

DETERMING FLOOD EFFECTS DUE TO UNDOCUMENTED STOPBANKS ON THE WAIMEA FLOODPLAIN

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The overarching aim of the project is to determine the impact of potential modifications to stopbanks within the Waimea floodplain on flood risk

BACKGROUND

Across the globe floods are the most costly natural disaster, and New Zealand is no exception to this. Throughout New Zealand there are over 100 communities located on floodplains that are at risk of inundation (Ericksen et al., 1986). Within many of these communities **stopbanks (levees) acts as the primary physical means of protection** against flooding.

Currently there is no nationwide standard for stopbank construction (MfE, 2008). As a result the **quality and construction methods of stopbanks vary greatly** in New Zealand. The reason for the variance is that each region has a different amount of risk and resources.

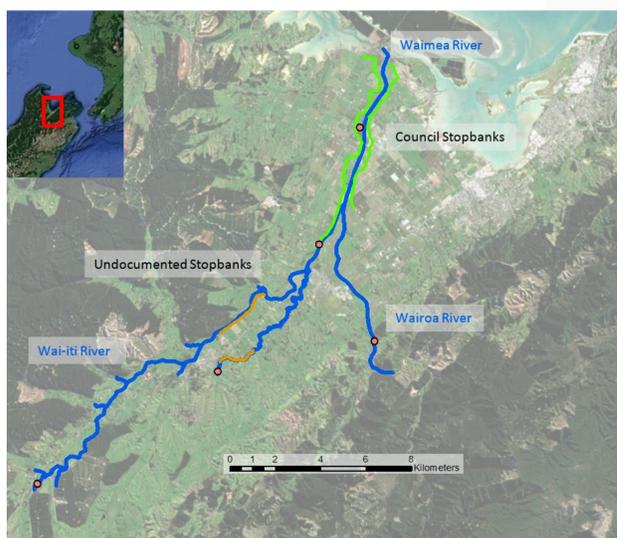
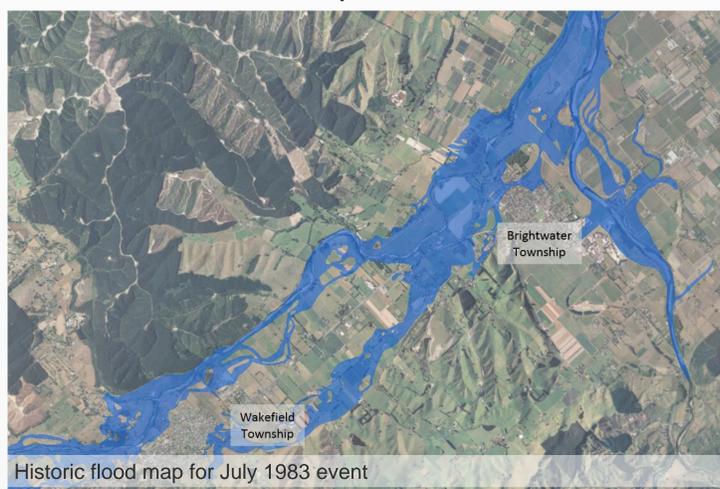
Other contributing factors are that government and public views on the amount of protection needed have changed through time (Ericksen et al., 1986).

In some parts of New Zealand there are a large number of stopbanks that are not catalogued by councils and are not council responsibility to maintain. For the purposes of this study, these structures are considered "undocumented stopbanks" with respect to formal council management records. Many of these were built decades ago as small structures used by landowners to prevent small floods damaging property. Over time these stopbanks may have been privately raised to prevent larger floods. Construction of undocumented stopbanks is believed to have ceased since the introduction of formal consenting processes in 1991. However, because they were not part of a council's assets in the first place they **weren't originally subjected to the consenting process or council oversight since**.

Undocumented stopbanks are **currently thought to have a significant, although presently unquantified impact on flood routing**. Tasman District Council acknowledges it has undocumented stopbanks within its jurisdiction. The council has previously carried out hydraulic modelling in the Waimea floodplain, and has a good understanding of effect on council and non-council stopbanks. However, the council does not carry complete documentation of every undocumented stopbank's performance, characteristics, or effect on flooding extent.

The undocumented stopbanks may increase or decrease the flood risk of downstream communities by affecting the movement of flood flows. However the effect on flood routing is currently unknown.

Because of this uncertainty the Tasman District Council has a **desire to better understand the impact of some of its undocumented stopbanks**.



River, gauge and stopbank locations

METHOD

The aim of the project will be achieved through modelling of different flood routing scenarios. The software selected to do the modelling is HEC-RAS 5.0.5, developed by the US Army Corps of Engineers. Because LIDAR data are available and data on river cross sections are limited, the model will be developed in 2D. This also gives a better understanding of flood velocities. The council has previously modelled the area in Mike21, this focused developing the Council's understanding of the present flood risk in the Brightwater and Wakefield areas

The boundary conditions will be located at already existing flow gauges. There will be three upstream boundary conditions at the Pitfure, Wai-iti and Wairoa Rivers, the downstream boundary is on the Waimea River. Within the domain there are several significant ungauged tributaries, here the peak flow and hydrographs will be estimated. A separate gauge will be used to validate the model by comparing stage data from historic events.

Once the model is calibrated and verified, modification cases can be created and modelled. These will assess the impacts of the different stopbanks scenarios that the council has expressed an interest in.

The scenarios are:

- Presence of undocumented and council stopbanks
- Removal of undocumented stopbanks
- Removal of council stopbanks
- Removal of undocumented and council stopbanks

The analysis of each scenario will aim to identify where and why there are differences between the present case and the modified case, if there are any. These analyses will act as one of the main outputs of the project.



The flood analyses **will allow the stakeholders to make more informed flood risk decisions** regarding management of undocumented stopbanks to reduce the risk to the area.

PROJECT OUTPUTS

- One of the long-term outputs of the project is a **data set recording the characteristics such as location, materials, cover, of the undocumented stopbanks**. This will raise the Councils' awareness of the extent of the undocumented stopbanks. This data set can also be added to the New Zealand Inventory of Stopbanks.
- This project will give the Tasman District Council a better understanding around the flood routing impacts of some undocumented stopbanks. This knowledge will allow the Council to **determine if these stopbanks should be protected, or removed to reduce the overall flood risk**. By understanding the impact of these stopbanks, stakeholders can work to ensure that management strategies support informed distribution of flood risk in future events.
- A wider aim for the project is that it is hoped this study will **contribute to New Zealand's knowledge of stopbank assessment methods**. A benefit of having a general assessment method is that it can be adapted so other councils can use it to get a indication of the impact their undocumented stopbanks have on flood extent. This method can potentially be adapted and applied to areas with similar issues, or area where there is less data available. This knowledge will allow councils to better understand, and respond to flood risk.

PURPOSE

This study aims to address a knowledge gap (as identified in the 2017 QuakeCore RfP project: Characterisation and screening of New Zealand stopbank networks (ongoing)) regarding the importance of undocumented and privately-owned structures on flood routing. It is hoped the method developed during the project can be adapted and applied as a methodology for rapid assessment of other undocumented stopbanks. Outputs from the flood assessments can be used to determine the subsequent risks to people and property. This in turn will inform councils of the risks and help them prioritise investment to minimise the flood risk. If the undocumented stopbanks prove to be of significant importance to minimizing flood risk, the council can use the information from this study as justification for developing and implementing more informed management strategies.

References

MfE (2008). *Meeting the challenges of future flooding in New Zealand*. Ministry for the Environment and the Flood Risk Management and River Control Review Steering Group. August 2008.
Ericksen, N.J. (1986). *Creating flood disasters? New Zealand's need for a new approach to urban flooding*. National Water and Soil Conservation Authority.



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