



# Waimea Plains Groundwater Quality Survey 2021

Melanie Westley (Science Officer – Groundwater)

Joseph Thomas (Senior Resource Scientist – Water and Special Projects)



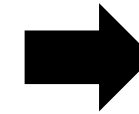
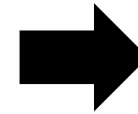
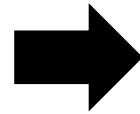
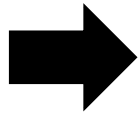
Te Kaunihera o  
**te tai o Aorere**

# Disclaimer

This presentation will focus on the nitrate-N specific results from the 2021 groundwater investigation in the Waimea Plains.

Please refer to the technical report for more detail on the history of nitrate-N contamination in this catchment, wider catchment investigations and further discussion on the other water chemistry findings from the 2021 survey.

# Outline of Presentation



Catchment  
Location

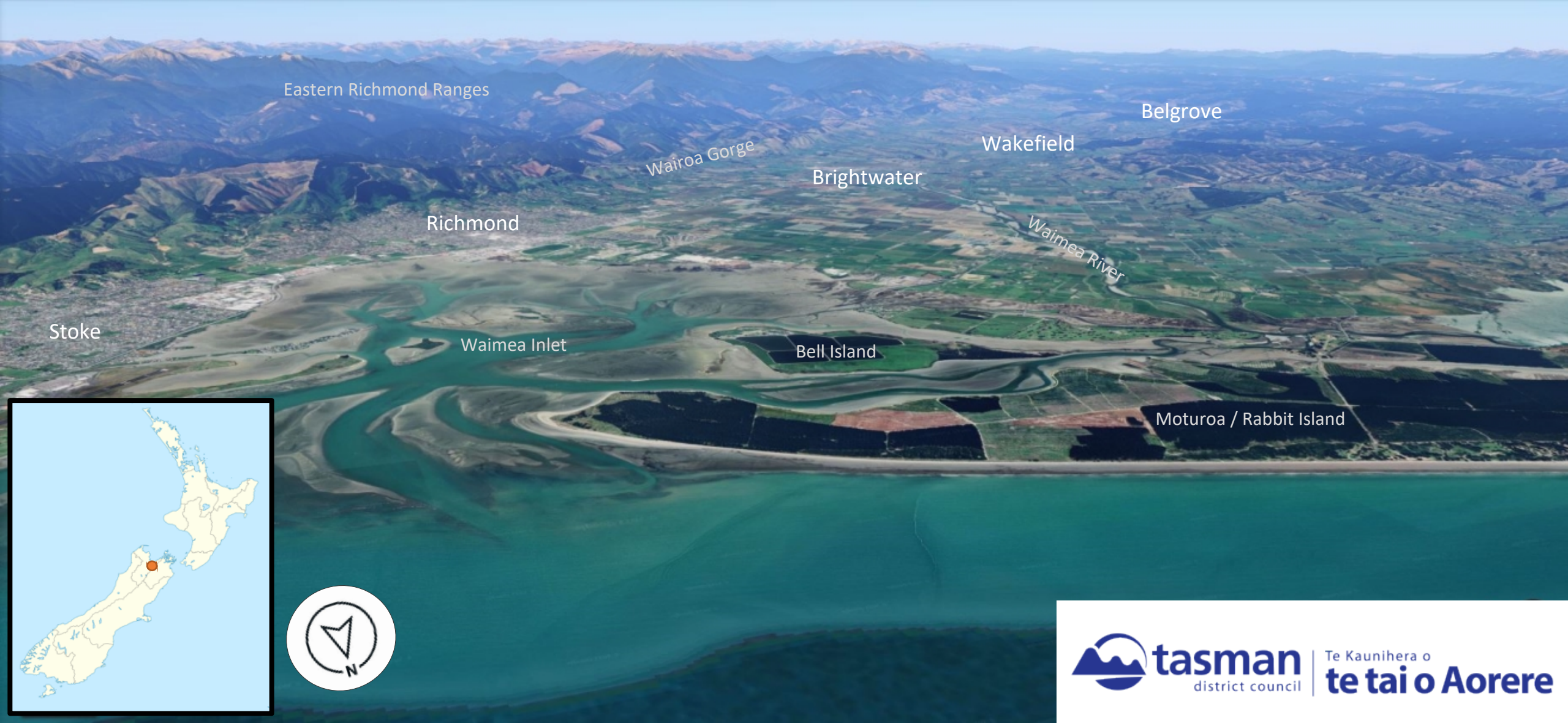
Overview of  
Catchment  
Environment

Previous  
Monitoring

Overview of  
2021  
Survey

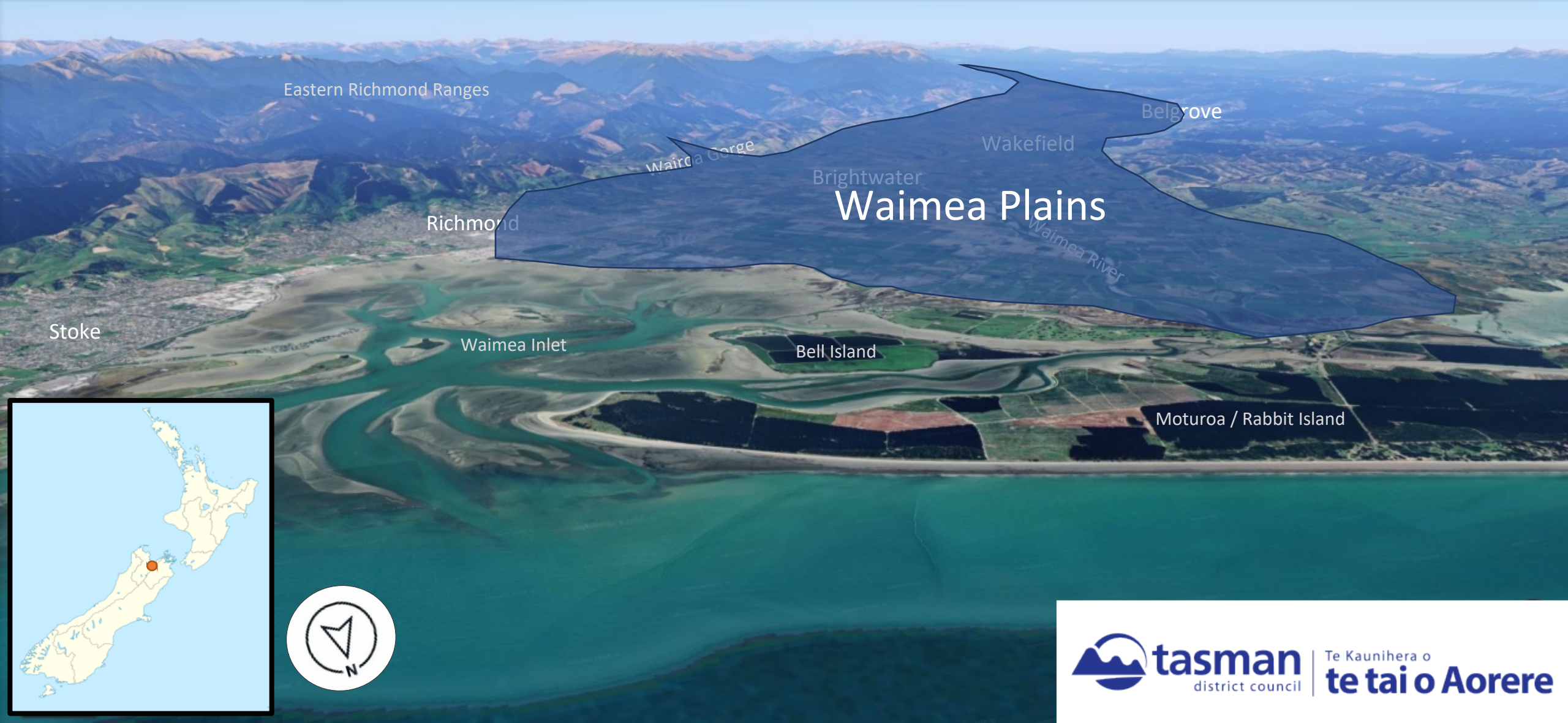
2021  
Nitrate-N  
Findings

# Waimea Plains Catchment

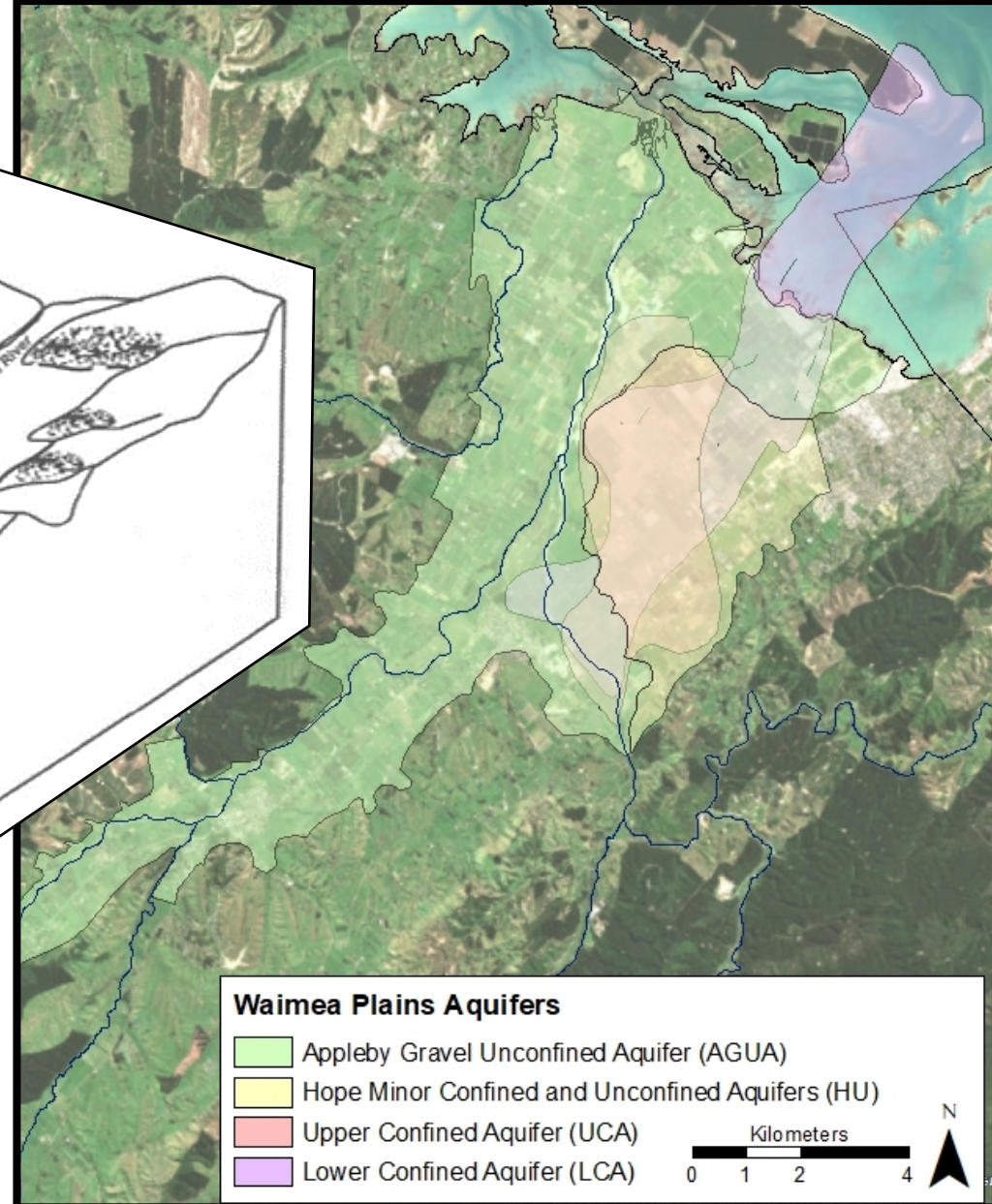
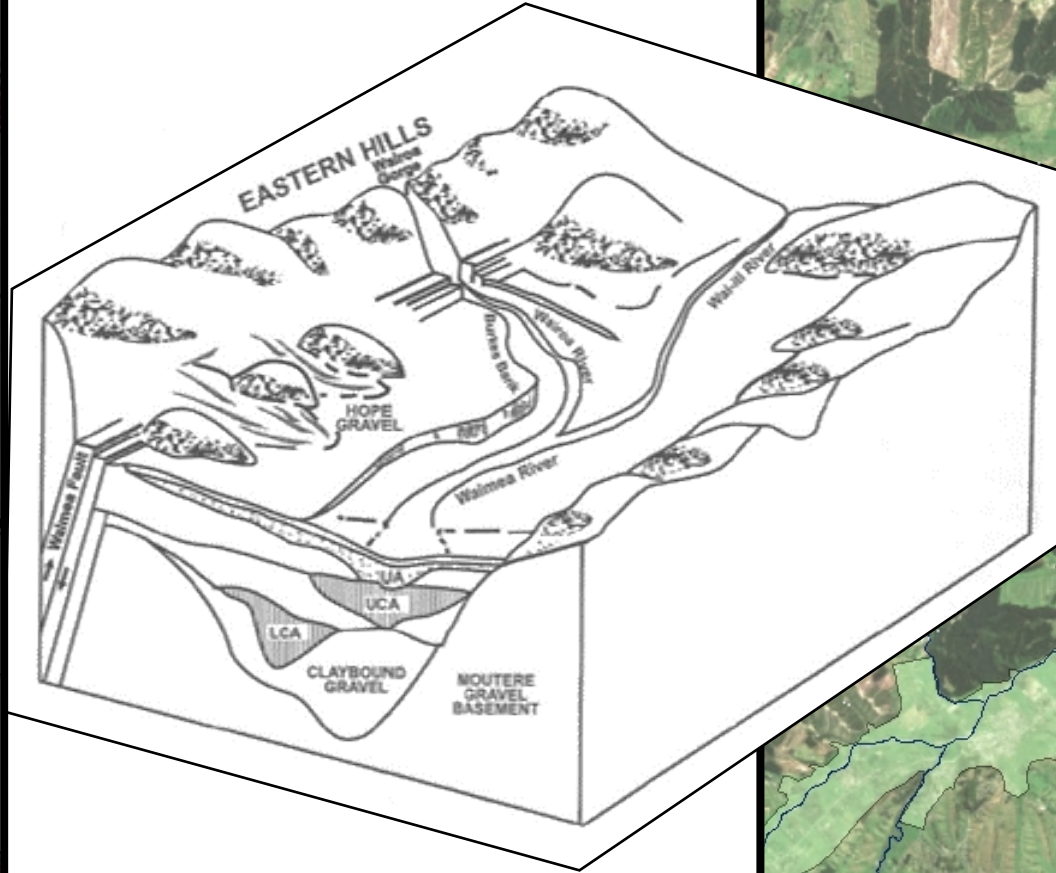
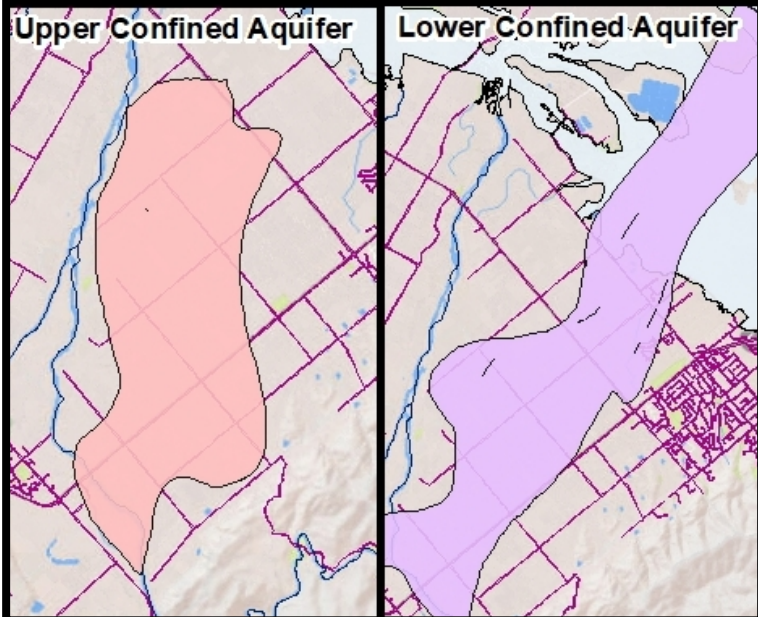
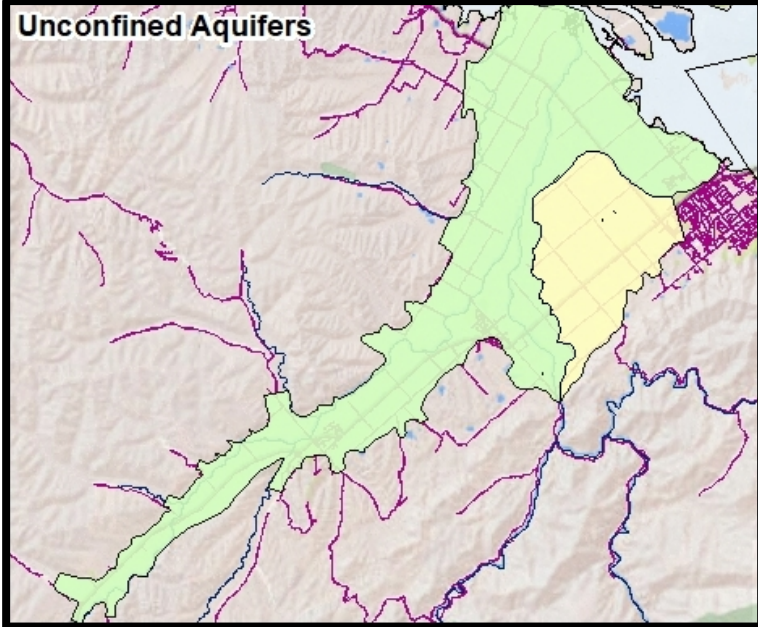


# Waimea Plains Catchment

Catchment  
Location



# Waimea Plains Aquifers

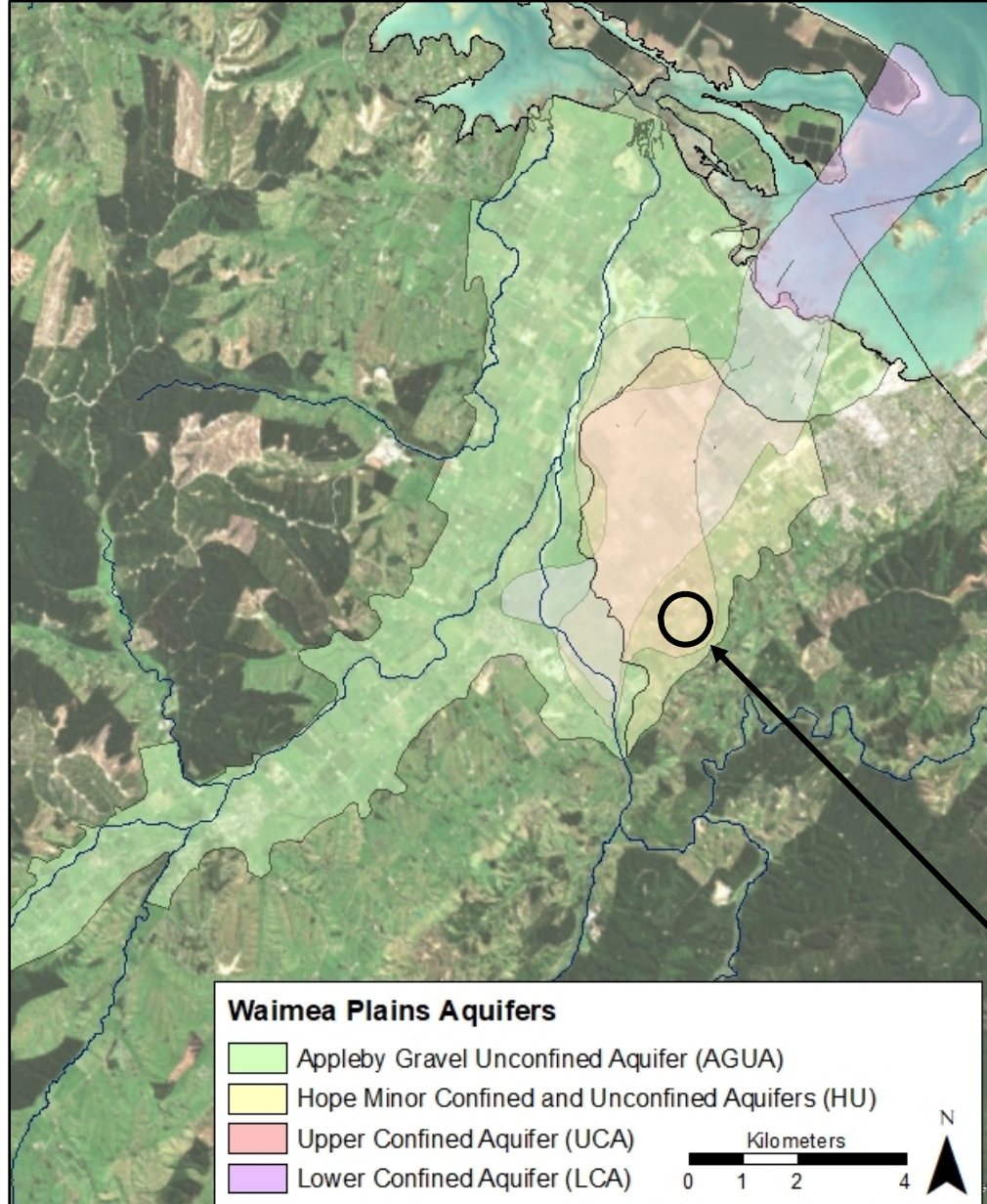


**Waimea Plains Aquifers**

- Appleby Gravel Unconfined Aquifer (AGUA)
- Hope Minor Confined and Unconfined Aquifers (HU)
- Upper Confined Aquifer (UCA)
- Lower Confined Aquifer (LCA)

Kilometers  
0 1 2 4

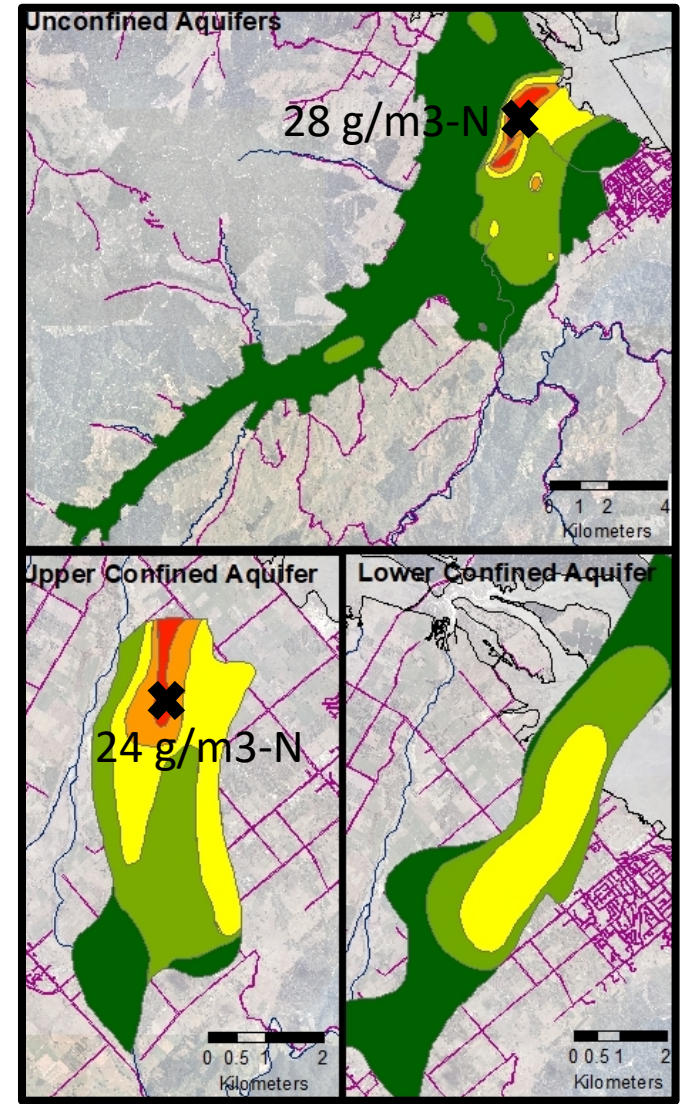
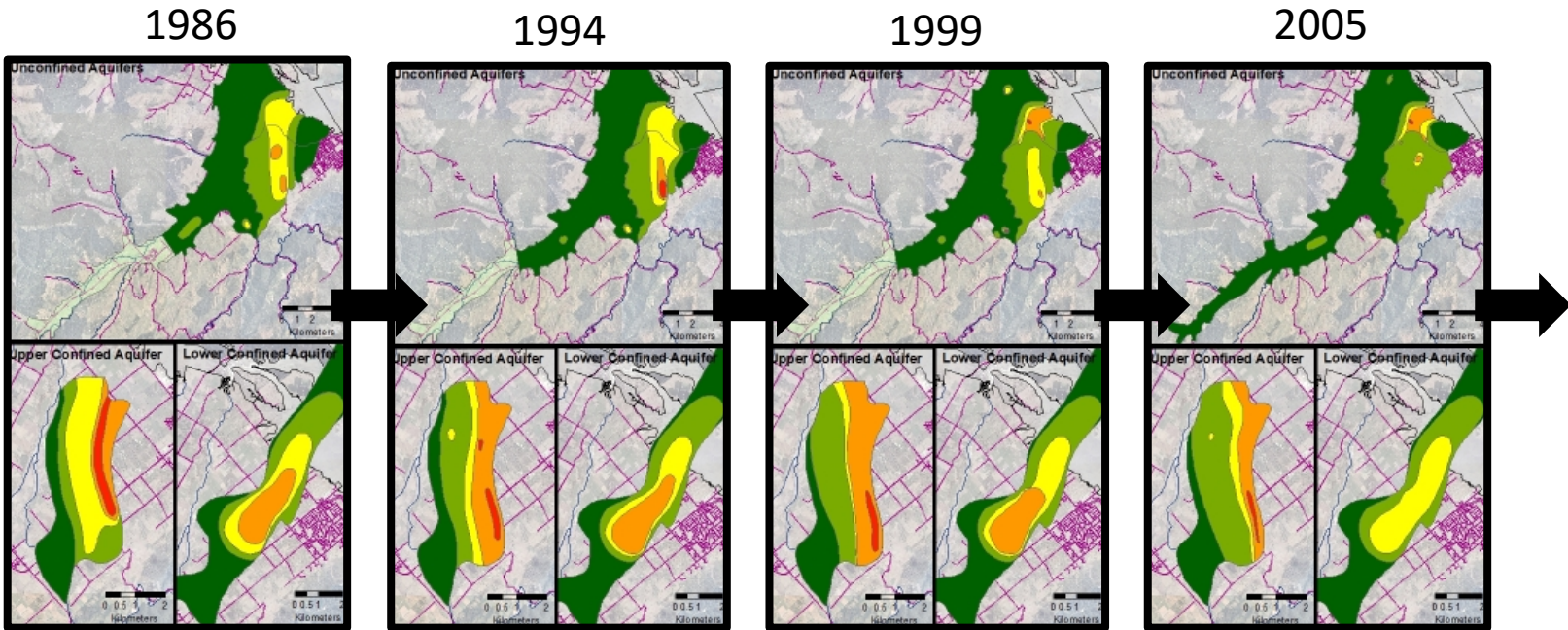
# Nitrate-N throughout the years



- Elevated nitrate-N concentrations in the Waimea Plains was first identified in the 1970s.
- Isotopic (age) testing suggests initial nitrate-N contamination in UCA and LCA could date back to 1940s.
- Council has undertaken various actions including catchment surveys in 1986, 1994, 1999, 2005, 2016 and 2021 to monitor nitrate-N movement in the aquifers.
- A piggyery in the recharge area of the HU, UCA and LCA thought to be a major source of nitrate-N.



# Previous synoptic surveys - 2016



Nitrate-N contours

- < 5.6 g/m<sup>3</sup>-N
- 5.6 - 11.2 g/m<sup>3</sup>-N
- 11.3 - 15 g/m<sup>3</sup>-N
- 15 - 20 g/m<sup>3</sup>-N
- > 20 g/m<sup>3</sup>-N

- 2016 shows increasing nitrates where UCA discharges into the AGUA, up to **24** g/m<sup>3</sup>-N.
- Further north in the AGUA nitrates are up to **28** g/m<sup>3</sup>-N.
- LCU remains stable.

Note: **yellow**, **orange** and **red** concentrations are above the MAV



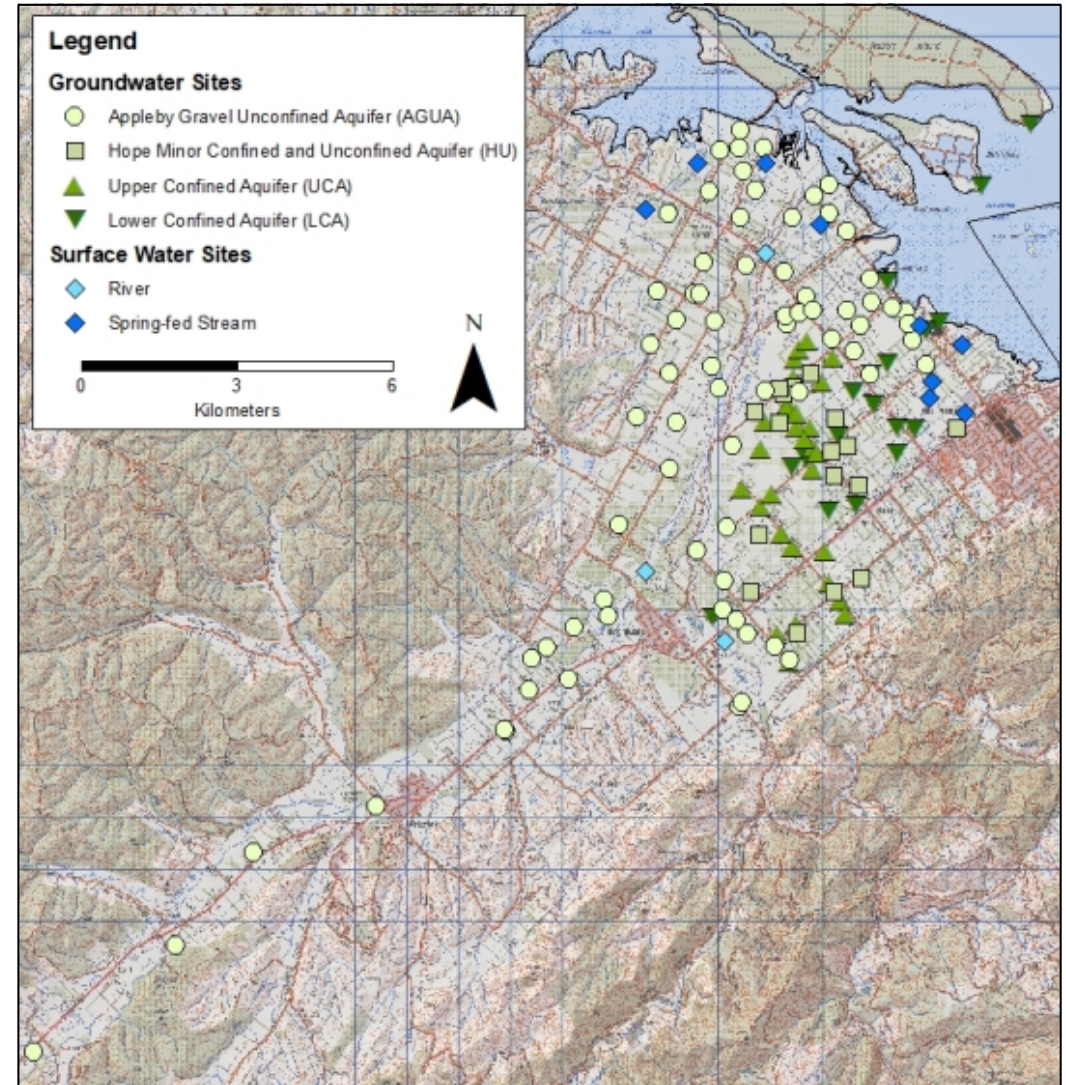
# 2021 Water Quality Survey



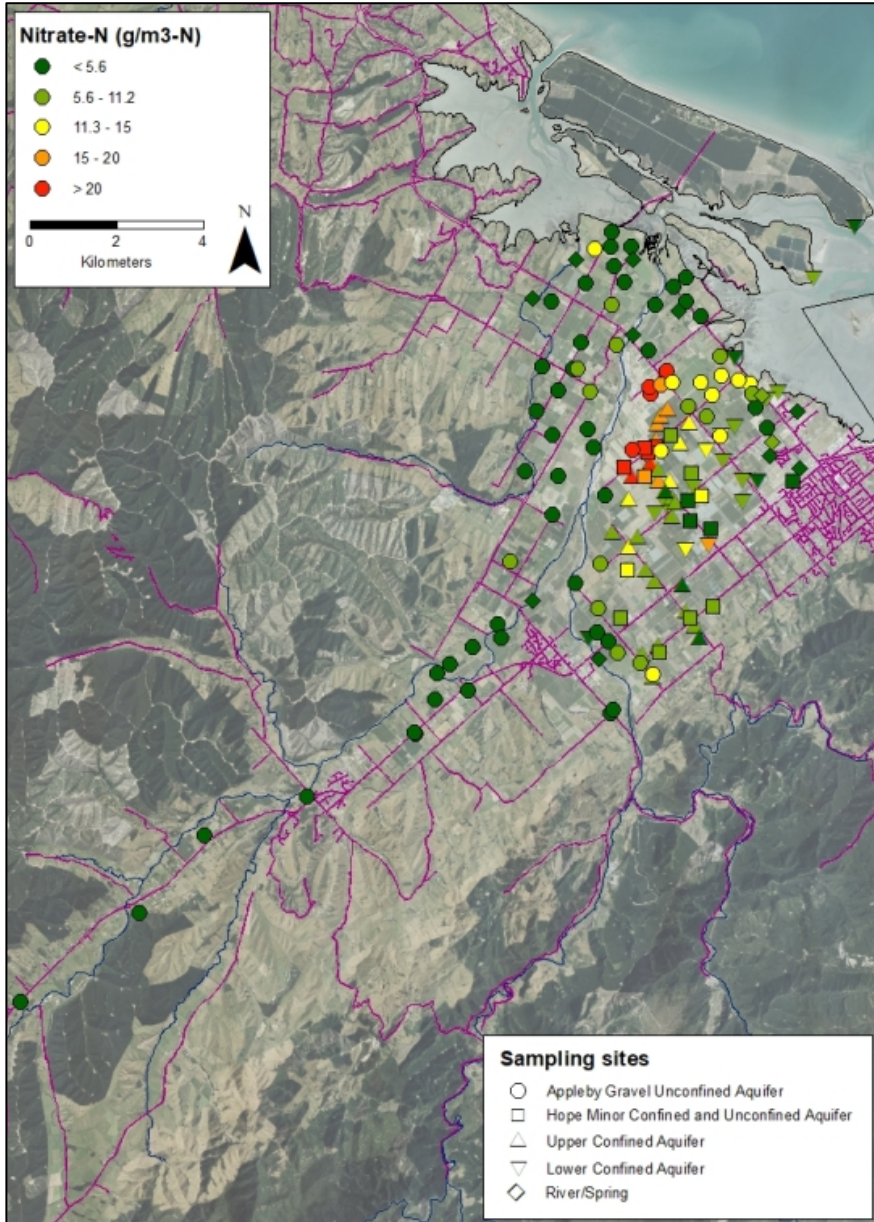
Between October and December 2021, the 6th wide-scale water quality survey was undertaken.

149 sites: 137 groundwater, 12 river/spring sites

2021 Sampling Sites	
Appleby Gravel Unconfined Aquifer (AGUA) sites	72
Hope Minor Confined and Unconfined Aquifer (HU) sites	16
Upper Confined Aquifer (UCA) sites	31
Lower Confined Aquifer (LCA) sites	18
River sites	3
Spring-fed sites	9



# Water Chemistry – Nitrate-N

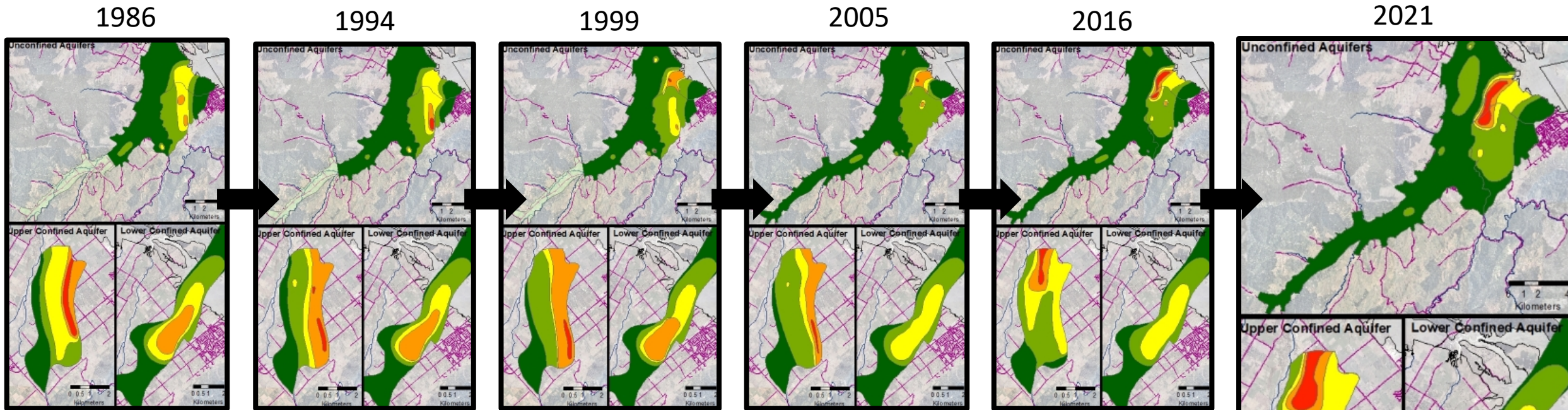


2021 Nitrate-N groundwater sampling results		
<b>Below 50% of MAV</b> ( $< 5.6 \text{ g/m}^3\text{-N}$ )	56 sites	41%
<b>Between 50% of MAV and MAV</b> ( $5.6 - 11.3 \text{ g/m}^3\text{-N}$ )	42 sites	31%
<b>Above 50% of MAV</b> ( $> 5.6 \text{ g/m}^3\text{-N}$ )	81 sites	59%
<b>Above MAV</b> ( $> 11.3 \text{ g/m}^3\text{-N}$ )	39 sites	28%
<b>Total groundwater sites sampled in 2021</b>	<b>137 sites</b>	

Water Services (Drinking Water Standards for New Zealand) Regulations 2022 Maximum Acceptable Value (MAV) for Nitrate-N is  $11.3 \text{ g/m}^3\text{-N}$ .

Above half of the MAV ( $>5.6 \text{ g/m}^3\text{-N}$ ) is the threshold where water suppliers must undertake a formal monitoring programme.

# Comparison to previous synoptic surveys to now

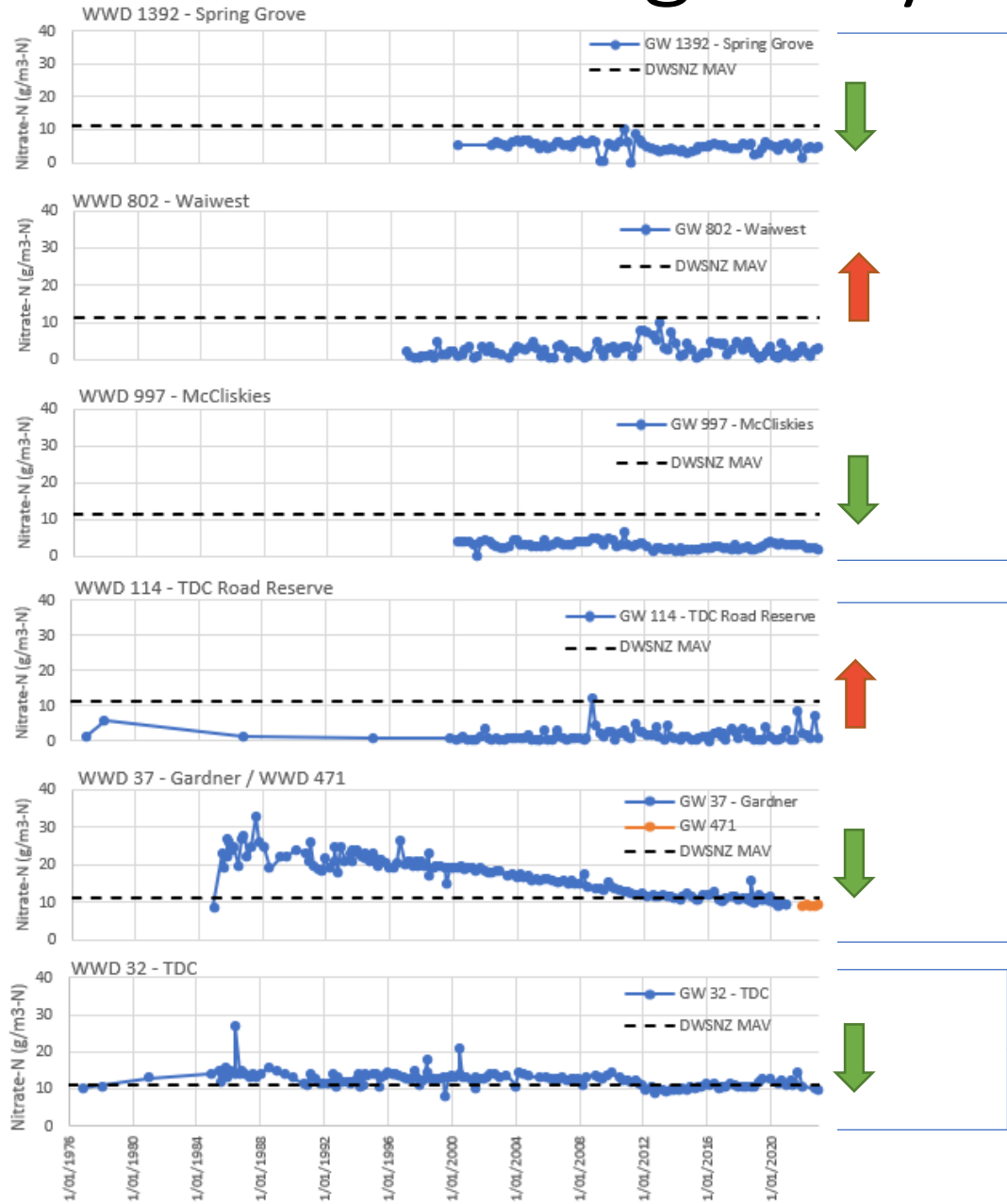


## Nitrate-N contours

- < 5.6 g/m<sup>3</sup>-N
- 5.6 - 11.2 g/m<sup>3</sup>-N
- 11.3 - 15 g/m<sup>3</sup>-N
- 15 - 20 g/m<sup>3</sup>-N
- > 20 g/m<sup>3</sup>-N

- Highest nitrates in 2021 is where UCA merges with AGUA (31 g/m<sup>3</sup>-N at Bartlett Road/Ranzau Road West) and along Blackbyre Road (30 g/m<sup>3</sup>-N).
- Historic piggery plume in this area is between 11 to 16 g/m<sup>3</sup>-N.
- Water taken from aquifers in this area for irrigation use will recycle nitrates.
- Present-day activities are contributing to nitrate entering the aquifers.
- 112 sites were resampled from 2016. 25 additional sites were chosen to better determine the elevated nitrate extent.

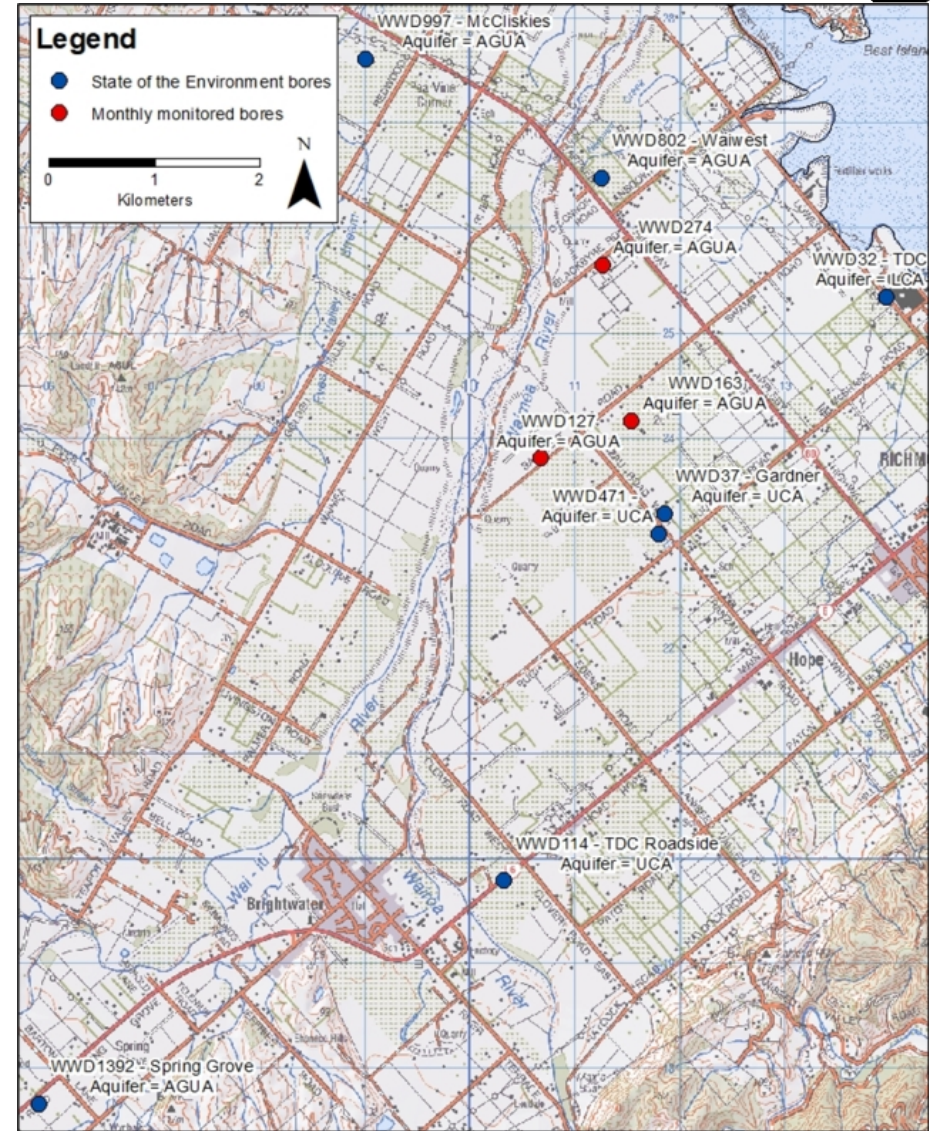
# Nitrate-N at regularly monitored sites



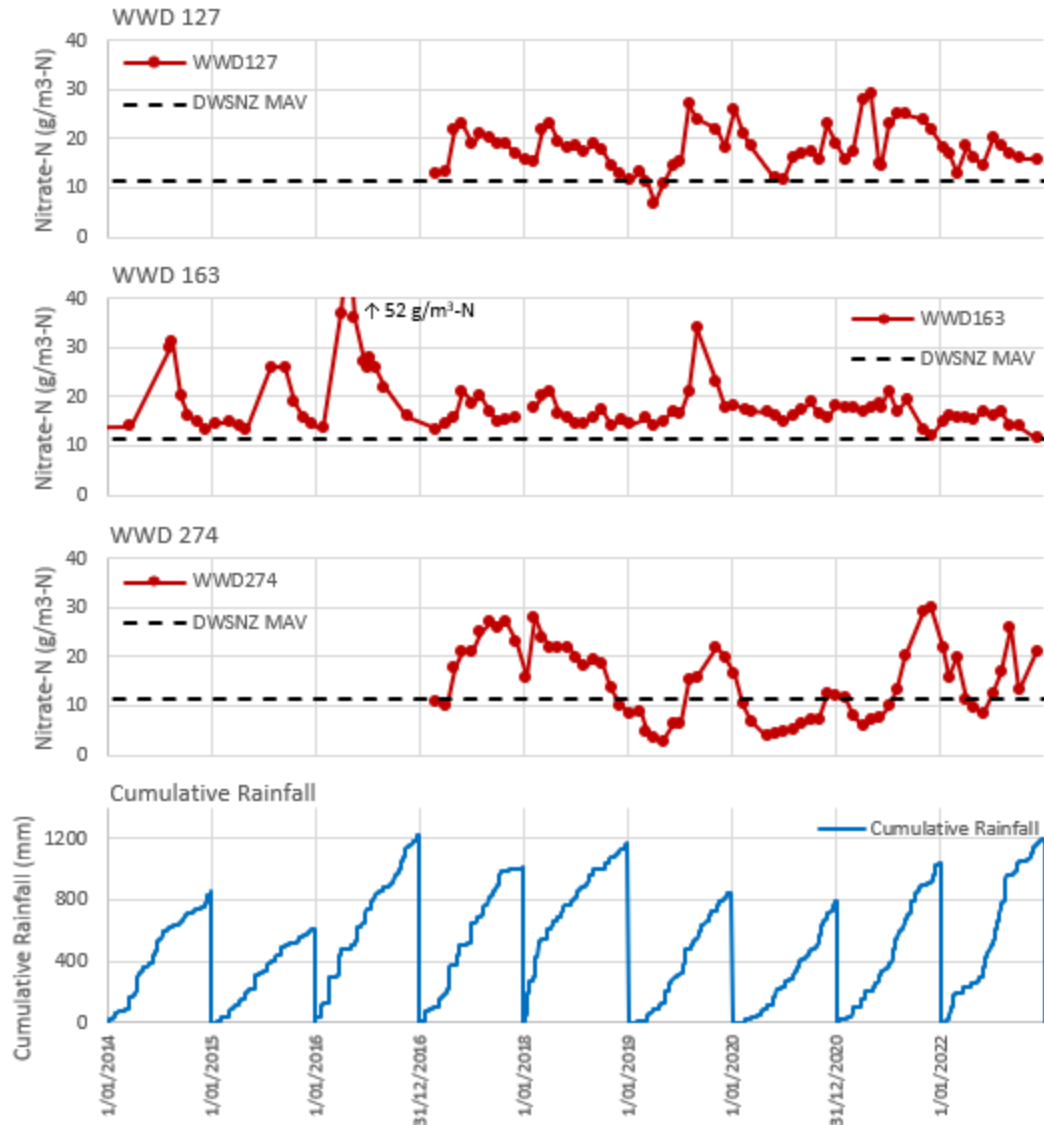
Unconfined

Upper  
Confined

Lower  
Confined



# Nitrate-N at regularly monitored sites



Reactive to rainfall

Semi-confined.  
Averaging 16 g/m<sup>3</sup>-N

Varys seasonally



# Summary



- Nitrate occurrence in the Waimea Plains are a combination of historic and present day inputs.
- South of Brightwater, nitrates are decreasing and well below half of MAV.
- North of Brightwater, nitrates are elevated in parts. Areas with increasing nitrate trends have overlying agricultural/horticultural land use activities.
- Highest nitrates in 2021 is where UCA merges with AGUA (31 g/m<sup>3</sup>-N Bartlett Road/Ranzau Road West) and along Blackbyre Road (30 g/m<sup>3</sup>-N). Irrigating with elevated nitrates is causing recycling to occur.
- Nitrates originating from historic piggery plume in southern UCA is decreasing.
- Nitrates in LCA is stable, slight decrease in recent years.
- Well head security a cause of the E.coli detections. This contamination is localised (Section 4.1 in Technical Report).
- Action Plan for policy in the Waimea Plains to address nitrates will follow this presentation (RSPC23-06-6).

2021

