TO STOPBANK OR NOT TO STOPBANK? A CASE STUDY

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ABSTRACT

When floods occur there are often calls to 'fix' the problem. Flood 'protection' works are often seen to provide just that – 'protection' – when in reality they reduce the risk or frequency or severity, but do not 'protect' or 'fix'. Stopbanks are often seen as a fix for flooding but they are not appropriate in all cases and can have significant drawbacks. When the residents along the Ōpāwaho / Heathcote River flooded again in July 2017, a significant package of flood management measures was put together to reduce the risk of flooding. Stopbanks were considered as one of the options, but further investigation into their feasibility and suitability of them was recommended first. The question was, to stopbank or not to stopbank? At the end of the investigation Christchurch City Council (CCC) staff recommended 'not to stopbank', and this abstract outlines how the decision to allow room for the river was reached.

1.1 Background

The Ōpāwaho / Heathcote River catchment has a history of flooding. The Canterbury Earthquake Sequence (CES) dramatically changed the flooding situation for the Ōpāwaho / Heathcote River, with a general uplift in the lower reach combined with settlement in the mid and upper catchment. This had the effect of exposing 101 additional dwellings to the risk of flooding above the floor in a 2% annual exceedance probability event (AEP). and also increased the number of houses at risk of flooding above the floor in frequent events. Flood events in 2013, 2014 and 2017 resulted in some houses flooding above floor level multiple times, and repeated deep road and underfloor flooding.

Figure 1: Flooding along the Ōpāwaho / Heathcote River in July 2017

Following the July 2017 flooding a range of floodplain management options were identified, with over $80 million allocated to works in the catchment to reduce above-floor level flooding. These works have included the purchase of the most frequently flooded houses, dredging, bank widening and strengthening, as well as the construction of four major flood basins. Combined, these works have reduced the risk of flooding along the river (with reducing benefits in areas subject to tidal flooding).

However, there was still a residual increased extent and risk of underfloor, property and road flooding above pre-earthquake levels. Low stopbanks were identified as a possible means to mitigate this, and staff were instructed to investigate the technical feasibility of low stopbanks to reduce frequent underfloor flooding.

1.2 Stopbanks along the Ōpāwaho / Heathcote River

Along the Ōpāwaho / Heathcote River high stopbanks could be used to 'protect' buildings at risk of above floor level flooding in more extreme events. However, the heights and widths of stopbanks required were considered unlikely to be acceptable to the community (or even technically feasible). In some places the stopbanks would be over 1.8m in height and tower above the narrow road along the river. In addition, the cost of stopbanks to provide this level of protection was estimated at several hundred million dollars, well in excess of the value of the property and other assets protected.

As an alternative to stopbanks to protect against extreme flooding, low stopbanks to mitigate frequent flooding were proposed for consideration. This is because the main flood management options proposed were aimed at frequent above floor flooding. However, underfloor flooding and deep road flooding also causes significant distress to the community, and it may have been that the community considered that the potential negative impacts of stopbanks would outweigh the negatives. Taking a staged approach and looking at technical feasibility before consulting, allowed stopbanks to be considered outside of the immediate post-emergency package of works, where it was more likely that the full range of positives and negatives would be considered.

1.3 Potential benefits of low stopbanks

Underfloor, road and property flooding can cause significant distress and disruption to the community, including:

- Detrimental psycho-social effect on residents (underfloor flooding can be as distressing as over-floor flooding for some).
- Emergency Operations Centre activation and the impacts on staff and resources
- Wastewater overflows to river (road flooding results in the sewer system being overloaded)
- Wastewater under houses, on property, in playgrounds and on streets
- Closure of roads, loss of access, and damage to roads
- Danger to life if the flood waters are entered in many locations
- Contents damaged in garages, under homes and cars written off
- Reputational damage to Council

Low stopbanks for more frequent events had the potential to mitigate some of these issues while avoiding the cost and impracticality of stopbanks for more extreme events.

Figure 2: Rendering of low stopbank along the Ōpāwaho / Heathcote River (Beca Feasibility Report)

1.4 Feasibility

It was proposed that low stopbanks could be considered in the most impacted locations, focusing on those areas with:

- Frequent underfloor flooding
- Deep road flooding (>300 mm) and limited alternative access for large numbers of houses

Beca were engaged to assess the technical feasibility of low stopbanks. The key areas of interest for assessing technical feasibility were:

- Impact on road layout, transport, parking and accessibility
- Ecological impact – trees, aquatic ecology
- Effects and mitigation of stormwater and wastewater issues during and after flood events – gravity and/or pumped drainage of floodplain behind the stopbanks after overtopping, providing a range of options to mitigate these.
- Impact on services
- Landscape impacts, including options for integration to deliver the Mid-Heathcote River/ Ōpāwaho Linear Park Masterplan works
- Constructability
- Resilience, particularly to lateral spread or subsidence along the river edge.

Beca concluded that low stopbanks were technically feasible, though there would be impacts and residual risks (discussed in the next section).

Figure 3 Potential extent of low stopbanks in green (background colours show Community Board boundaries)

The estimated total outturn cost to complete the low stopbanks ranged from $58M for a 10% AEP level of service, including climate change (2ºC) and 0.5 m sea level rise, to $22M for a 20% AEP current climate level of service.

1.5 To stopbank or not to stopbank?

The low stopbanks would result in impacts along the river corridor and introduce some risks. Some of these were less critical such as the immediate loss of tree canopy, loss of on-street parking and potential accumulation of wastewater flows on private property. However, the more significant risks which led to the staff recommendation for the project to be cancelled were:

- Setting a precedent for a level of service to be applied citywide
- Being inconsistent with the approach being taken by Council for other areas

- Residents may consider flooding to be 'fixed', and therefore be less prepared when a larger flood, which overtops the stopbanks, occurs (and it will); this would lead to a less resilient outcome through community complacency

- If flooding is considered by residents to be 'fixed', then they may be encouraged to increase their investment in the area; this in turn could lead to Council being held responsible by residents to provide higher protection in the future

- It could be seen as predetermining a long-term approach of 'defending' against flooding, rather than changing land use and adapting to living with water

- When an overtopping flood occurs, residents may be caught unaware as the early signs of road flooding would not be present

- The community may expect Council to make the stopbanks higher over time rather than accepting the level of service provided.

Many of these risks are present for stopbanks wherever they are constructed and need to be balanced with the potential benefits. In this instance, low stopbanks would set a precedent for defence along a relatively narrow terraced river, likely providing a false sense of security and encouraging further investment in the river floodplain. While other flood management measures proceeded, such as a series of flood storage basins in the upper catchment, these were communicated as reducing the risk rather than being a 'fix' or 'protection'. However, regardless of the associated communication, it was likely that the low stopbanks would result in a longer-term commitment to confining the river and encouraging further development. While it was not clear cut, decision-makers accepted the potential negative outcomes outweighed the positive in this instance.

Community views and preferences were tested by the project with public engagement from the July 2017 flooding up until mid 2022. Community feedback was mixed, with some supportive due to the impacts of the flooding, and others considering that the character of the river environment would be compromised. By the time the decision was made to cancel the project, there was no significant negative feedback, particularly when the flood benefits provided by the mostly completed scheme were communicated.

1.6 Conclusions

When floods occur there is inevitably a call for a 'fix'. Stopbanks are often seen as a quick win but can result in perverse outcomes where the risk from flooding is increased due to the behaviours of those now 'protected'. However, when the decision-making process is allowed to consider the full range of benefits and costs in a measured fashion, there is potential for better long-term decisions to be made. Stopbanks do have their place in the toolbox, but this case study shows that they are not always the right tool and it is sometimes appropriate to answer the question, 'To stopbank or not to stopbank?', in the negative.

KEYWORDS

Flood management, stopbanks, room for the river

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