

# Kaituna River Re-diversion and Wetland Creation Project

Issue Three: March 2014



## Modelling for the future

Work on preparations for the Kaituna River Re-diversion and Wetland Creation Project is in full swing now.

Council staff and consultants are busy assessing the environmental effects of the preferred option and comparing it with both the status quo and alternatives. This edition outlines some of the assessment results to date and updates what's planned over the next few months.

The Regional Council's project manager Pim de Monchy says the project is on track to lodge applications for resource consent and land designation by the middle of this year. The applications will include a full Assessment of Environmental Effects, with details on risks, benefits and uncertainties. It is expected that a hearing will occur at the end of 2014 with construction potentially starting in the summer of 2015/16, subject to legal processes.

The next project public meeting will be held at Whakaue Marae in Maketū at 6:00 pm on Thursday 6 March. Two fish-friendly floodgates will be opened after the meeting on culverts entering the estuary near the marae.



*Maru Tapsell of Waitaha and Regional Council Environmental Scientist Stephen Park assessing dissolved oxygen levels in the Waitipua Stream where it flows into Ongatoro/Maketū Estuary*

## What's numerical modelling?

Numerical modelling is an important computing tool for predicting changes to river and coastal environments. In 2013 the Regional Council engaged DHI Water and Environment, an international firm specialising in modelling riverine, coastal and estuarine processes, to create a series of models simulating and comparing different options for re-diverting the Kaituna River and creating wetlands.

The first step was collecting good information of the bathymetry (sea, estuary and riverbed levels) and topography (land levels) with both aircraft-mounted lasers and depth sounders. Next we collected accurate data on water levels, tidal volumes, waves and currents within the existing river, estuary and offshore

environments. This included how these vary during changes in the tidal cycle and during floods. We also collected information on wind, rainfall, salinity, bacteria, nutrients, sediment and dissolved oxygen, and more recently a detailed study of the area's ecological values.

Project modelling consultant Ben Tuckey says the high quality information allowed DHI to create a comprehensive set of computer models to simulate the physical environment. Options for the re-diversion have since been assessed (and are ongoing). Draft results are presented here, and the full modelling report is being peer reviewed and will be published on the Regional Council's website during March.

## Want more information?

Check out our website for important dates and information on how you can have your say. Get more detailed documents from our website [www.boprc.govt.nz/kaitunamaketu](http://www.boprc.govt.nz/kaitunamaketu) or from Project Manager Pim de Monchy at [pim.demonchy@boprc.govt.nz](mailto:pim.demonchy@boprc.govt.nz) or phone 0800 884 881 extn 8518.

# Modelling results – water volume, currents and salinity

Modelling predicts that the preferred option will nearly quadruple the volume of water re-diverted from the Kaituna River into Ongatoro/Maketū Estuary. It also predicts an increase of over 200 percent in the amount of freshwater entering the estuary, but re-diverted saltwater increases significantly as well. These changes will slightly lower salinities in the mid and upper estuary. Lower salinities allow a wider range of estuarine wetland plants to grow and provide better germination and growing conditions for most salt-tolerant species too.

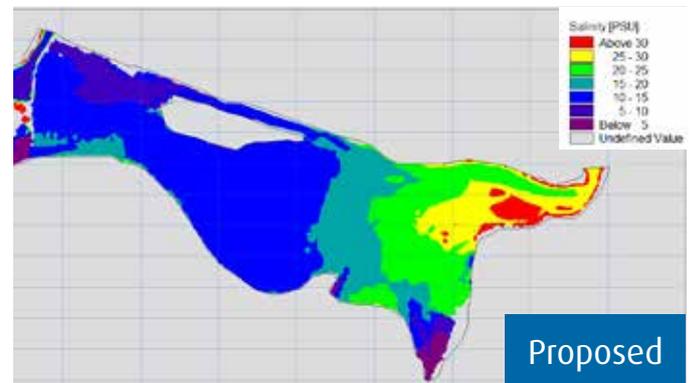
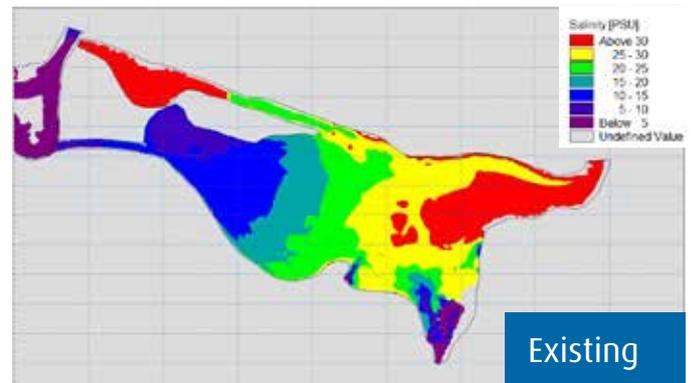
The preferred option will reduce the volume of water entering the estuary at Maketū Surf Club on the incoming tide by 17 – 20 percent, and increase the outgoing tidal volume by 23 – 29 percent. This will reduce the amount of sand infilling in the lower estuary. Average and maximum current speeds near the surf club are not expected to change significantly during normal Kaituna River flows, but may increase during floods.

Volumes through Te Tumu Cut are predicted to increase substantially on the incoming tide but decline only marginally (2 – 6 percent) on the outgoing tide. This is because water can only be re-diverted when the upper estuary is lower than the sea at Te Tumu, and the tide drops faster at Te Tumu than in the upper estuary. This is good news for boat operators who use Te Tumu Cut for navigation, as any change in conditions at the bar is unlikely.

*Salinity at water surface (red is very salty, blue is fresh) for average Kaituna River flow conditions. Existing situation top, preferred option bottom. Note this change varies with depth as salt water is denser than fresh water.*

Tide	Total volume (m <sup>3</sup> ) per tidal cycle			Freshwater volume (m <sup>3</sup> ) per tidal cycle		
	Existing	Proposed	Difference	Existing	Proposed	Difference
Neap	97,200	317,300	220,100	100,300	302,600	202,300
Mean	151,000	583,500	432,500	133,700	436,600	302,900
Spring	198,800	814,700	615,900	100,400	370,300	269,900

*Modelled changes in total and freshwater volume of proposed re-diversion through Ford's Cut during average river flows*



*Regional Council staff measuring the flow of water into Ford's Cut using an Acoustic Doppler Current Profiler (ADCP) unit*

## Modelling results – sediment movement

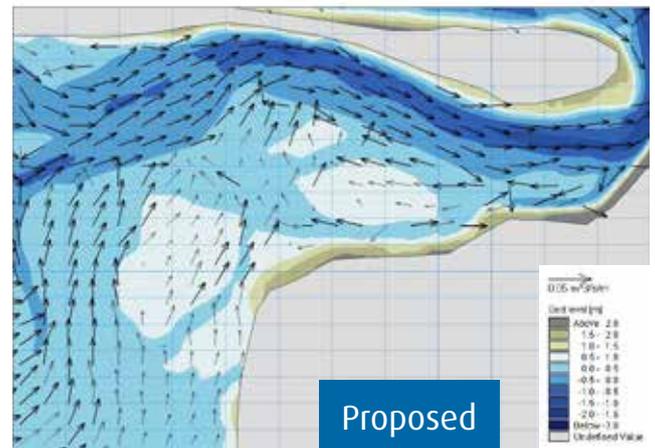
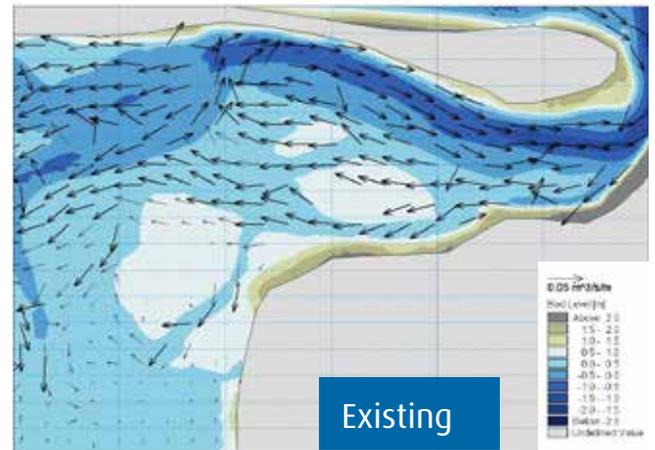
One of the major concerns for the Maketū community is sand that has gradually filled in the lower estuary, largely because Te Tumu Cut's construction in 1956 took away the Kaituna River's ability to flush out sediment. The modelling suggests that the proposed option will reduce the sand infill rate.

Arrows in these images show which direction sand is likely to move long-term during average river flows, and compares the existing situation with the proposed re-diversion. These changes will be further enhanced by allowing a higher proportion of flood flows into the estuary.

There is a risk that Maketū Spit will breach at its narrowest point soon, as it did in 1994. We predict this risk will decrease after the proposed re-diversion if flushing out of sediments in the lower estuary occurs. Project staff are considering whether to try and manage the risk of a spit breach short-term.



Lower Ongatoro/Maketū Estuary showing the loose, rippled mobile sand accumulated over decades



Residual sediment transports rates ( $m^3/m$ ) for flood tide delta of estuary with existing situation (top) for average river flow and over a neap/spring tidal cycle, and the preferred option (bottom)

## Modelling results – flood risk and drainage scheme operation

The main reasons for constructing Te Tumu Cut in 1956 were to lower river levels and allow farmland development. Modelling predicts that the re-diversion project will significantly reduce flood peak water levels in the Kaituna River and slightly increase water levels in the estuary. The project team is investigating what sort of controls are needed to ensure that any change in flood risk is acceptably low, while trying to maximise the amount of water flowing through from the river into the estuary.

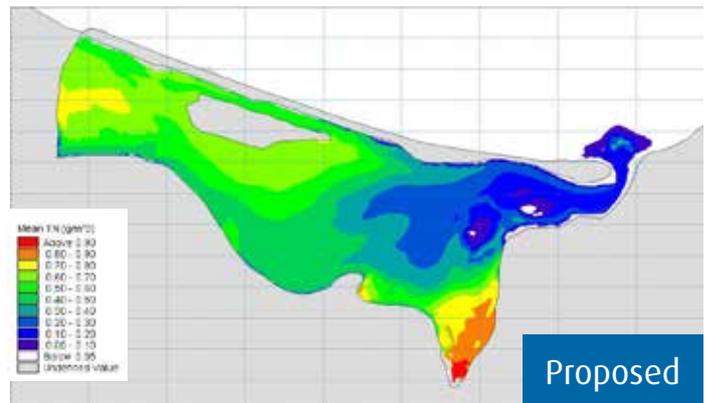
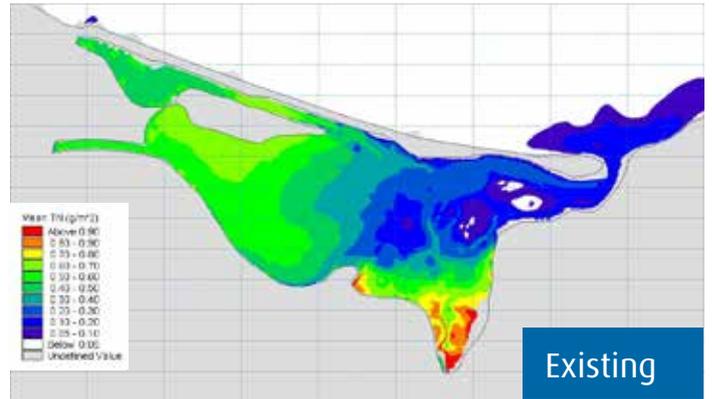
Modelling also predicts a slight (1 – 6 cm) drop in normal river levels at high tide, but no change in water levels around low tide. These changes are not expected to affect drainage scheme operation. We're investigating the effect of the predicted change on management of the Kaituna Wildlife Management Reserve.

# Modelling results – water quality

In the 1990s high bacterial concentrations in the Kaituna River limited the amount of water that could be safely re-diverted into Ongatoro/Maketū Estuary. These concentrations have reduced significantly since then, making it possible to consider re-diverting more water. Modelling suggests that the effects of the re-diversion on bathing safety in the lower estuary will be negligible. We're still investigating the effects on gathering shellfish safely.

Concentrations of nutrients such as phosphorus and nitrogen are high in parts of the estuary near Ford's Cut, the drains and in Papahikahawai lagoon. Nutrients stimulate growth of algae, such as sea lettuce, Gracilaria and benthic cyanobacteria. Our monitoring has found that prolific algae growths in the mid and upper estuary cause large fluctuations in dissolved oxygen levels, with daily minimum dissolved oxygen levels too low to support healthy fish.

Modelling suggests that there will not be a significant increase in nitrogen or phosphorus into the estuary. The model predicts higher nitrogen concentrations in sections of the estuary where there is less mixing with seawater. Total nitrogen is shown at right as an example of the proposed changes.



A comparison of average nitrogen (TN) concentrations between the existing situation (top) and the proposed option (bottom) based on a dilution model. Red is high TN concentration, blue is low

## What happens next?



### Project Stage

- Project plan, data collection and concept designs
- Pre-consent consultation: Phase one
- Draft resource consent and designation applications, feasibility designs
- Final resource consent and designation applications, feasibility designs
- Resource consent and designation processing (opportunity for submissions)
- Appeals, land acquisition and detailed designs
- Construction and implementation: Phase one
- Construction and implementation: Phase two
- Implementation and monitoring



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**Come along to public meetings on 6 March and 8 May 2014, 6 pm at Whakaue Marae in Maketū and make submissions later in 2014.**