



MAPPING RESIDENCE TIMES IN WEST COAST ESTUARIES OF THE WAIKATO REGION

WHAT WE'VE DONE

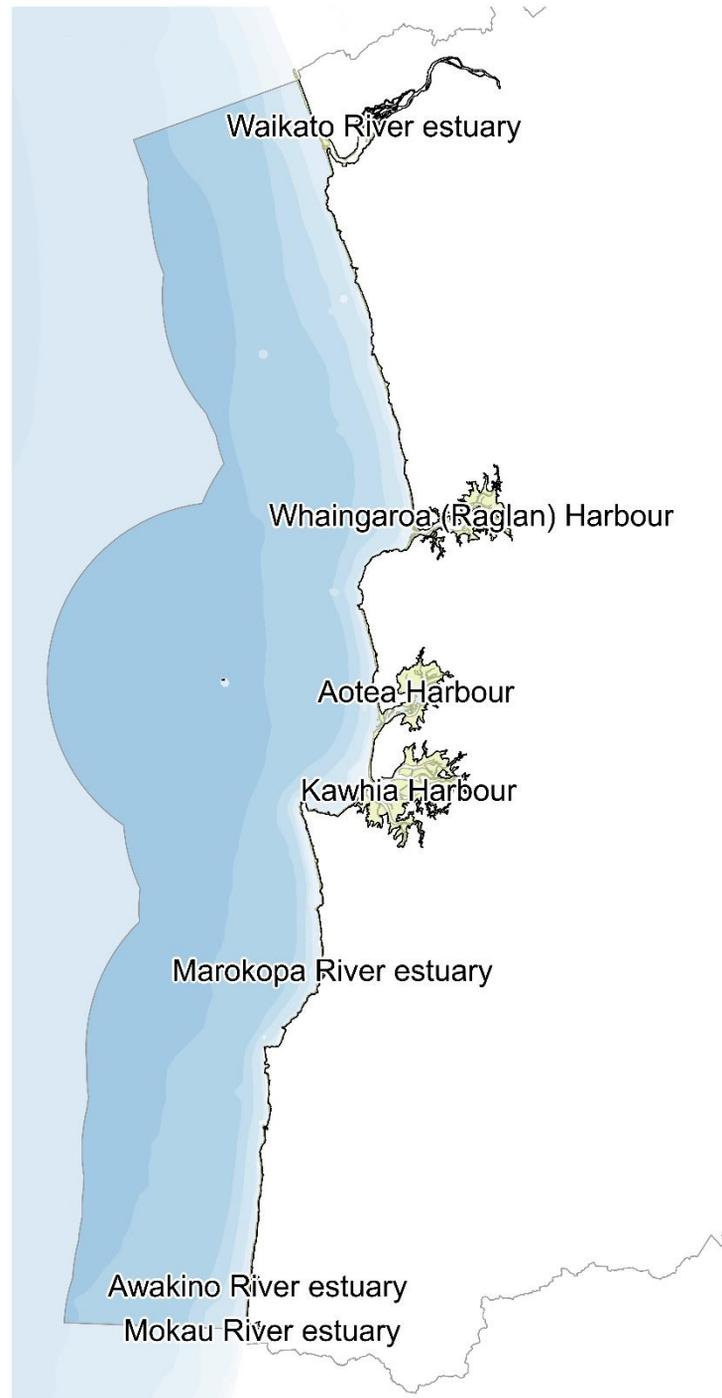
Quantifying residence times in estuaries (i.e. how long water is retained within different parts of these water bodies) can improve our understanding of the fate of discharges within estuarine systems. Until now, relatively little work has been undertaken to investigate how long water takes to flow through different parts of estuaries on the Waikato region's west coast.

Whilst residence time is an intuitive concept there are many ways of defining or estimating residence time. Waikato Regional Council contracted eCoast to develop a methodology, or proof-of-concept, for mapping residence times in seven estuaries along the west coast: Waikato River estuary, Whaingaroa (Raglan) Harbour, Aotea Harbour, Kawhia Harbour, Marokopa River estuary, Awakino River estuary and Mokau River estuary.

In each of the seven west coast estuaries data were collected on water flow, water level, salinity and bathymetry (the shape and depth of the sea floor). These data were used to develop computer models that replicate tidal process and water flow (hydrodynamic models) for each of the estuaries. A simulated release of a tracer was then used to estimate residence times throughout each of the estuaries.

This study was a proof-of-concept and the hydrodynamic models were relatively simple and only partially calibrated. As such, the results are considered indicative, but the models and methodology can be refined in the future to improve the accuracy of the residence time estimates.

The seven estuaries on the Waikato west coast included in this study ►





WHAT WE FOUND

We have displayed the estimated residence times as maps, which show the variability in residence times in different parts of an estuary and between different estuaries.

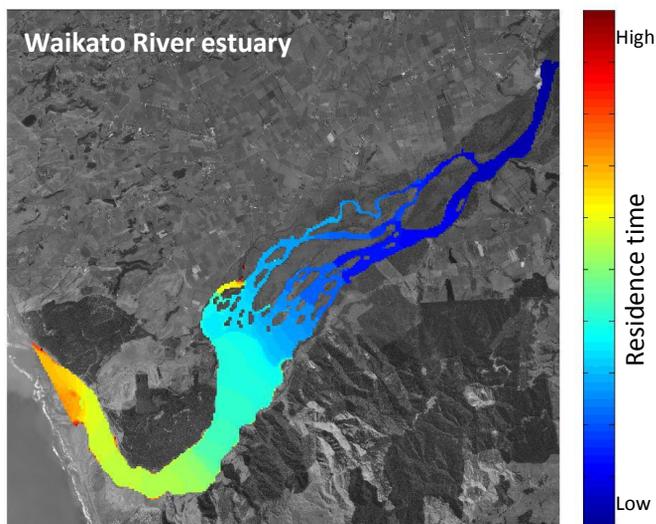
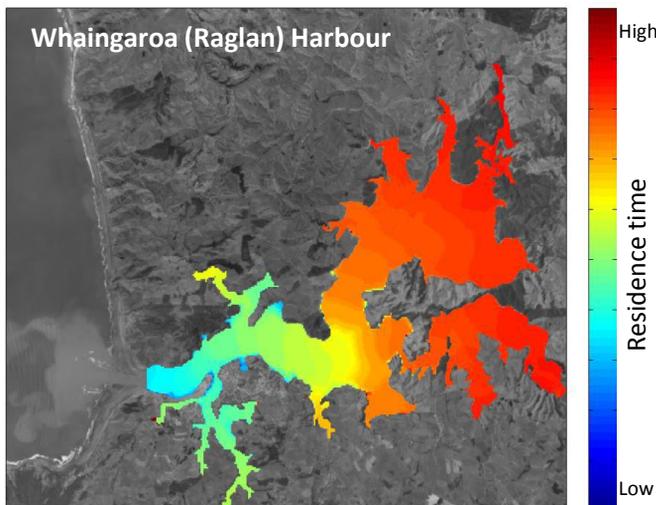
The maps show that residence times can be highly variable within an estuary, e.g., residence times may be much longer in the upper parts of an estuary, and shorter near the estuary mouth. Furthermore, residence times can vary quite a lot between estuaries, e.g., residence times are typically short in the tidal river estuaries, such as Waikato River estuary, but may be much longer in other types of estuaries such as Whaingaroa (Raglan) Harbour. This shows that the effects of a discharge on an estuary may vary considerably depending on where it is released, and will also vary between estuaries.

The study is described in detail in a technical report¹, which is published on our website <http://www.waikatoregion.govt.nz/tr201619/>



WHERE TO FROM HERE?

The residence time estimates could be improved by refining the models and methodology. Further work is also required to investigate methodologies that use alternative definitions of residence times and/or the dilution of freshwater in estuaries, and the use of these different definitions of residence times for resource management.



▲ Estimated residence times in Whaingaroa (Raglan) Harbour and Waikato River estuary. Red colour indicates longer residence times and blue colour indicates shorter residence times

¹ Greer et al. 2016. Mapping residence times in west coast estuaries of the Waikato region. Waikato Regional Council Technical Report 2016/19