Kaituna Re-diversion Effects on Boating

Frequently asked questions

The Kaituna River Re-diversion and Ongatoro / Maketū Estuary Enhancement Project (the Project) aims to re-divert 20 percent of the Kaituna River's flow back into Ongatoro / Maketū Estuary. The Regional Council has received a number of submissions from people concerned about the effects of the Project on boat navigation through Te Tumu Cut. This set of frequently asked questions (FAQs) has been written in response to those submissions and for other interested people.

If you have any questions that aren't answered below or if you want to discuss the project further, please email pim.demonchy@boprc.govt.nz or phone 0800 884 881 extn 8518.

Question 1: Will the existing navigability be maintained at Te Tumu Cut?
Yes. The changes to channel depth and bar height predicted for the Project are so small (1 – 2cm) that they are not measurable and will make no difference to bar navigability.

Question 2: What is a bar?
A bar is a build-up of sand outside the entrance of a river mouth, estuary, or harbour. Bars shift and change as sand and silt is moved by river and tidal flows and wave action. Every bar is different. The photograph below shows the sand bar at Te Tumu Cut (end of Ford Road) at low tide, January 2015.

Question 3: Why can bars be dangerous?
Weather, current and tide conditions over bars can cause waves to break in an unpredictable pattern that causes unstable and hazardous situations for boats. The bar at Te Tumu Cut is relatively shallow. The location and depth of any channel changes frequently. Boat users crossing the bar have to watch out for waves, strong currents and other users (e.g. fishers, surfers, swimmers etc.) as well as staying away from shallow water.

The photo over page again shows the bar at Te Tumu Cut at low tide with a small ocean swell running.

Question 4: What affects boat access across the bar at Te Tumu Cut?

Bar navigability depends on interactions between river flows, the tidal prism (the amount of water held in the lower Kaituna River between high and low tide levels), waves, currents, and sediment transported along the coast and by the river. The interaction between these factors varies significantly over time, meaning access through or around the bar also varies.

The form/shape of the bar is mainly controlled by the balance between the water flowing out of the river mouth (outgoing tide plus fresh water from the Kaituna River) and the power of the waves (wave energy).

The water depth over the bar and the cross sectional area of the channel at the entrance typically increase when there is more water flowing out and decrease when there is greater wave energy.

For example, during high flows or floods in the Kaituna River, the depth over the bar may increase significantly for a period – but becomes shallow again when low flows in the river coincide with high wave energy.

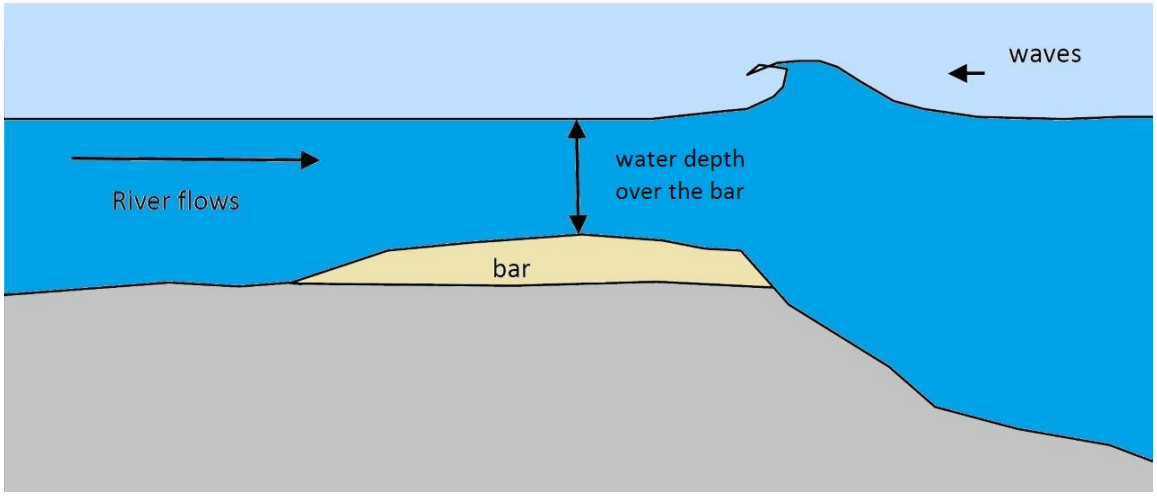

Figure 1: Typical river entrance with sand bar.

At Te Tumu Cut, there is almost always a channel through the outer bar as can be seen in the diagrams (Figures 2 and 3) below. On the outgoing (ebb) tide, sediment is transported out to sea by the fast current speeds which maintain channel depth. On the incoming (flood) tide, water comes in from all directions and is countered by the river's flow. The incoming tidal current across the bar is very slow. This means there is very little sand movement back towards the river entrance.

Using different colours, the diagrams below show the situation as it is now, including:

- depth of water at Te Tumu Cut – the blue shows deeper water.
- direction in which silt and sand is moved (black arrows)- the length of the arrow shows how much is moved in one tide.

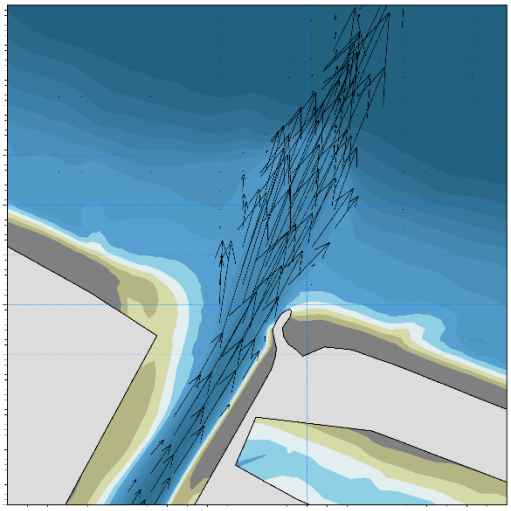

Figure 2: Sediment transport for a typical outgoing tide. The water is flowing fast with the river's flow behind it so it acts like a jet and moves a lot of sand and silt out to sea.

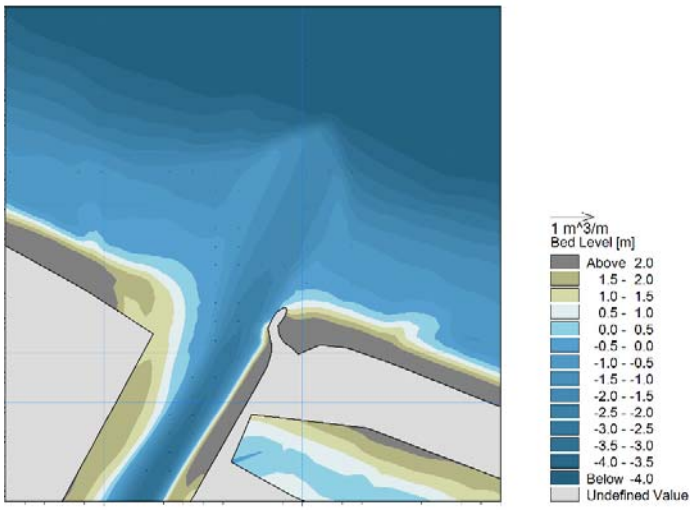

Figure 3: Sediment transport for a typical incoming tide. The water is moving slowly because it comes in from all directions and has the river opposing it. There is very little sand movement from the sea back towards the river.

Question 5: What investigations did you do to assess the effect of the Project on bar navigability?
Extensive survey work was carried out to map the beds of the sea, estuary and river as well as the flows of water, the wave patterns and a number of other factors. Sophisticated computer modelling was completed to provide a picture of the potential effects of the diversion on the form and structure (morphology) of the bars and channels at Te Tumu Cut and Maketū Estuary entrance under both normal and unusual conditions. The modelling was reviewed by coastal scientists and river engineering specialists.

A model simulation was run using weather, tide and other variables across a one year period. The simulation examined changes based on a combination of significant waves, high river flows and low river flows (based on historical data). Low river flows typically occur during summer, when use of the bar by boats is highest, and when the depth of water over the bar can be shallow.

Question 6: What changes in river flows at Te Tumu Cut will occur as a result of the Project?
For average flow conditions, modelling predicts that the Project's re-diversion of 20 percent of the Kaituna's flow into the estuary will result in a very small decrease in the volume of water flowing out to sea through Te Tumu Cut on each outgoing tide. As shown in the table below, this predicted decrease ranges from 2.5 percent (during spring tides) to 6.2 percent (during neap tides).

The very small reduction in Kaituna River outflows reflects the fact that the amount of river flow re-diverted into the estuary is largely balanced out by the increased volume of water which will enter the river mouth on the incoming tide (and then flow out again as the tide drops) .

The amount of water flowing out to sea through Te Tumu Cut on each outgoing (ebb) tide under average Kaituna River flow conditions, measured in cubic metres (m^3)			
	Neap tide	**Mean tide**	**Spring tide**
Existing	1,722,800	1,846,300	2,039,400
Proposed	1,622,800	1,779,000	1,989,400
Difference	6.2%	3.8%	2.5%

The following table shows the change in water volumes coming in through Te Tumu Cut on an incoming tide as a result of the Project. As can be seen, the volume increases significantly. However, the effect of this on the navigability will be negligible because the current speeds will stay low, as explained in Question 7.

The amount of water flowing in through Te Tumu Cut from the sea on each incoming (flood) tide under average Kaituna River flow conditions, measured in cubic metres (m^3)			
	Neap tide	**Mean tide**	**Spring tide**
Existing	3,100	134,600	423,800
Proposed	120,100	502,000	1,007,700
Difference	3774%	273%	138%

During river flood events the modelling indicates that the proposed re-diversion may result in some reduction in outflows through Te Tumu Cut because some of the flood water is diverted to the estuary. This will not affect navigability as the channel at Te Tumu will still be scoured during flood events.

Question 7: Will there be any changes in the amount of sediment moved?
The rate of sediment movement depends on the type of sediment and the speed of the current. Small and light particles like mud and silt are easier to move than bigger heavier particles like sand and gravel. As shown in Question 6, the re-diversion will allow higher volumes of water to come in through Te Tumu Cut on incoming tides. However, this increased water volume on the incoming tide will still be moving too slowly to shift much sand.

Incoming water flow across the outer bar is predicted to be so slow that there will be very little increase in sediment movement back towards the river entrance. When the tide turns and goes out again it will flow out quickly, acting like a hose that scours out the river entrance and channel through the bar. This means a sand bank (or shoal) will not develop in the lower river and the channel depth across the bar will not be decreased as a result of the Project. The outgoing tide will still dominate the transport of silt and sand.

Figures 4 and 5 below show channel flows post re-diversion, including:

- depth of water at Te Tumu Cut – the blue shows deeper water.
- direction in which silt and sand is moved (black arrows)- the length of the arrow shows how much is moved in one tide.

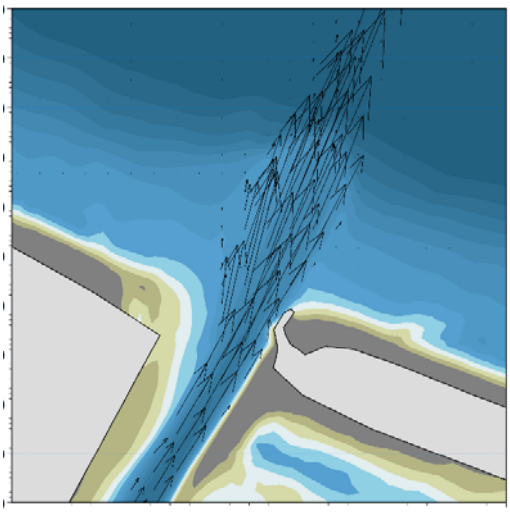

Figure 4: Typical outgoing tide after Kaituna River re-diversion. Outgoing flows will still be strong enough to transport a lot of sand out to sea.

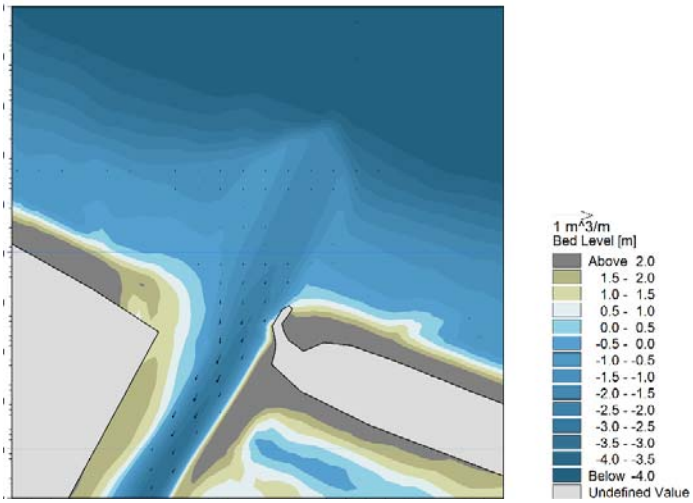

Figure 5: Typical incoming tide after Kaituna River re-diversion. Current speeds will be higher than they are now, but still too low to transport much sand into the river entrance.

Question 8: Will the depth of water over the bar at Te Tumu Cut change?

Water depth over the bar at Te Tumu already changes regularly as part of natural processes. Based on observations and studies at Te Tumu and other bars, the Project team's investigations looked at the relative changes in water depth over the bar.

The slight reduction in river outflows predicted (see Question 6) for neap, mean and spring tides is likely to mean approximately 1cm reduction in water depth over the bar during mean and spring tides, and a 2cm reduction during neap tides. Changes of this size are not measurable and will make no significant difference to bar navigability. In fact the water depth over the bar parallel to the beach already varies regularly by at least 30cm, due to soft shifting sands and turbulent water currents.

The large change in water inflow does not affect the currents across the bar; rather it changes currents in the river itself where no bar is present or able to form because the outgoing currents are so strong they prevent accumulation of bar-forming sand.

Question 9: Why isn't safe boating access being provided at Te Tumu Cut 24/7?

Safe 24/7 boat access to the sea at Te Tumu Cut does not currently exist. Crossing the bar at Te Tumu is something only experienced boat operators should attempt. The Harbourmaster and Coastguard do not recommend crossing the bar after dark. Improving the conditions for boat access across the bar is outside the scope of this Project, which is focused on works to enhance the Ongatoro / Maketū Estuary environment.

Question 10: What will happen at the Maketū Estuary entrance?
Conditions at the Maketū entrance are quite different to those at Te Tumu Cut. Modelling predicts that the proposed diversion will significantly increase outflows at the Maketū entrance – by around 25 to 29 percent depending on the tide conditions. Inflows are also predicted to decrease substantially. This means water depth over the Maketū Estuary entrance bar is likely to increase by 5 to 7.5cm.

Question 11 It is just a model, how sure can you be about the results?
Models by their nature predict what is likely to happen. The predictions on navigability depend critically on accurate modelling of the impact of the proposed re-diversion on outflows. The model used is a reliable representation of real situations, based and verified on years of observation of actual natural processes. Modelling information has been used alongside expert advice from independent coastal scientists. During the Project's implementation, data will be collected to verify the model predictions.

Question 12 What monitoring is proposed?
Studies and modelling conclude that the Project is not likely to have any measurable effect on water depths over the bar at Te Tumu Cut for either average flow or low flow conditions (when navigability is typically most difficult). For this reason, and because there is so much natural variability in the conditions at Te Tumu Cut, the resource consent applications did not propose monitoring of water depths over the bar.

Observations of the bar at Te Tumu Cut will be made during summer, before and after the re-diversion. Measurements of water flow rates and volumes will be recorded at Te Tumu Cut, the culverts under Ford Road, Ford's Cut, and at Maketū Estuary entrance, after the river is re-diverted. The information collected will be compared with the observations made before the re-diversion, changes at other river entrances and predictions from the model.

Measurement of outflows after the re-diversion will provide a very direct and simple test of the modelling predictions. If the measured outflows are consistent with model predictions then this will confirm that the re-diversion will not measurably impact on depths of water over the bar.

Question 13 Why can't you dredge the channel to improve the bar?
The bar could be dredged but this would need to be done on a regular and ongoing basis to have any long term benefit because the bar is constantly changing. Improving the navigable access across the bar at Te Tumu Cut is outside the scope of this Project.

Question 15 What information is available on how to safely cross the bar?
The Harbourmaster and Coastguard have produced a video on how to cross the Kaituna River bar safely: www.boprc.govt.nz/barcrossingvideos

Want to know more?
Please contact Bay of Plenty Regional Council Project Manager Pim de Monchy by email pim.demonchy@boprc.govt.nz or phone 0800 884 881 extn 8518.