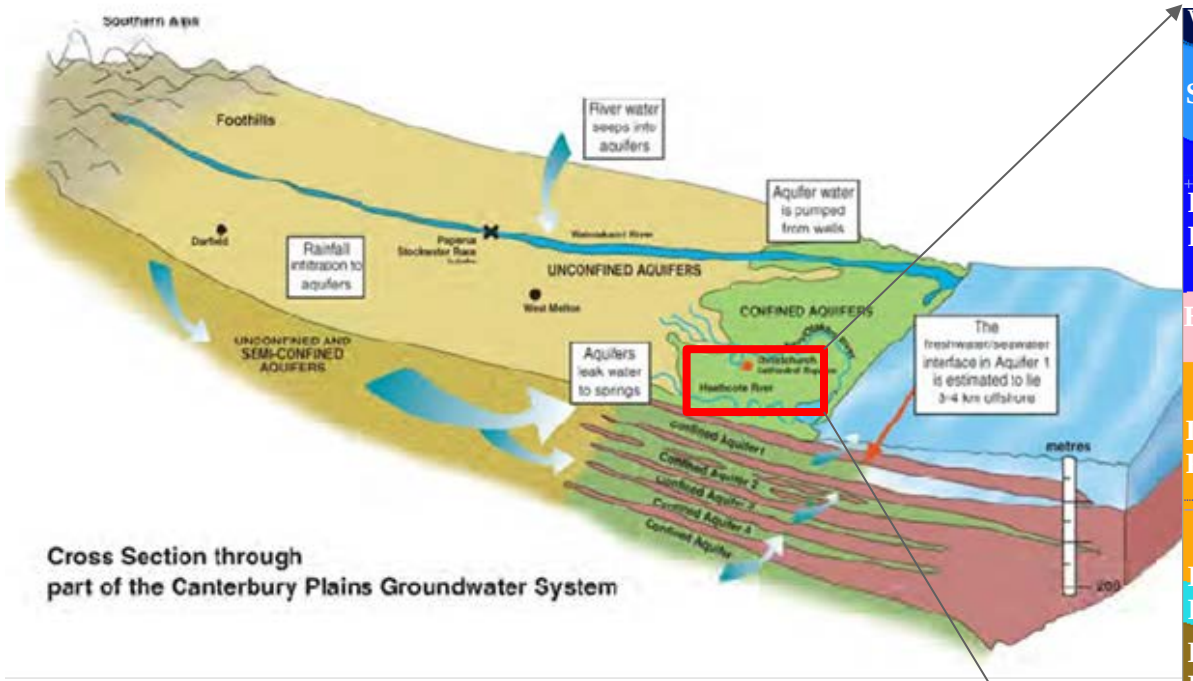
Mike Thorley

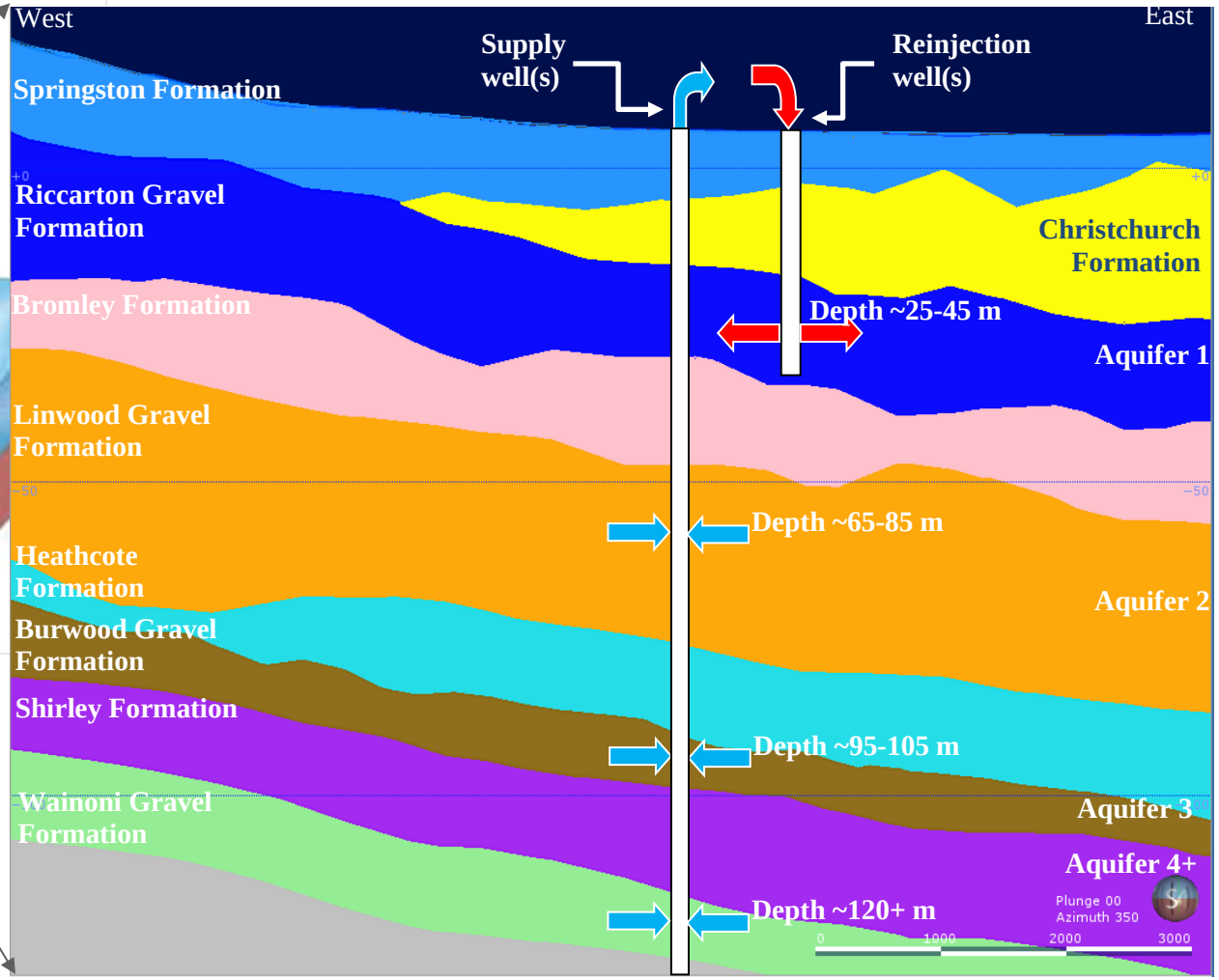
Beca. Creative people striving together to transform our world

Introduction

- Ground-sourced heating and cooling system provides the following benefits:
- Lower operating costs;
- Lower energy usage;
- More reliable system than cooling towers;
- No local emissions compared to a boiler system; and
- Lower maintenance costs than compared to a boiler and cooling tower system due to the legionella risk.

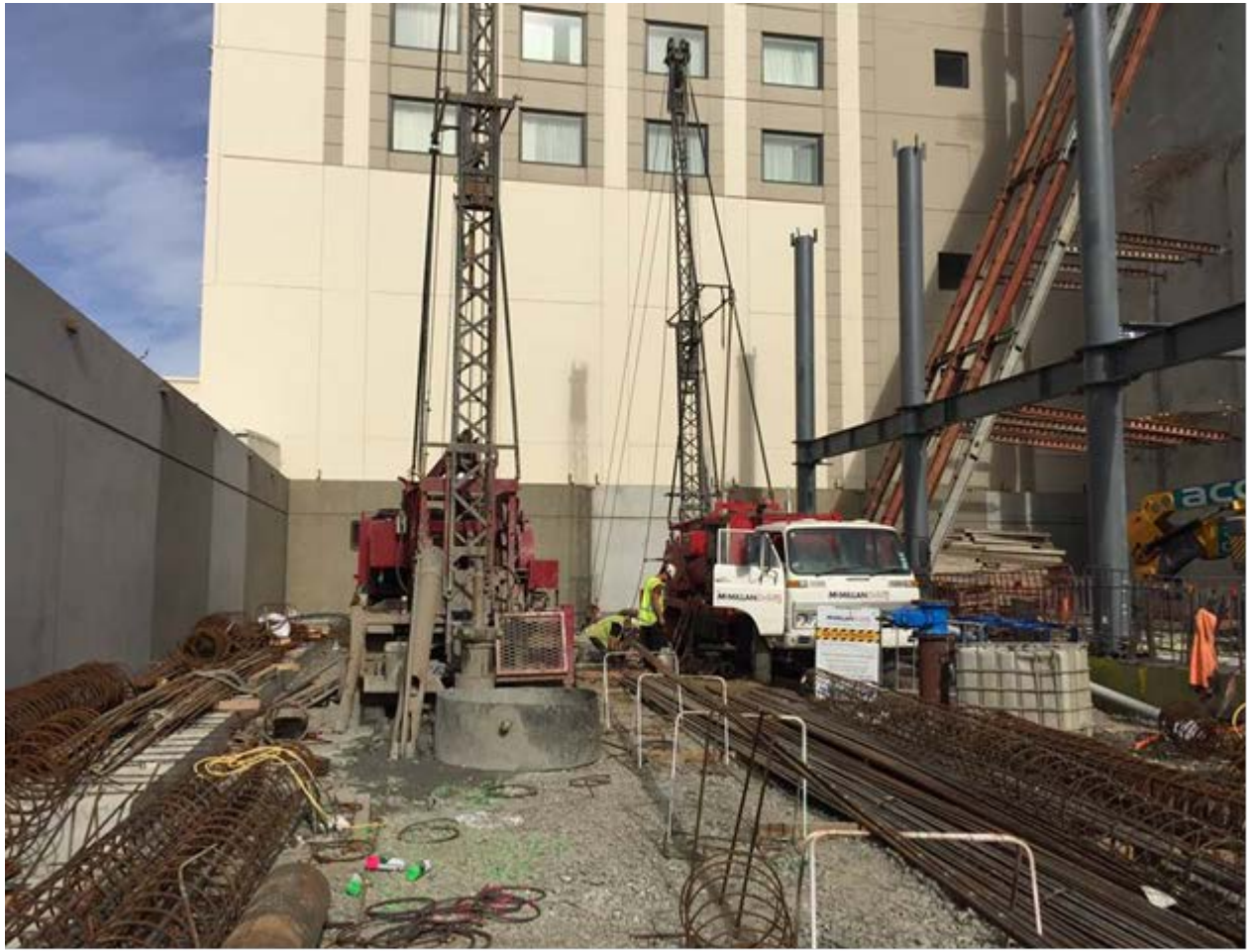
Hydrogeology





Abstraction/Reinjection Pairs

Drilling methods



Cable Tool

Air rotary

The Terrace

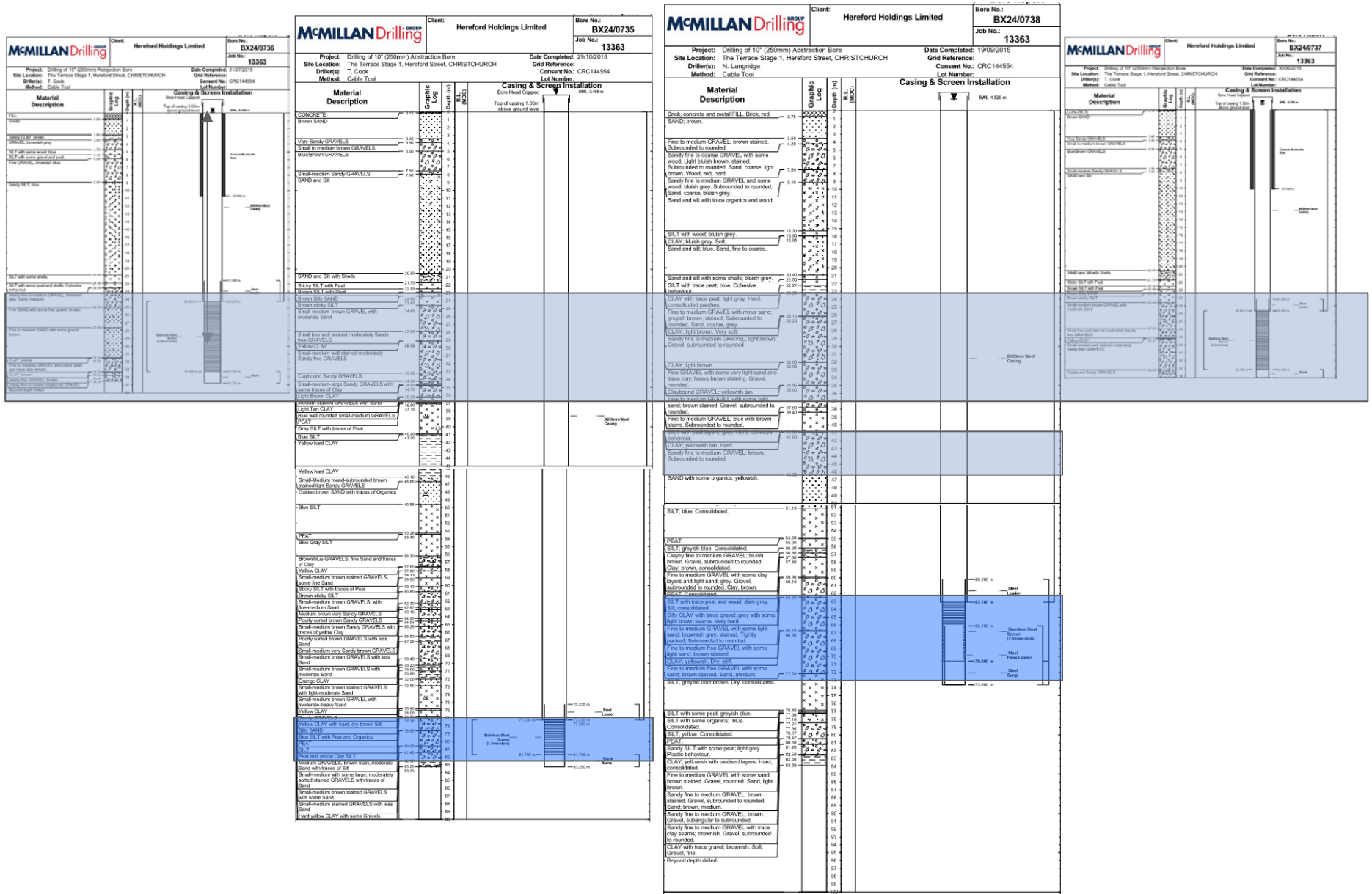

BX24/0735 (Abstraction)
BX24/0736 (Reinjection)
BX24/0738 (Abstraction)
BX24/0737 (Reinjection)
Hereford Street
Cambridge Terr
Oxford Terrace
Plymouth Lane
1.45713 Meters


Town Hall
Botanic Gardens
Conference Centre
Central Library
KEB
The Terrace
Justice Precinct
Bus Interchange
ECan
Metro Sports

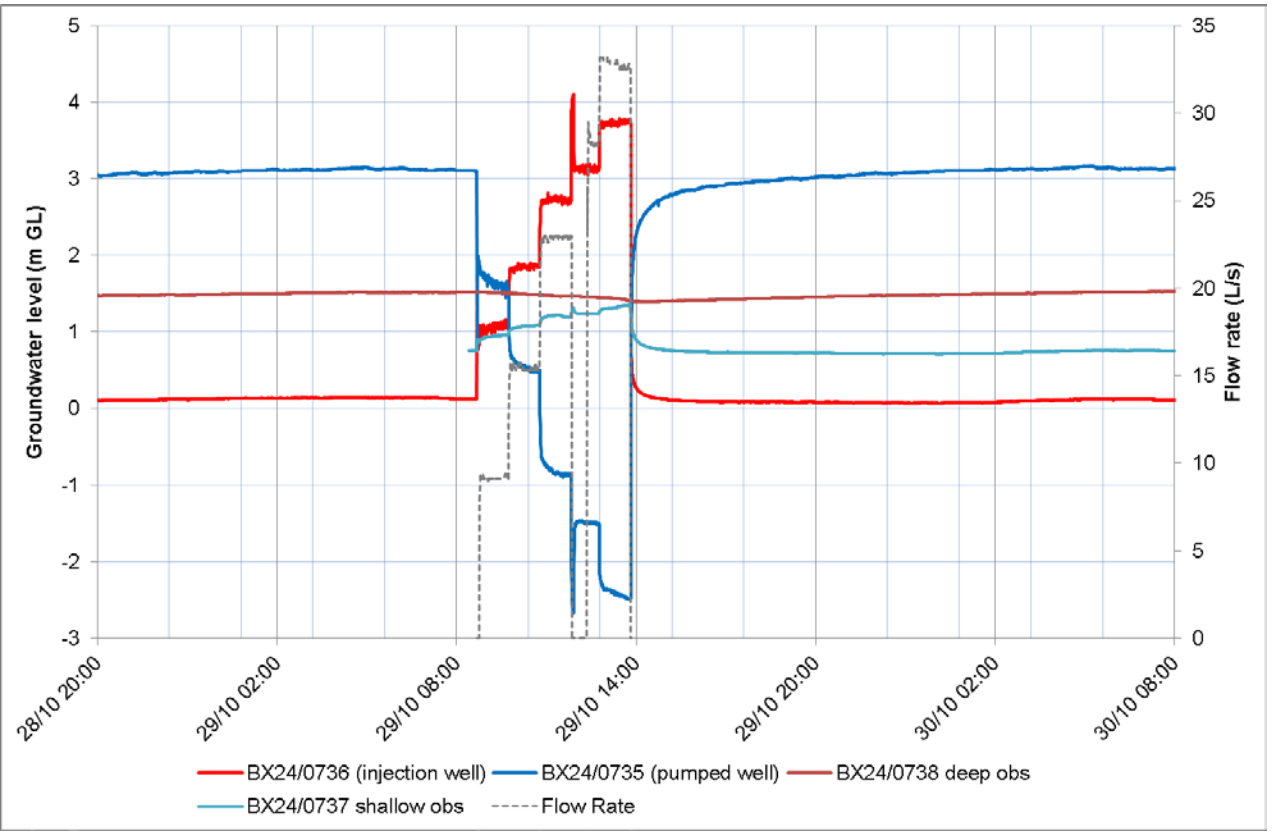
Drilling Results

Aquifer 1
Riccarton Gravel
25-46 m depth

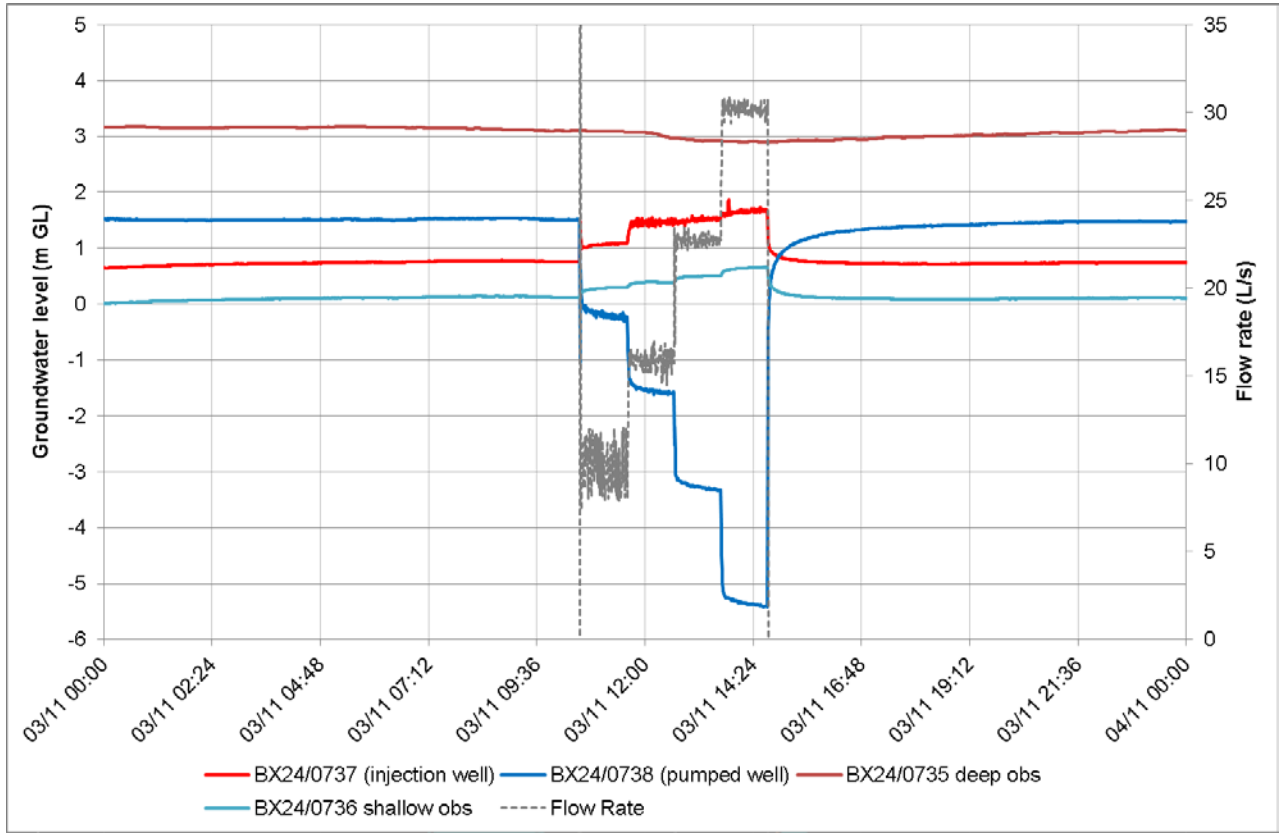
Aquifer 2
Linwood Gravel
62-82 m depth



Pumping Test results

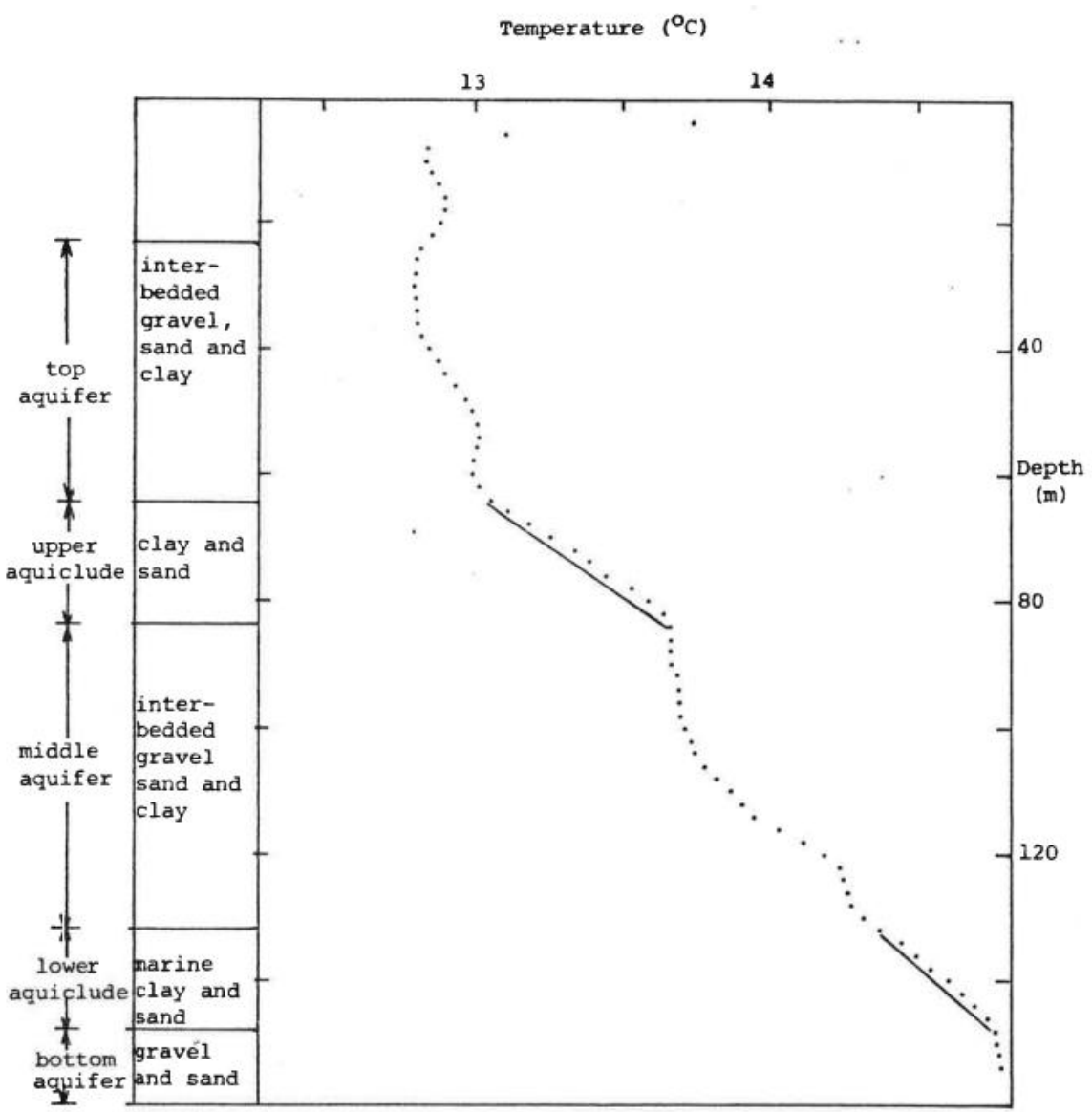


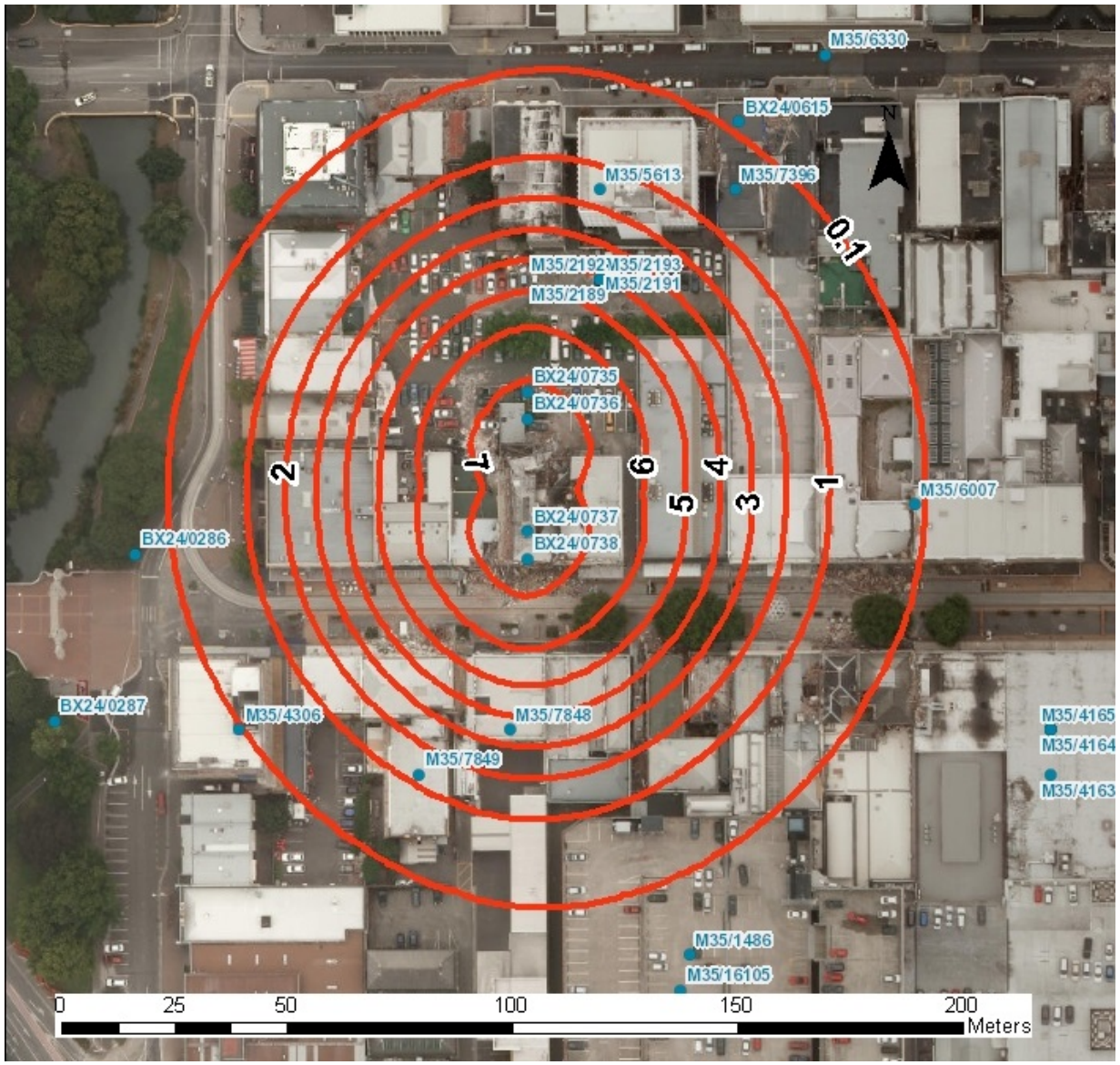
Pair 1
BX24/0735 & BX24/0736



Pair 2
BX24/0737 & BX24/0738

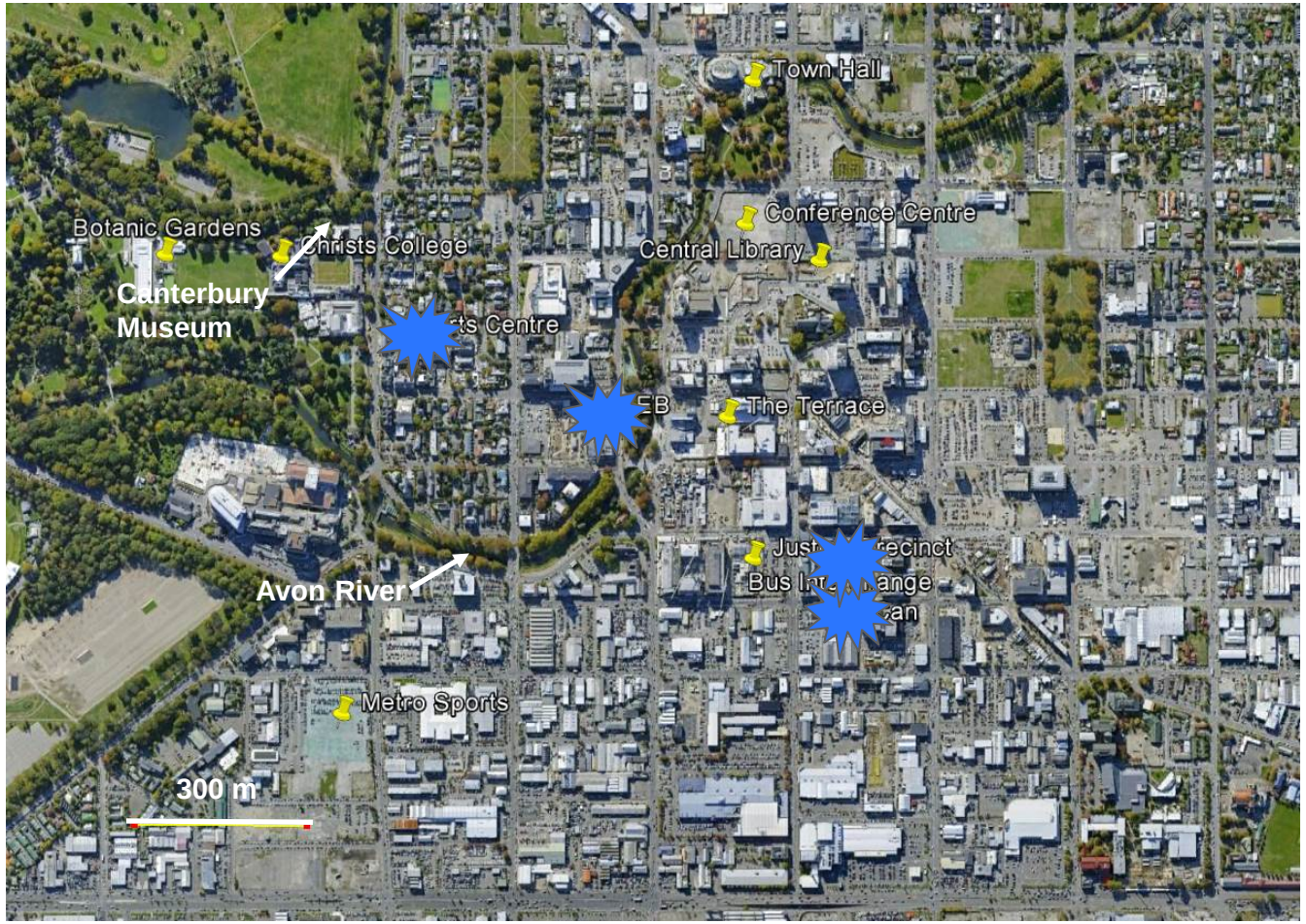
Thermal Effects - Reinjection



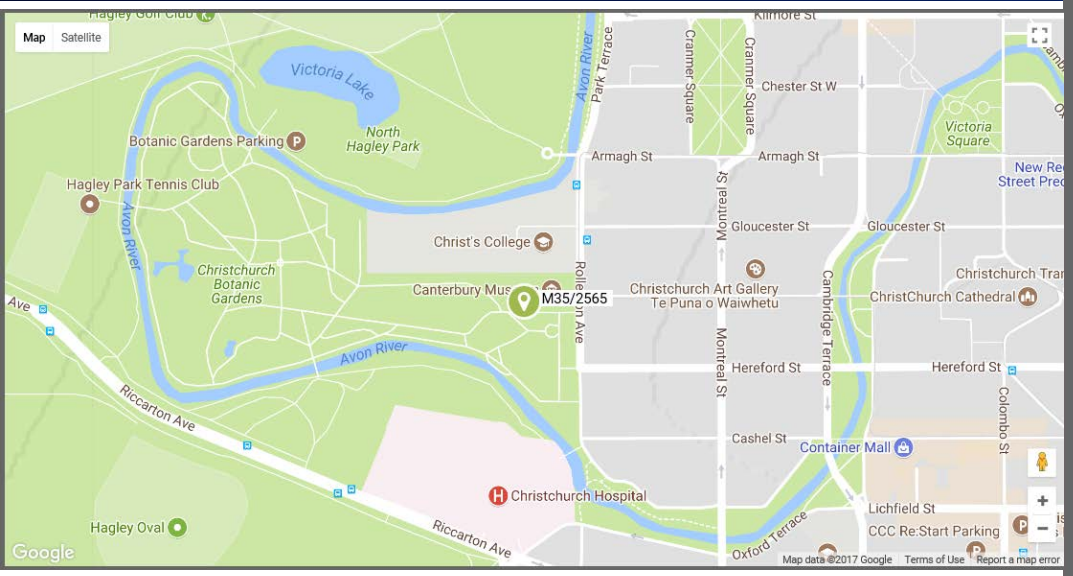


Operational Systems

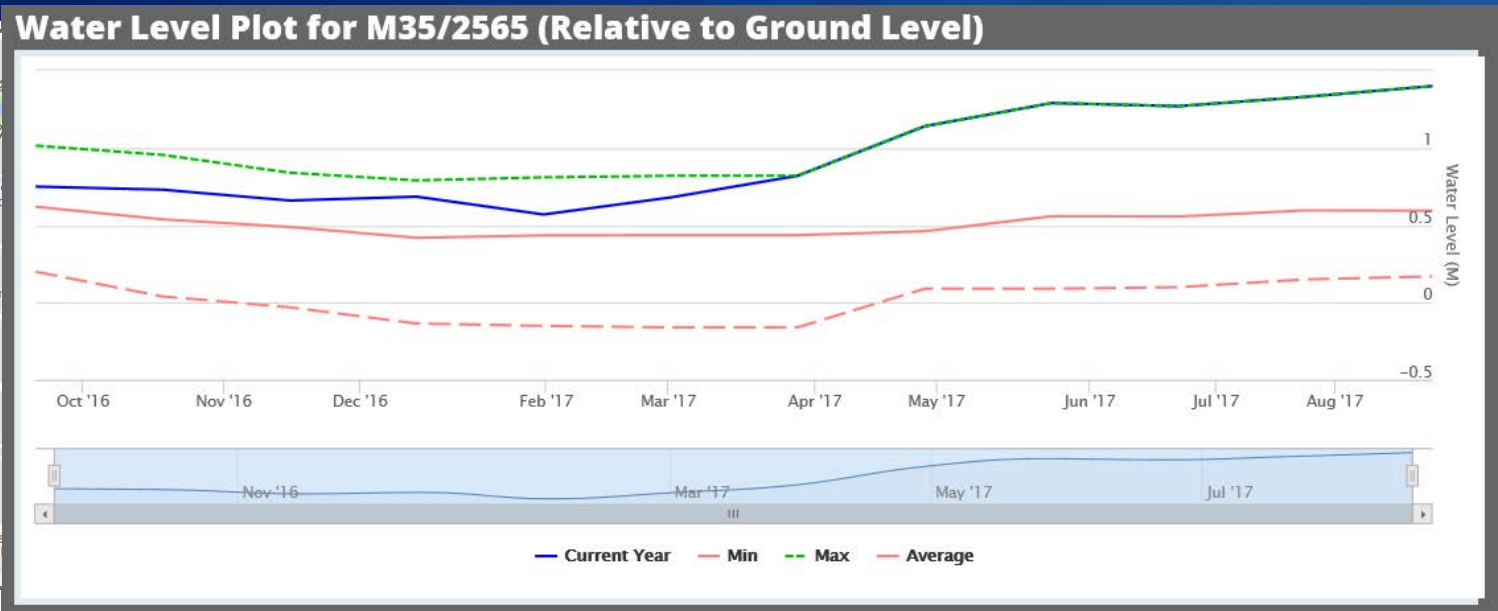
- Reinjection at 4 sites
- Biggest users not yet operational
- More due at the end of 2017

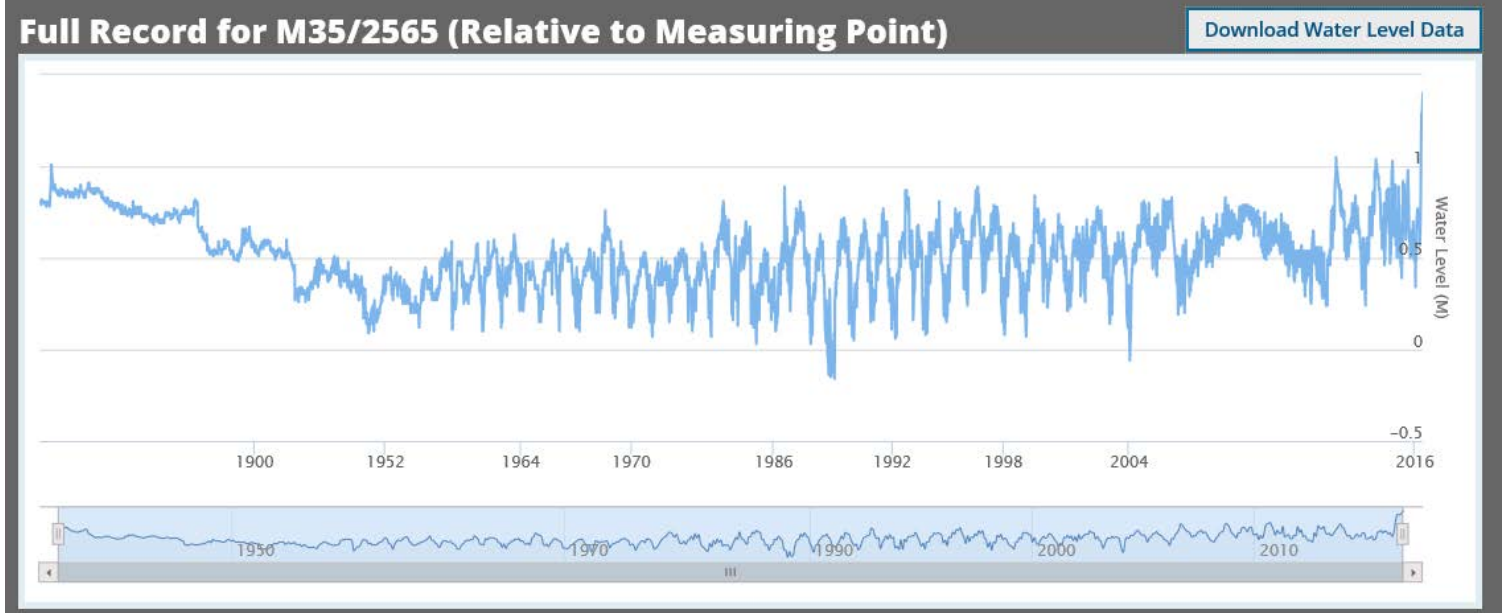


Aquifer response to reinjection



- Canterbury Museum Well
- 30 April 1894 – SWL +0.8 m
- 22 August 2017 – SWL +1.4 m





Learnings

- Christchurch Aquifer System is ideally suited for open loop ground-source systems
- Groundwater temps naturally at 12-15 °C and changed by up to +/-8°C
- Temps rapidly dissipate back to natural temperature
- Vertical offset of abstraction and reinjection wells beneficial in tight urban spaces
- Fine scale heterogeneity and sand is the enemy!
- Confirming water source early is critical to project success later on
- Mounding in the reinjection aquifer becoming a critical management issue

Questions

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