# ENV 2010 WLG 080

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# Jackett Island: Discussion on future possible actions for the long term resolution of the erosion issue

This documents sets out the results of the discussions between Dr Shaw Mead and Mr Richard Reinen-Hamill regarding future possible actions for the long term resolution of the erosion issues at Jackett Island.

## The required objectives

The following objectives are required to form the basis of any long term resolution of the erosion issue at Jackett Island:

1. Reduce risk of erosion hazard affecting human life and physical assets
2. Restore the shoreline position to approximate the 2000 shoreline
3. Provide a solution that considers the seaward edge of the Jackett Island shoreline for a period of 35 years (i.e. long term = 35 years), the maximum duration possible for a coastal permit.
4. Legitimise or remove existing groyne from the Coastal Marine Area.

## The current understanding of coastal processes

Kirk (1990)[1] provides the most comprehensive description available of the coastal processes of the Motueka Spit/Moutere Inlet/Jackett's Island complex. This report presents the results of a technical investigation into the causes and nature of bar sedimentation, prior to groyne construction (1996) and considers methods of controlling infilling of the navigation channel. In summary:

- An offshore bar that is the submarine extension of Motueka Spit lies 400-500 m offshore and is nourished by sand transported south-eastward along the Spit by waves and wave-driven currents;

- Offsetting of the channel (southeasterly propagation) and infilling develops over several years. Periodically the bar was breached nearer the Port by floods from the Moutere Inlet that augment the tidal compartment. An interval of generally improved navigation then ensued before offsetting again occurs. Kirk estimated realignment occurred every 10-15 years.

- The offshore bar is controlled by longshore drifts of sand from the Motueka River under wave action and is periodically relieved by major freshwater flood from the Moutere.

- Estimated net sand transport occurs from northwest to southeast in the ratio 3.6:1 and the best estimate of transport under dominant northerly waves is 47,500 $m^3$/year.

[1] Kirk, R. M., 1990. Coastal Sedimentation and Navigability at Port Motueka, Moutere Inlet. Report to Tasman District Council. July 1990

- Wave action drives alongshore sediment transport southeast down the Spit. This amount approximates the average sediment supply from the Motueka River each year (64,000 $m^3$).

- Severe ongoing erosion of the mainland shore northwest of Port Motueka is considered to be due to Motueka spit capturing the longshore sand supply that once nourished this shore.

- One of the 5 control options suggested was a groyne or offshore breakwater to deflect southward transported sand and potentially stabilize the channel if located at the northwest distal tip of Motueka Spit. However, Kirk recommended dredging as the best method of maintenance of the channel entrance.

A 700 m long groyne was constructed in 1996. The consequences of construction of the groyne, which is more accurately described as a breakwater/seawall (depending on the elevation of a particular part of the structure), due to its' orientation largely parallel to wave crest orientation, has contributed to:

- Lengthening, widening and heightening of the Spit to dimensions and at a rate not recorded since 1881;

- 'Plugging' of the area that usually breached in the past with a 700 m non-erodible structure;

- Interrupting of the estimated 10-15 year breaching cycle (the Spit has not breached since the groyne was constructed 16 years ago and is now considered too wide and high to readily breach at present), and;

- Aggressive erosion of Jackett Island.

The aggressive erosion of central Jackett Island is due to the following processes:

- Focussing of wave energy over the intertidal and subtidal terminal lobe of the Spit, which is presently adjacent to central Jackett's Island, leading to locally increased wave heights (erosion adjacent to the distal tip of the Spit has previously been observed and reported as the Spit grew southward between breach cycles);

- Sand eroded from the beach (across-shore due to the short-period waves) is then removed from the site by the tidal current that run parallel to the beach;

- Due to the relatively close proximity of the distal tip of the Spit to Jackett Island, the strong tidal currents of the main channel are forced closer to Jackett Island further exacerbating the erosion is this area, and;

- Loss of sediment supply to Jackett Island due to the presence of the main tidal channel between the Spit and the Island. The sediment supply to Jackett Island was previously from the Spit, with the biggest influxes occurring following Spit Breach, with the remnant Spit south of the new channel formed by the breach migrating shoreward to Jackett Island without the main tidal channel between.

Erosion rates of central Jackett Island have been up to 4 m/year since 2000.

## What data is required to improve understanding

A better understanding of the tidal currents and processes operating between the inlet and the open coast which could be combined with present information on wave processes is required to provide a more complete understanding of existing processes. This would require additional information on the topography and bathymetry of the channel separating Jackett Island from the spit and of the currents entering and leaving the Moutere Inlet.

Also useful would be the geological composition of Jackett Island at a number of sections to establish the make-up of the island. Ecological studies are also required on the areas of possible sources of sand for possible beach restoration. The studies would determine potential risks and effects that may arise from or preclude use of sand of these areas.

These studies, combined with our knowledge of the island composition and aerial photograph and LiDAR information analysis are required to project the expected behaviour of the spit and to assist in the consideration of effects.

## Potential solutions

The removal of the existing groyne along Motueka Spit is unlikely to result in the restoration of spit breaching, as other processes such as sand build up and vegetation are now acting at this location. However, removal of those portions of the groyne that currently extend into the Coastal Marine Area may have localised effects on alongshore sediment transport and sheltering of the southern (distal) end of the spit. This option is proposed rather than full groyne removal or reconsenting of the existing structure. Ongoing monitoring would be required and exposed areas of groyne removed as it becomes exposed. We note that it may be possible that the initiation of progressive groyne removal could be progressed with a shorter time frame than the overall solution, or be staged to be done early in the process, but does require more comprehensive assessment to support any necessary consent application.

Considering the general options and approach as set out in Policy 27 the New Zealand Coastal Policy Statement, the following options to provide erosion protection to Jackett Island could be considered:

- **Do nothing.** We expect the shoreline to continue to retreat and possibly with increasing rates as a result of future climate change.
- **Asset relocation.** Removing the dwellings further landward to remove assets from risk
- **Planning responses.** This may include establishment of hazard lines and development of planning policies within the District Plan to reduce increasing risk of hazards as done in many parts of New Zealand (eg. Canterbury, Hawke's Bay and Bay of Plenty). Such policies have included prohibition of new development within extreme hazard areas and preventing inter-generational passing on of land. The planning responses need to recognise the timing needed to achieve this which may require the implementation of engineering or structural solutions in the short to medium term.
- **Sand bypassing.** Small scale and regular mechanical bypassing of sand from the distal end of the spit to Jackett Island, replicating the natural process affected by the original groyne.

- **Small channel dredging.** Enhancing the existing channel to improve access to the port. Material dredged for formation of the channel and ongoing maintenance would be used to replenish the foreshore of Jackett Island.
- **Major channel dredging.** Forming a major dredged channel through the Motueka Spit to provide more direct access to the Port, using material dredged during the capital and maintenance works to replenish the Jackett Island shoreline.
- **Training Groynes** (with nourishment). These groynes would extend along the seaward edge of Jackett Island to move the tidal currents away from the existing shoreline. These would be substantial structures and would need to be infilled to provide an improved coastal edge.
- **Seawall** (land protection). This would be a substantial structure, occupying the existing upper beach extending around the majority of the island's perimeter.

## Discussion

A plan to manage the erosion along Jackett Island needs to be developed and the interim works do not provide a full response to the longer term erosion issues. There is a need to manage the erosion problem considering the entire Jackett Island. The solution should also consider the wider users, including users of the Port.

The preferred physical works approach is more likely to be focussed on the small channel dredging at the distal end of the spit, with the capital and maintenance dredging being placed on the Jackett Island shoreline, replicating the natural process. This would be an ongoing process, the timing of the ongoing transfers subject to further studies and monitoring. The timing of this solution would be the order of 35 years, based on the maximum duration of a coastal permit. This approach provides time for non-structural management/planning solutions to be implemented consistent with the Policy 27 of the NZCPS.

## Potential timelines for doing the work if this process is agreed

The following indicative timeline is based from when an agreed work process can be agreed:

| Time period from award (months) | Description |
|---|---|
| 0 to 3 | Data acquisition and consultation on options |
| 3 to 6 | Coastal process modelling and option development |
| 6 to 12 | AEE studies and consent process |
| 12 to 18 | Detailed design and implementation |

## Attachment 1: Extract of New Zealand Coastal Policy Statement (2010)

**Policy 27 Strategies for protecting significant existing development from coastal hazard risk**

(1) In areas of significant existing development likely to be affected by coastal hazards, the range of options for reducing coastal hazard risk that should be assessed includes:

(a) promoting and identifying long-term sustainable risk reduction approaches including the relocation or removal of existing development or structures at risk;
(b) identifying the consequences of potential strategic options relative to the option of 'do-nothing';
(c) recognising that hard protection structures may be the only practical means to protect existing infrastructure of national or regional importance, to sustain the potential of built physical resources to meet the reasonably foreseeable needs of future generations;
(d) recognising and considering the environmental and social costs of permitting hard protection structures to protect private property; and
(e) identifying and planning for transition mechanisms and timeframes for moving to more sustainable approaches;

(2) In evaluating options under (1):

(a) focus on approaches to risk management that reduce the need for hard protection structures and similar engineering interventions;
(b) take into account the nature of the coastal hazard risk and how it might change over at least a 100 year timeframe, including the expected effects of climate change; and
(c) evaluate the likely costs and benefits of any proposed coastal hazard risk reduction options.

(3) Where hard protection structures are considered to be necessary, ensure that the form and location of any structures are designed to minimise adverse affects on the coastal environment.

(4) Hard protection structures, where considered necessary to protect private assets, should not be located on public land if there is no significant public or environmental benefit in doing so.