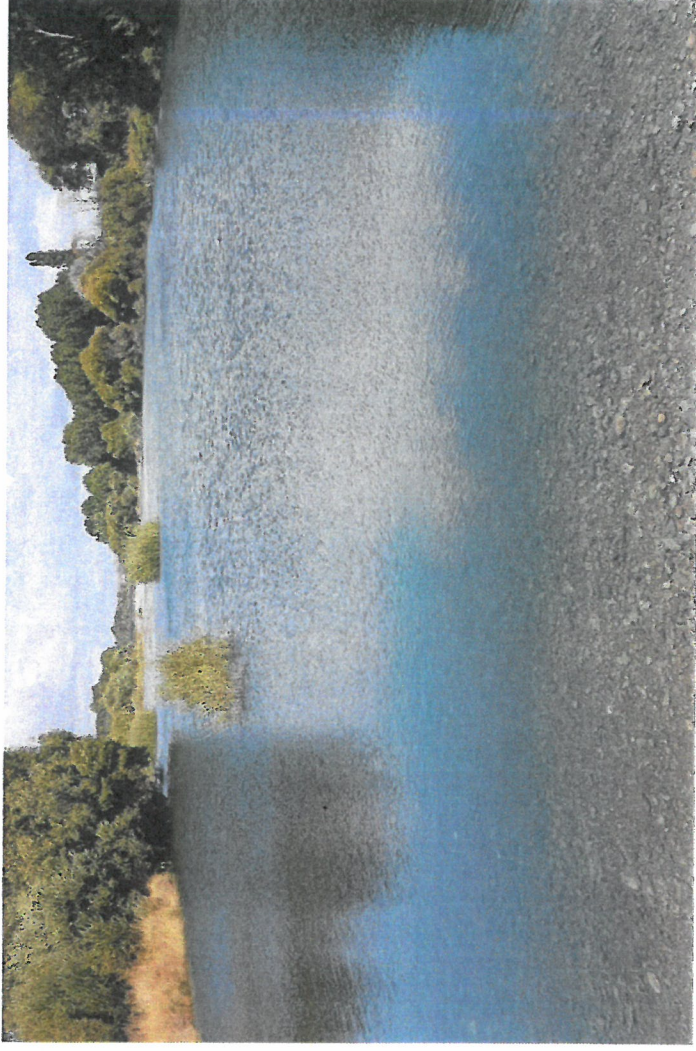


BUND BELOW APPELBY BRIDGE



TO: Dugald Ley

FROM: Joseph Thomas – Resource Scientist Water/Special Project

DATE: 9 June 2009

FILE NO: W325

RE: **Shifting TDC Lower Confined Aquifer (LCA) – Well Field Lower Queen Street**

TDC Lower Confined Aquifer (LCA) Bores

The TDC Richmond supply comes from the Lower Confined Aquifer (LCA). There are five bores located off Lower Queen Street NW of the Mc Shane's Road turnoff. The LCA is at a depth of between 32 – 38 metres below ground here. The bores are all artesian here, i.e. water flows out of the bore if unpumped.

Drawdown and Seawater Intrusion Risk

The LCA is a confined aquifer and extends out past Rabbit Island. The actual connectivity with the estuary (Waimea Inlet) and sea past Rabbit Island is unclear. Council operates a monitoring bore behind the Chipmill that measures both the water level and salinity. This bore acts as a sentinel bore for the LCA. This bore clearly picks up the pumping effects from the LCA well field. In drought conditions combined with peak pumping from the LCA well field, water levels drop significantly near the coast. Council generally starts implementing rationing as a precaution when water levels drop below mean sea level at this monitoring bore. Modelling indicates a level of about - 4 metres and lower pose a risk to this aquifer re; seawater intrusion. As this aquifer is reasonably sealed – significant reverse pressure would be required for seawater to seep into the aquifer. However if seawater does seep into the aquifer it would be also be much harder to flush it out. To date no abnormal increase in salinity has been measured at the monitoring bore at Chipmill; however the LCA has been rationed regularly in the past years as water levels dropped below mean sea level near the coast. The TDC LCA well field is the one closest to the sea and as such has the highest risk if seawater intrusion occurs. This risk increases if more severe droughts and climate change (sea level rise) scenarios are considered.

Shifting of TDC LCA Bores Further Inland

Shifting of LCA bores inland is the simplest solution to increasing the security of supply from seawater intrusion. Drawdown (i.e. water level drops due to pumping) is determined by the hydraulic characteristics of the aquifer and distance from the pumping source. Hence moving the bores further inland (assuming similar pumping regime as currently from the well field) would result in lesser drawdown effects at the coast hence a lower seawater intrusion risk as a higher pressure would be maintained at the coast. However, it also has to be considered that the drawdown effect that may affect yield would occur at other LCA bores upstream that would be closer to the well field now. The size and magnitude of this and if it would be significant can only be made on further detailed examination, i.e. where the bores are, distance, authorised pumping rates. Proper well head protection of bores will also have to be undertaken as part of any shift of the bores to any new site.



Joseph Thomas
Resource Scientist Water/Special Project