



## Regional Council Workshop

**Date:** 31 July 2024  
**Time:** 12.30pm  
**Venue:** Council Chamber  
Hawke's Bay Regional Council  
159 Dalton Street  
NAPIER

### Late Attachments excluded from Agenda

Item	Title	Page
<b>3.</b>	<b>Heretaunga Plains and Upper Tukituki Cyclone Gabrielle scheme reviews</b>	
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# Heretaunga Plains Flood Control Scheme Reviews

HBRC Councillor Presentation

31 July 2024

The information presented in this workshop represents a preliminary list of potential options for consideration.

This analysis is for discussion purposes only and does not constitute official council policy.

The proposals have not been approved or endorsed by the council.



## Presentation purpose

1. Provide an update on the scheme review
2. Assessed scheme performance during Cyclone Gabrielle and what this means for potential scheme improvement opportunities.
3. Share potential improvement opportunities with councilors

# Scheme objectives- HPFCS

As per the revised Terms of Reference, the scheme objectives are that:

## Scheme Objectives


The objective of the Scheme is to ensure that the Heretaunga Plains communities are very rarely affected by significant flooding, and that waterways within the Scheme are highly valued community assets, from a flood control, environmental and recreational aspect.

Component	Current Level of Service (Flood prevention)
River Assets	The level of protection in technical terms is to convey a flood discharge with a 1% probability of being exceeded in any one year (1%AEP) safely to the sea
Drainage Assets	The design standard is to drain 32mm of runoff in 24 hours from rural areas. This is nominally a 5 year return period event





## Hydrology review - NIWA

River	Pre Cyclone Peak Flow (m <sup>3</sup> /s)	Post Cyclone Peak Flow (m <sup>3</sup> /s)
Tutaekuri 1% AEP	2300	2900
Tutaekuri 0.2% AEP	3560	5200
		
Ngaruroro 1% AEP	3550	3930
Ngaruroro 0.2% AEP	5000	6000

IRG programme included basis for lifting LoS from 1% to 0.2% AEP. NIWA work now suggests 0.2% AEP flows are significantly higher than pre-Gabrielle.

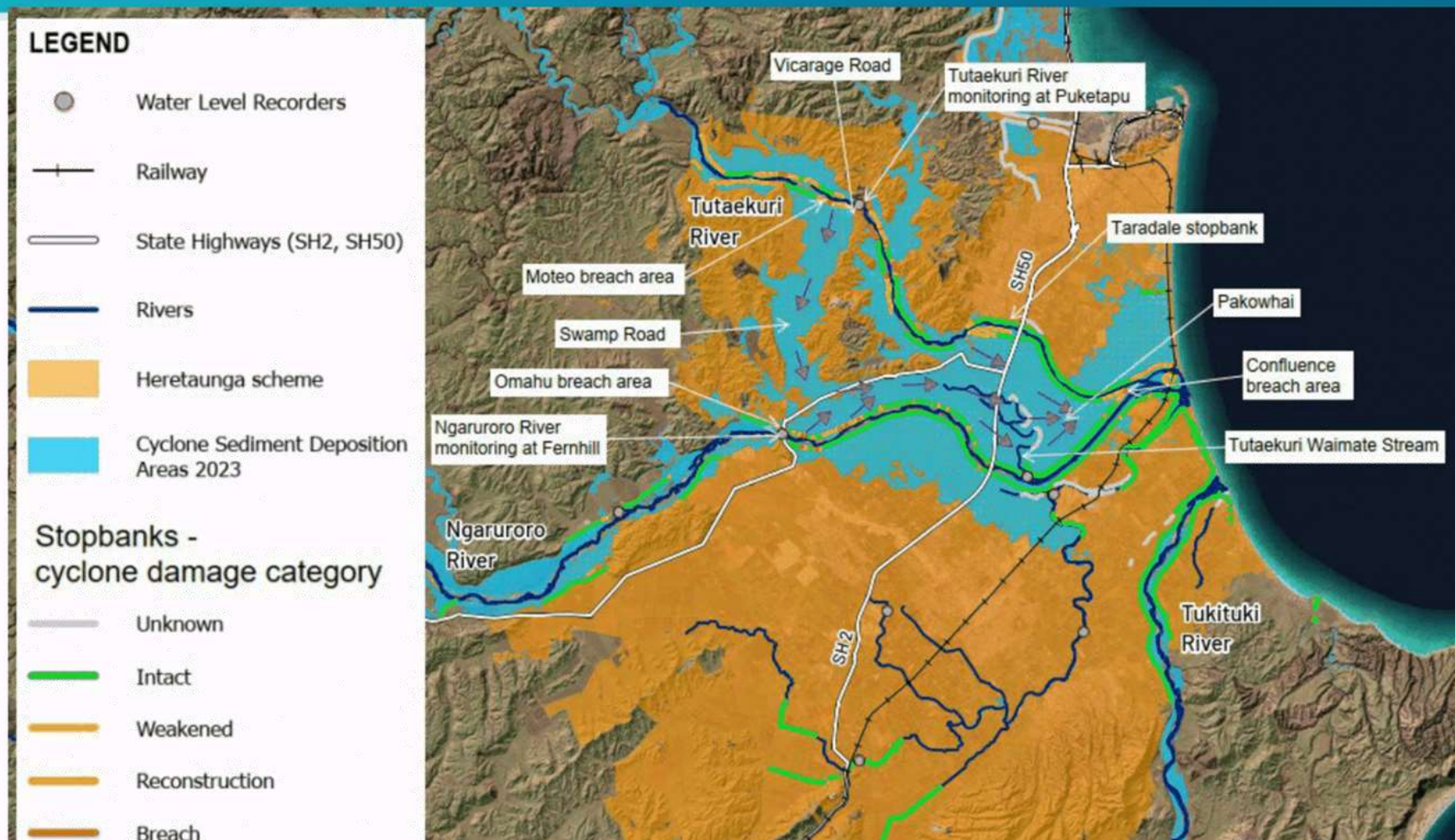
Previous scheme design included allowance for 3,300m<sup>3</sup>/s flow in Tk and 4,500m<sup>3</sup>/s flow in Ng

## Cyclone Gabrielle

As per the NIWA review report, in terms of peak flows, the Cyclone Gabrielle event was assessed to be:

- A 980-year return period event in the Tutaekuri River (Puketapu) site. This recorder station was damaged during the event and breaches and overtopping were noted out of the system at Moteo.
- A 710-year return period event in the Ngaruroro (Fernhill).
- An 80-year return period event in the lower Tukituki. However, breach flows upstream at Walker road would have affected flows in the lower sections of the Tukituki.

Post cyclone estimates (used to inform future scheme performance expectations) reduce the ARI to 400-year ARI in the subject catchment areas. **This means the Cyclone Gabrielle event is similar to the proposed overdesign event scenario (500-year/0.2% AEP).**





## Scheme performance - Channel Fairway & Berms

- Overall performance of the channel fairway, bank protection, and buffer vegetation, was very good given the scale of the flood event.
- Aside from breach sites-river bank & berm erosion was negligible. Stopbank erosion on riverside batter slopes only occurred in unusual circumstances i.e. Pakowhai & Taradale.
- The concept of a clear channel fairway of adequate & uniform width, bounded by vegetation buffer zones, and with adequate berm separation to stopbanks, was well proven.

### Bridges

- Tutaekuri River Bridges such as Puketapu, Redclyffe, and Brookfields, as well as the Rail and SH51 Waitangi Bridges, all trapped substantial volumes of woody debris.
- They also caused waterway obstruction, and contributed to increased stopbank overflow and breach.
- In practice the bridges, although owned & maintained by authorities other than HBRC, are key elements of the HPFCS.





## Assessed scheme performance

A number of breaches and scours were noted in Heretaunga, including:

### Tutaekuri

- Major breaches at Moteo and Dartmoor leading to inundation along Swamp Rd.
- Scour and breaches at Omarunui section.
- Major breaches and scour of Ebbets stopbank (private)
- Major breach at Awatoto leading to inundation of industrial area and Napier WWTP
- Out of channel flows into Waiohiki community (no stopbanks present).
- Scour on toe of Taradale Stopbank (recently upgraded to 0.2%AEP). Water was at crest level of new bank.





### Ngaruroro

- Breaches on small stopbanks at Ohiti Rd
- 5 breaches and 20 overtopping scours at Omahu to Fernhill (the overtopping was effectively all the way to SH2 expressway)
- Failure at Confluence (overtopped from landward side)
- Scour and 2 breaches at Raupere section.
- Minor scours and overtopping at Lower Raupere section
- Overtopping and scour damage at Farndon Rd.

### Lower Tukituki

- No damage noted and flood levels were contained within stopbanks.
- Berm scour at Tennants Rd deflection access ramp





## Key observations

- Most of the Heretaunga stopbanks comprise gravel core with silt overlay.
- Most breach sites were clearly as a result of overtopping and headward erosion/scour developing into full breach.
- A handful of sites may have had some level of piping failure associated (around old penetrations). However, this is still likely a secondary failure mode.
- **In summary, the current stopbank geometry is vulnerable to erosion**

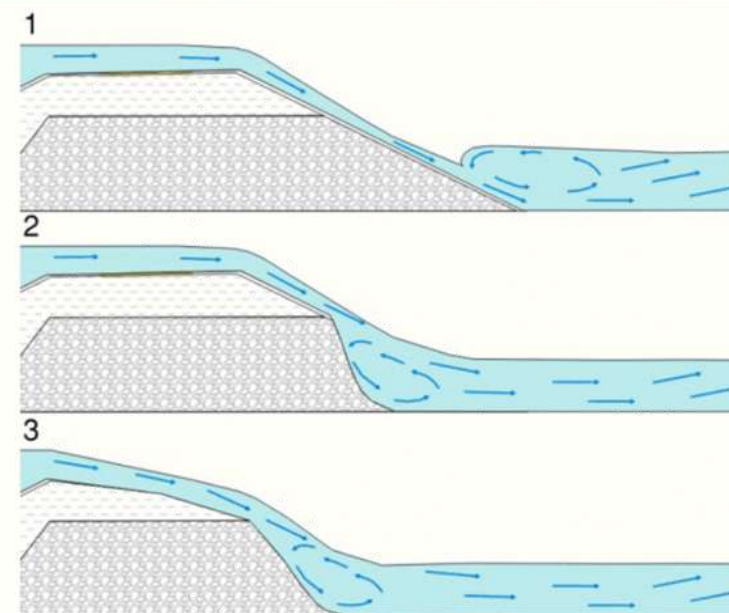
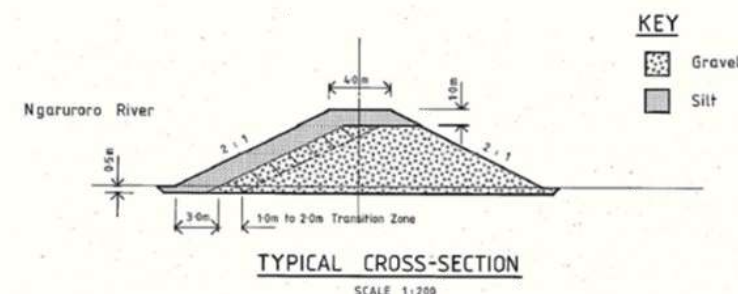


Figure 9- A schematic diagram showing the progression of overtopping to scour to eventual breach.

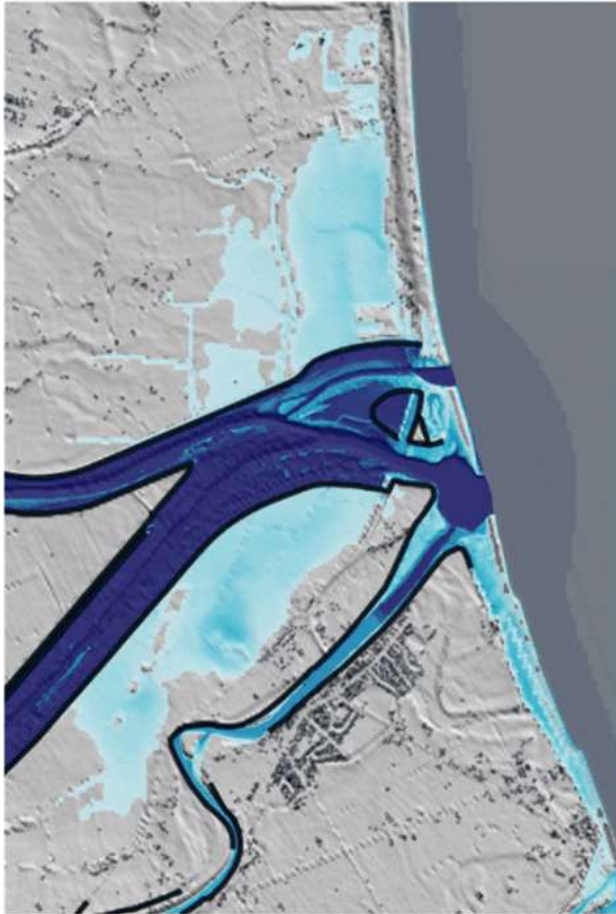


## Key observations cont..

- Bridge approaches, access ramps and deflection banks caused localised overtopping.
- Vegetation management could be improved adjacent to some stopbanks to create a clear back berm. Well cleared sites performed better (i.e. Pakowhai Park area).
- Limestone pathways are vulnerable to scour and require particular care with design and construction.
- Aside from the areas of gross overtopping, the stopbank network performed well (there is no evidence to suggest seepage is a primary failure mode).







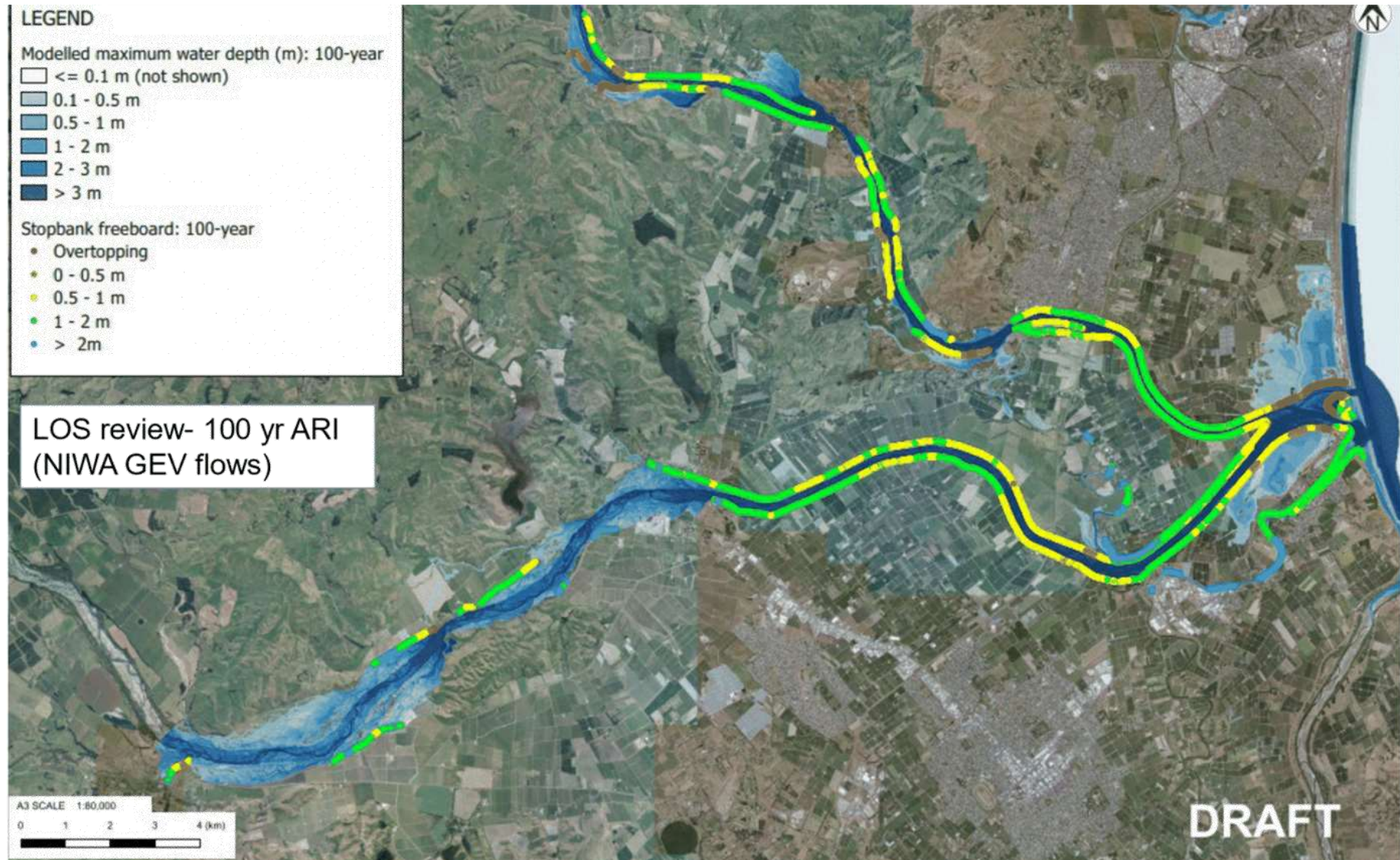
## Hydraulic model results

Several scenarios have been modelled:

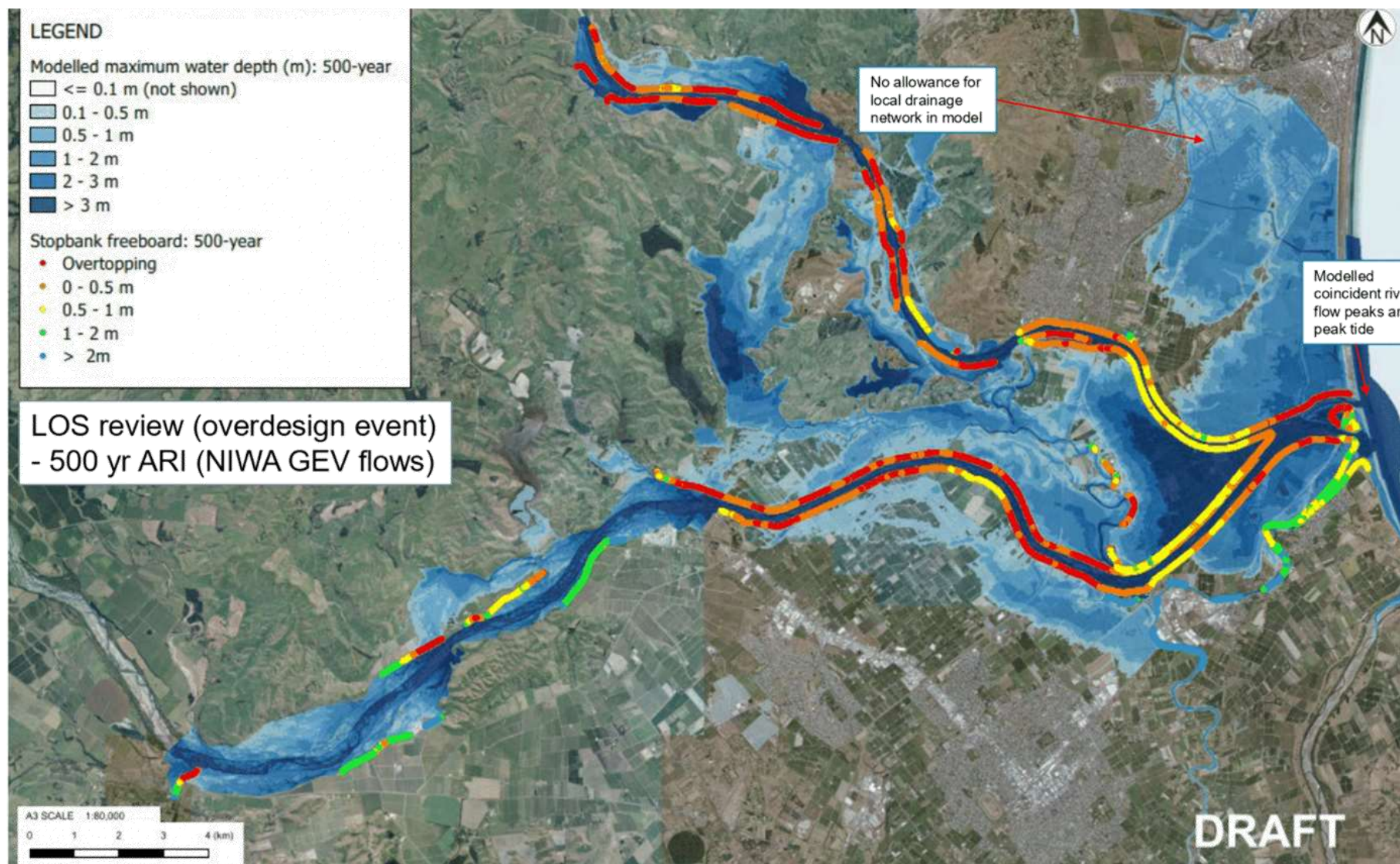
1. 100-year ARI 'design LoS' event
2. 500-year ARI 'overdesign' event
3. Taradale-Awatoto stopbank raise
4. Awatoto secondary bank
5. Moteo stopbank raise

Several other model runs are being undertaken presently.

Models runs use NIWA advised peak flows







## Cyclone Gabrielle event performance

Cyclone Gabrielle was assessed to be an overdesign event in terms of peak flows.

The observed Cyclone Gabrielle performance was similar to that modelled by the post-cyclone 500 yr ARI model (0.2% AEP). There is large flooding predicted in Napier but this does not account for local drainage schemes, pump stations and assumptions of downstream boundary conditions need to be checked.

**Post Gabrielle flood frequency updates (NIWA report) means that achieving a 500 yr (0.2% AEP) design service level will require significant investment.**

**It is unlikely to be practical to accommodate these flows in the primary stopbank network alone.**



# Preliminary Improvement opportunities Tonkin+Taylor

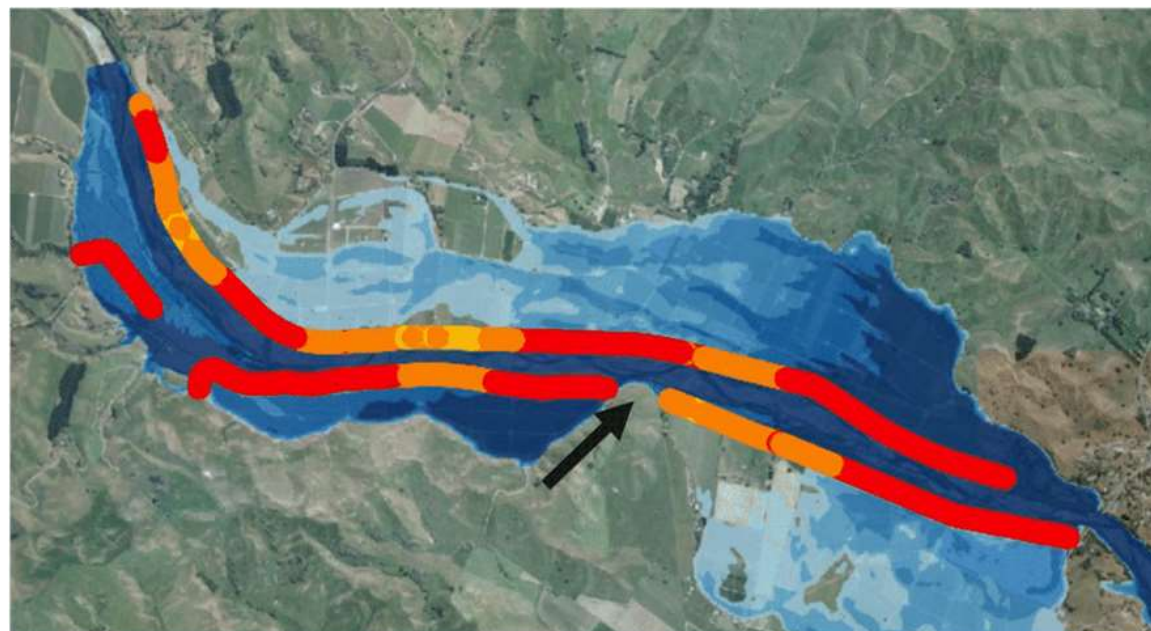
Priority improvements proposed at:

1. Awatoto/Mouth- Long- and short-term options considered
2. Taradale
3. Moteo
4. Omahu
5. Raupere/Farndon

**Across much of the scheme, stopbank cross section will need to be amended to provide resilience to overtopping.**

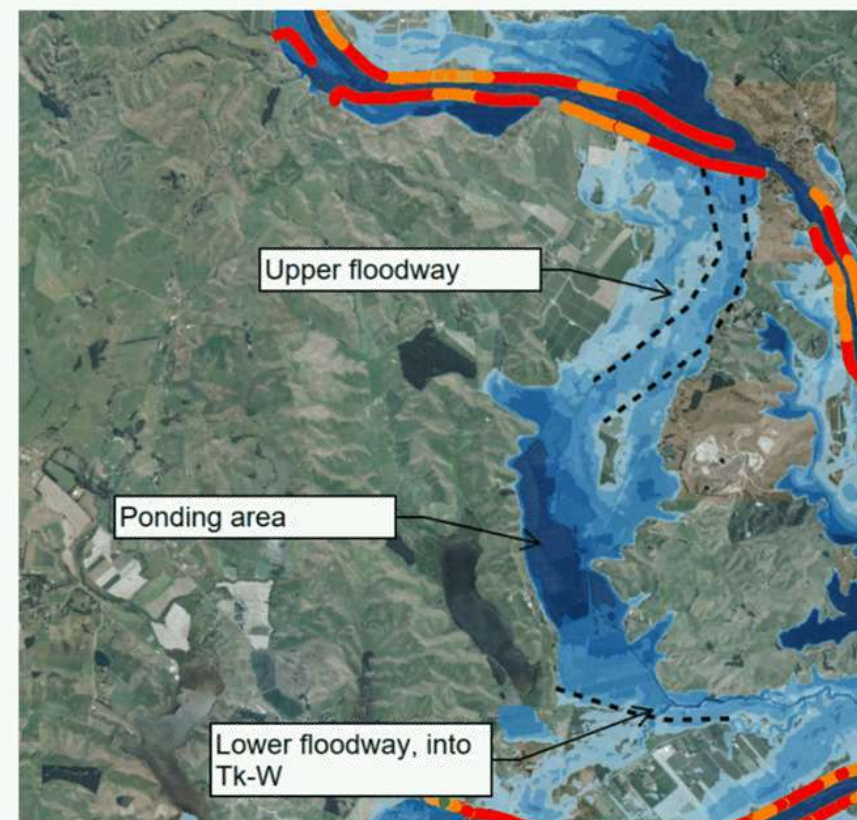
## Upper Tutaekuri

- River corridor is highly constrained. Narrowed and stopbanked following 1980s review.
- Dartmoor area could be realigned to provide the river more room. Set back from headland on southern bank.
- Ebbets bank could be decommissioned to provide floodplain capacity.
- Moteo- Previously proposed for stopbank raising. Acts as strategic spillover point.
- Downstream effect of raising Moteo bank: Raising stopbanks confines flow, increasing water levels within channel



## Moteo Floodway Concept

- Headland at Moteo and Puketapu creates narrowing of flood channel & chokes flow.
- Option to divert overtopping flow into Swamp Rd area over Moteo stopbank (either as passive strengthening or dedicated spillway). Takes small amount of peak off downstream network.
- Contain flood flows into wide channel, with narrow low flow channel. OR let it follow natural topography.
- Major reconfiguration of Tk-W scheme
- Requires significant property acquisition.
- Community, Cultural and environmental impacts?
- Downstream effect: More water diverted into Tk-W





## Moteo floodway concept- NZ examples

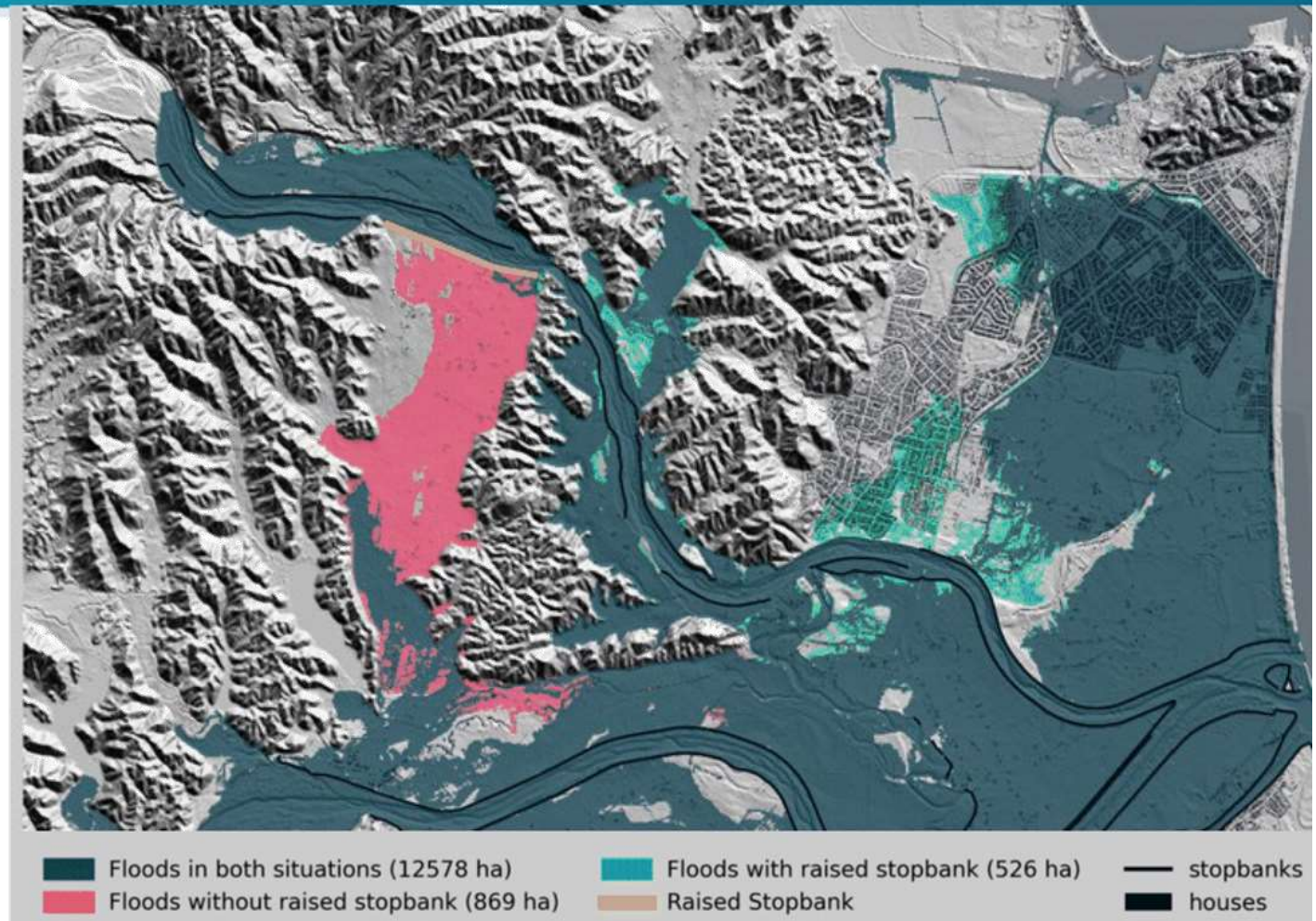
- NZ precedent. Lower Manawatu scheme (Moutoa)
- Borck Creek – Nelson/Richmond –much smaller scale
- Oporua floodway – Lower Wairarapa Valley Development Scheme
- McPhails floodway – Waipaoa River Flood Control Scheme





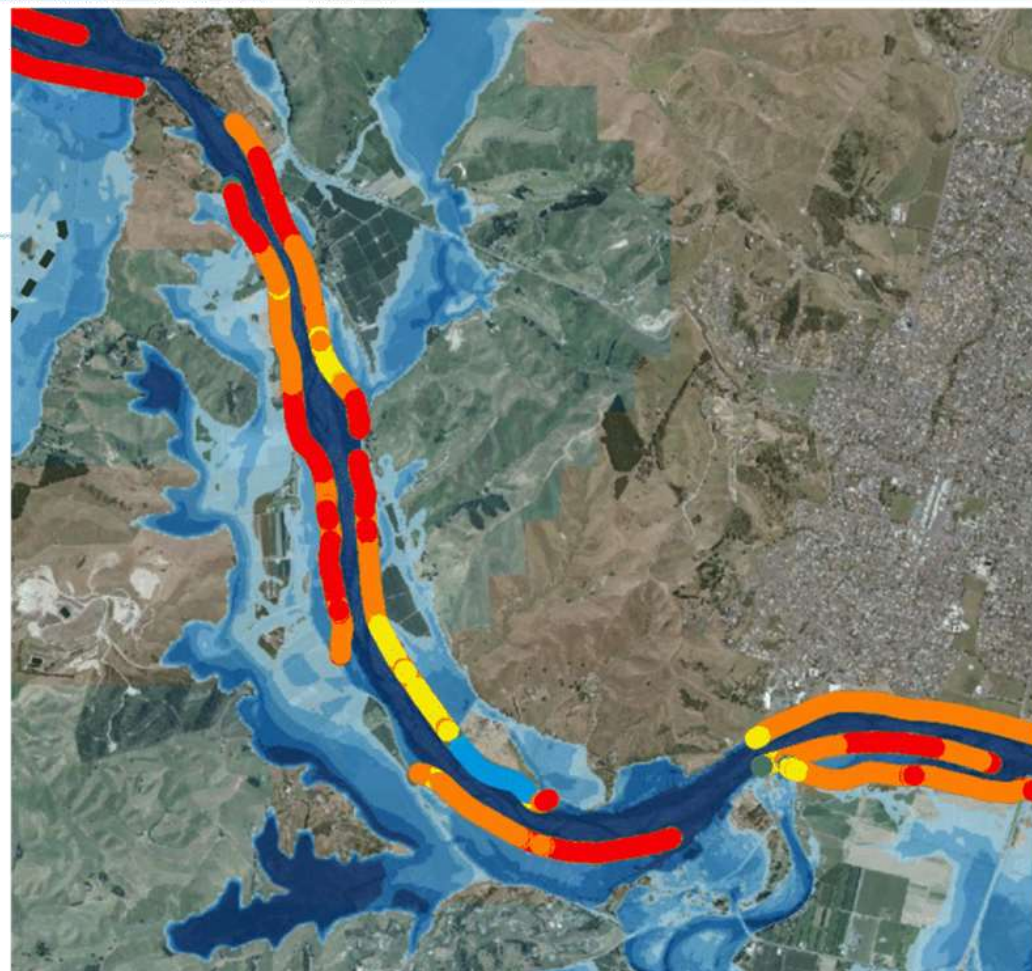
## Moteo stopbank raise option

- Raising Moteo stopbank may require stopbank 6m high (needs to be at the level of Vicarage Rd).
- Results in increased flood levels downstream, including overtopping into Taradale.
- Springfield Rd, Taradale-Meanee stopbank may also require raising if Moteo considered.



## Mid Tutaekuri

- Omarunui Bank- **Old stopbank, requires substantial rebuild.**
- Springfield Rd- Protects left bank incl NCC landfill site and Redcliffe Substation.
- Taradale-Model suggest freeboard is very minimal. Matches observations during Cyclone Gabrielle. **Further crest raise recommended. Toe erosion protection recommended.**

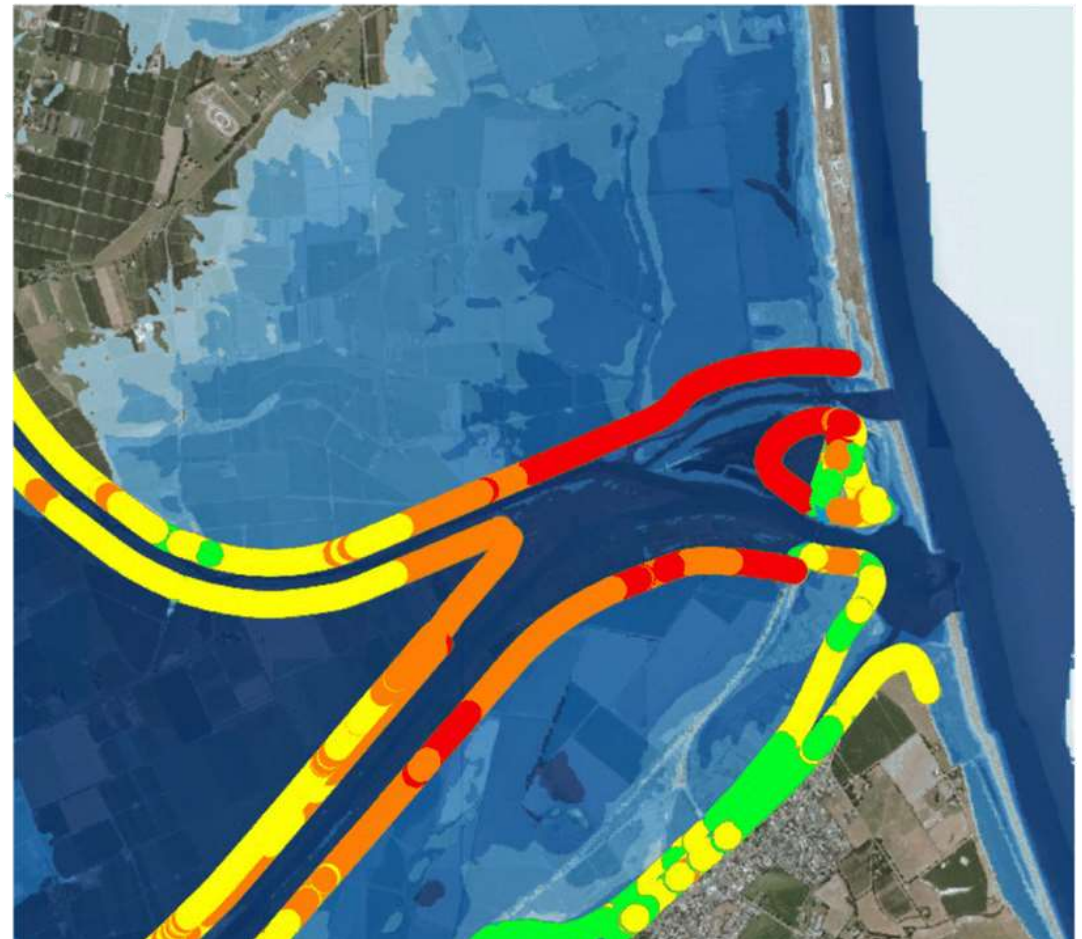




## Lower Tutaekuri

Awatoto – Major works required. Highest priority due to poorest performance, extent of flooding and effects on critical infrastructure. Options considered.

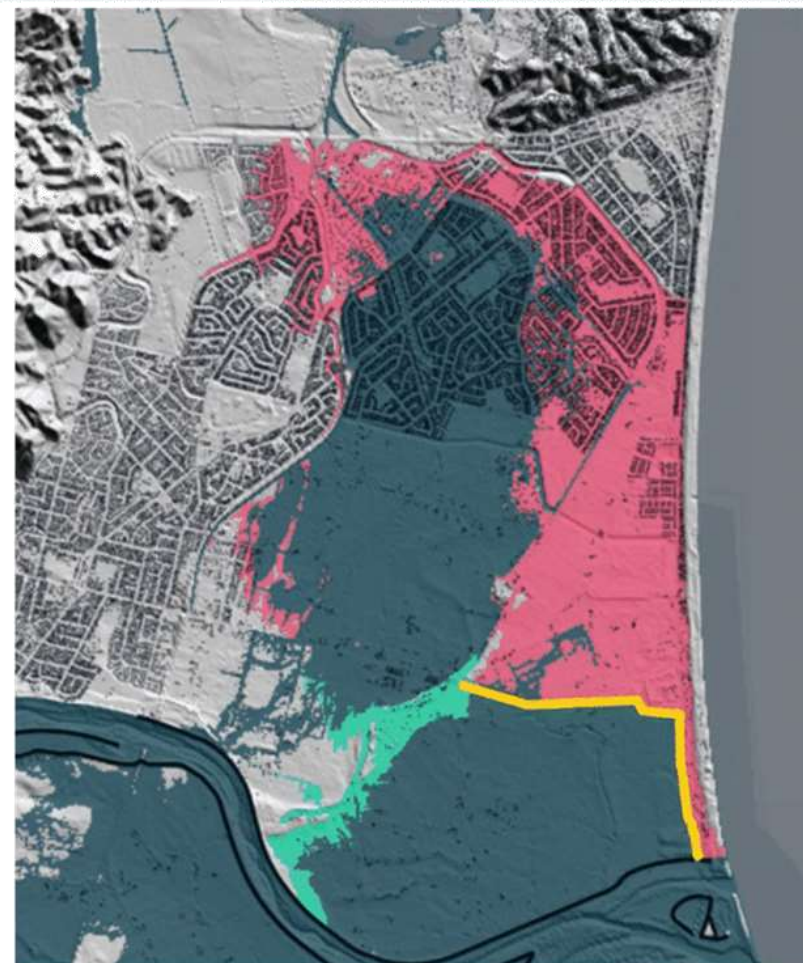
1. Improve mouth outfall channels?
2. Secondary stopbanks and ponding area?
3. Stopbank raise, strengthening and resilience.
4. Raised road and rail crossings? TREC input?
5. Pump station improvements for local drainage.





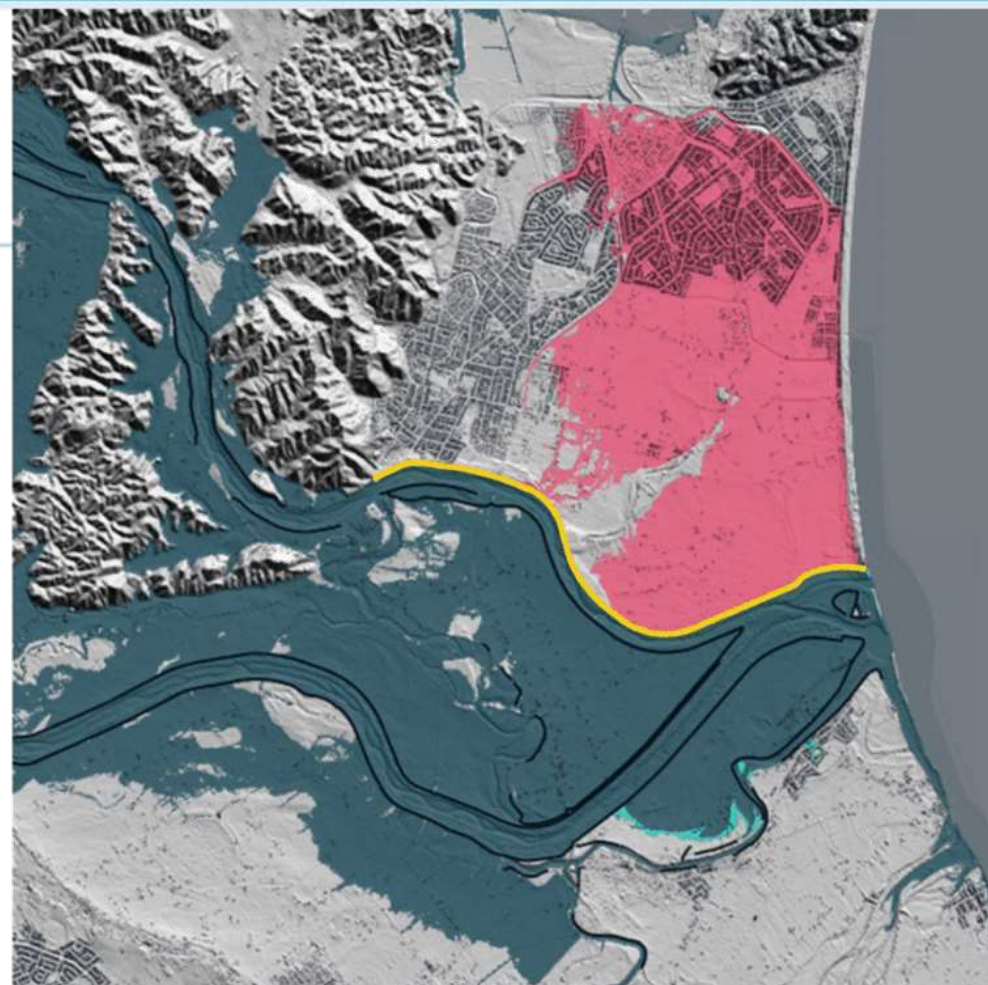
## Awatoto Secondary bank option

- Secondary stopbank (approx. 2m high) to protect industrial area and south Napier area.
- Appears to be outflanked through Meanee in large events but does provide improvement
- Could be expanded with further secondary banking to further improve resilience.



## Taradale-Awatoto stopbank raise option

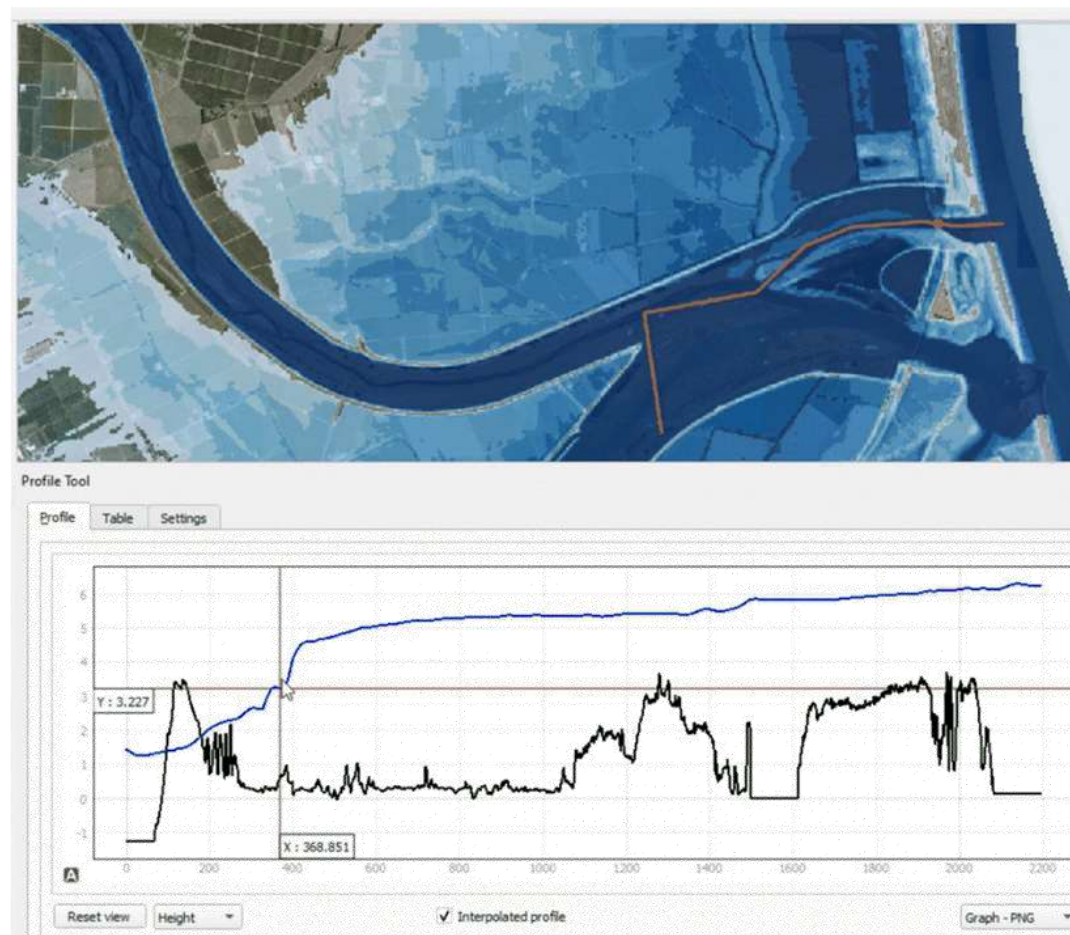
- Appears to be effective in managing 500 yr event with minimal adverse effects.
- Stopbanks will need to be raised significantly (circa 1-2m). Will require careful design and seepage controls.
- Does not provide redundancy or secondary protection.
- Road and rail crossings at mouth would need to be raised significantly.





## Awatoto mouth improvements

- Currently overtops in 100 yr scenario
- Flood flows are constrained by current road/rail abutments (on both Tk and Ng side).
- Long term solution could include progressive improvements to bridge crossings AND primary / secondary bank works.
- Lengthening (and raising) bridge spans would improve conveyance.
- Aggradation (silt build up) in lower reaches to be reviewed.



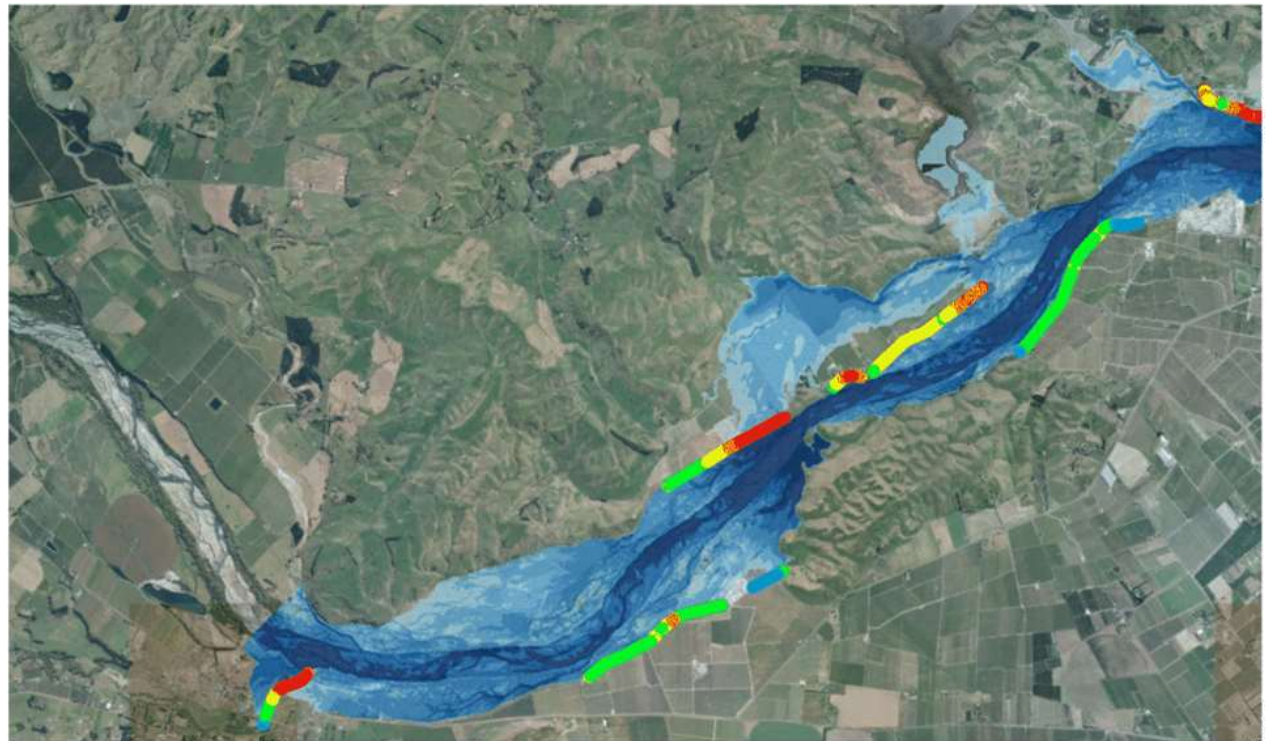


## Awatoto –Mouth improvement options



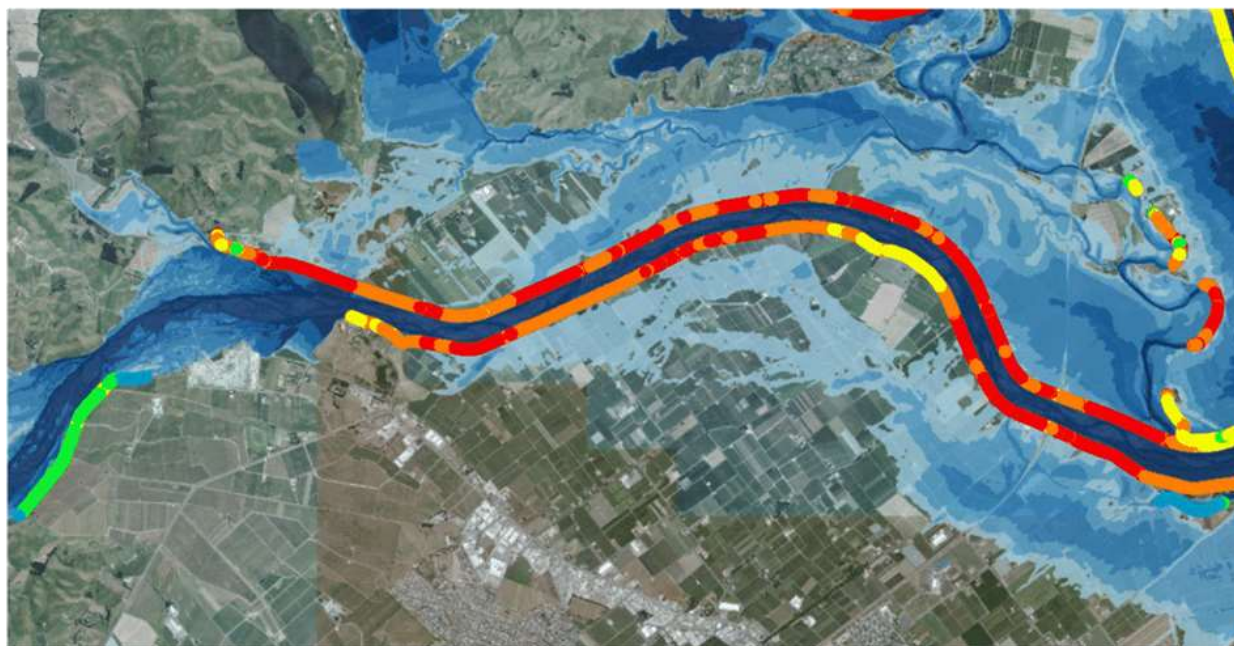
## Upper Ngaruroro

- In 500-year event, Ohiti Rd banks outflanked or overtopped. Consider realignment to provide river more room.
- Roys Hill and Ngartarawa sites appear to have ample freeboard.



## Middle Ngaruroro

- Deflection banks and access ramps should be reconfigured on both banks.
- Stopbank resilience measures required, such as flattening batter slopes, erosion matting or cement stabilising to mitigate overtopping scour.
- Freeboard is limited along the length of both banks in 500-year event. Consider widening stopbank corridor or raising.





## Middle Ngaruroro (Omahu) cont..

Options to consider could include:

- Stopbank crest raise and resilience (batter treatment)
- Stopbank set back and corridor re-alignment
- Combination of the above, plus controlled spillway into Tk-W
- Combination of the above, plus spillway, plus secondary banks/channel

Options will need to consider land acquisition requirements

Access road to be realigned and crest levels reviewed

Realignment to provide more channel capacity?  
Wider stopbank required

## Omahu Section- channel alignment

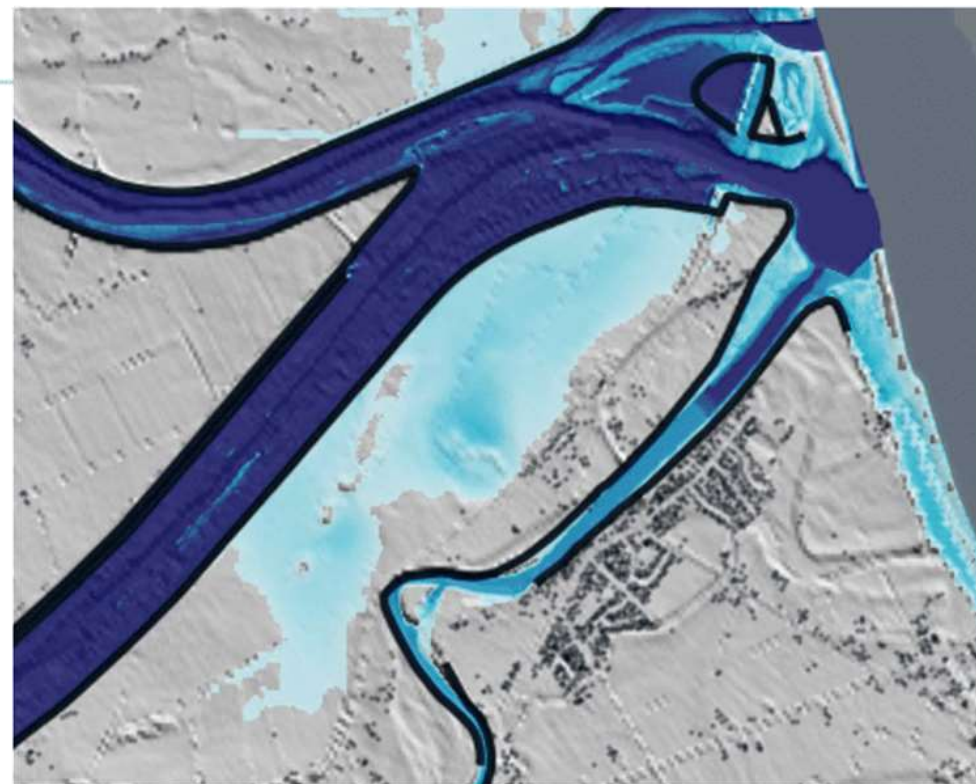
- Opportunity to widen channel fairway, & increase river & bridge waterway capacity at Fernhill/Omahu.
- Need to confirm bridge pile depth adequacy & new rock lining/channel design requirement.



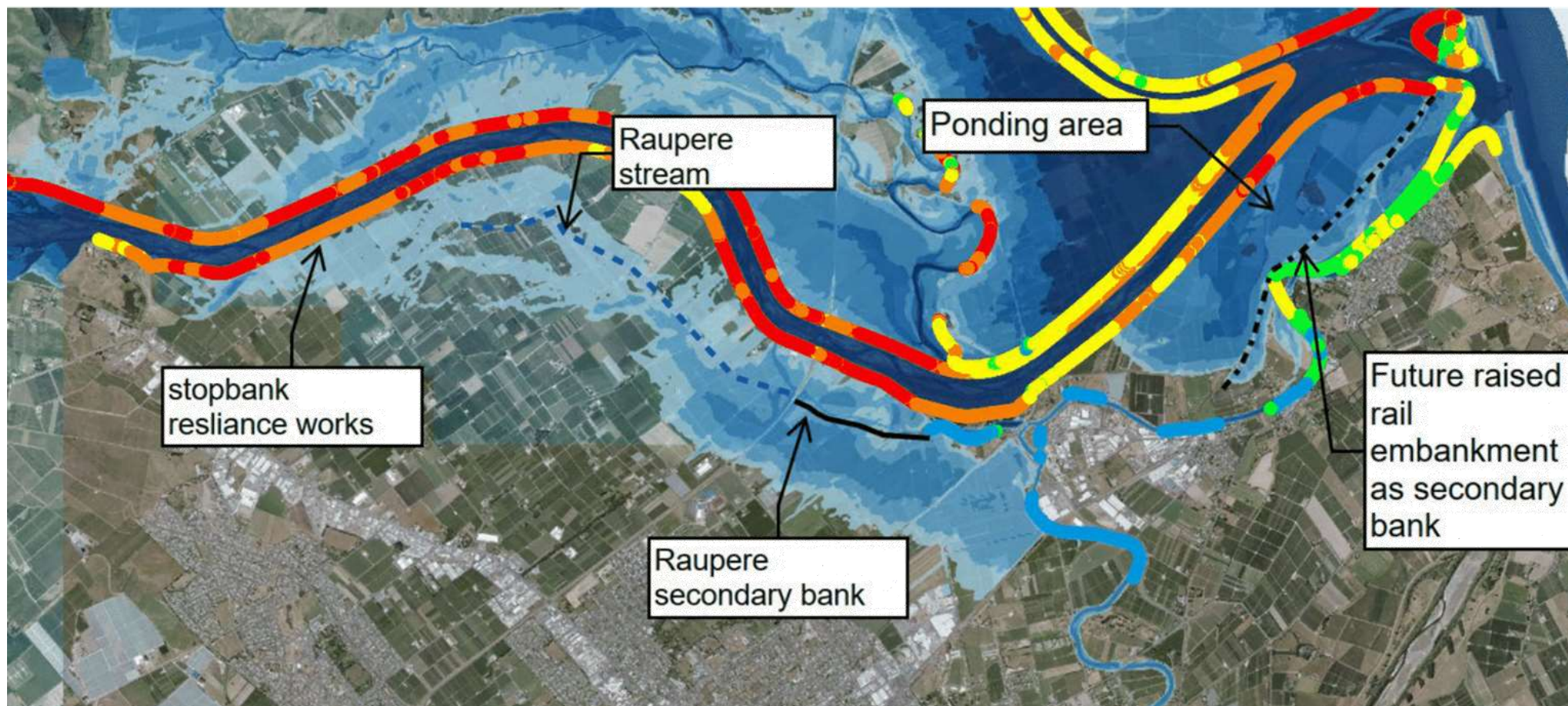


## Lower Ngaruroro

- Lower Farndon Section overtopping in 100-year ARI event.
- In larger events, flood impacting Nth side of Clive.
- **Consider combination of ponding areas and secondary banks?**
- Road and rail corridors to be raised and act as secondary stopbanks?

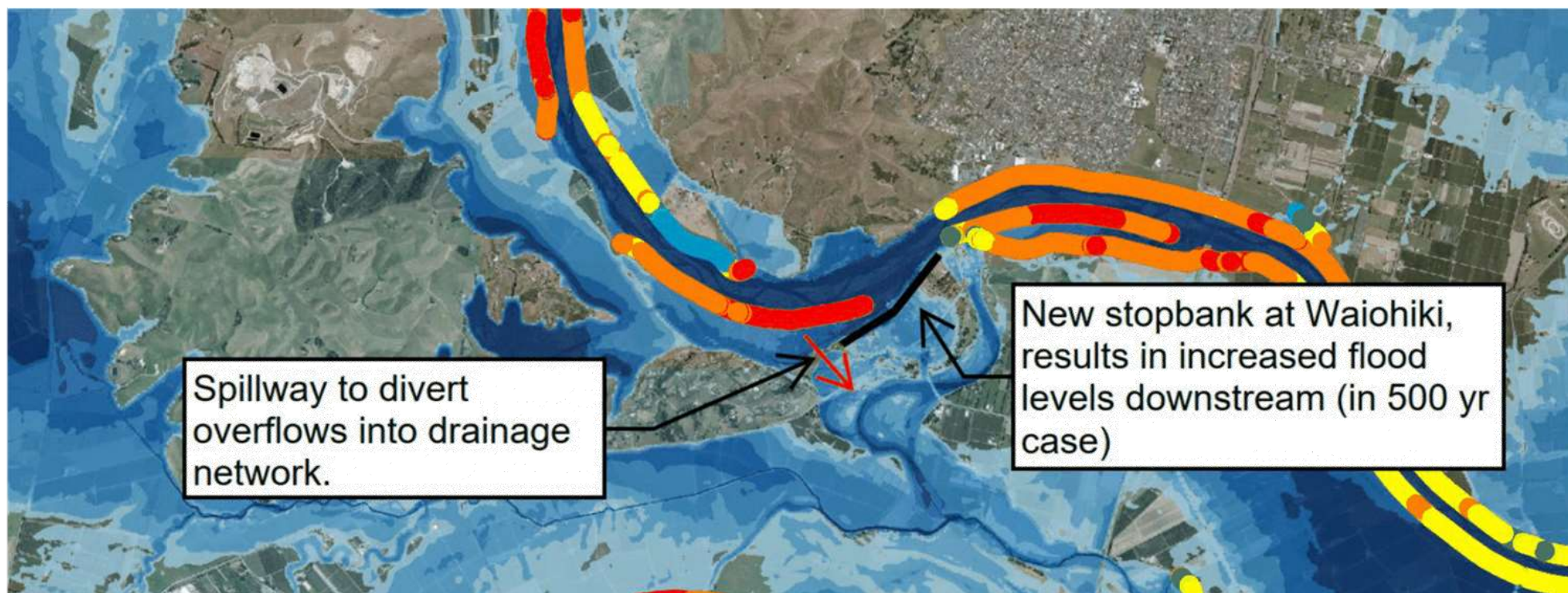


## Lower Ngaruroro Cont..





## The role of spillways



## Upper Catchment Initiatives

- Large scale flood detention unlikely to be cost effective in upper catchment (incised gullies, active faults, geotechnical limitations)
- Planting and erosion control supported but limited likely to have minimal impact in extreme event.
- Small catchment scale wetlands, ponding areas and flood detention dams/bunds feasible but would require adoption on masse.



## Upper catchment cont..

- Reduced woody debris input from riparian margins.
- Woody debris capture at strategic locations? Improved forestry management?
- Gully erosion in upper Tutaekuri near Rissington. Typical of upper-mid catchment land use.



## Conclusions

- Cyclone Gabrielle has been assessed as an overdesign level event for the HPFCS
- The scheme was overwhelmed by overtopping along much of its length. Major breaches were generally a result of overtopping and headward erosion.
- There is currently no provision for managing overdesign events.
- Limited hydraulic modelling has been undertaken to assess scheme performance. The 500-year ARI event generally simulates an event close to Gabrielle.
- Most of the scheme can pass the 100-year event aside from coastal areas (Awatoto) and some upper scheme areas.
- Bridges and other hydraulic controls (i.e. headland features, bottlenecks) have a significant effect on scheme performance.



## Conclusions

- Scheme performance should be considered holistically (e.g. raising stopbanks may result in adverse effects elsewhere).
- Improvement opportunities proposed include:
  - Making room for the river- Where practical to do so (i.e. Dartmoor)
  - Secondary stopbanks, ponding areas (Moteo, Farndon lower, Raupere lower)
  - Stopbank batter strengthening (Chesterhope/Raupere Upper)
  - Stopbank raising –Where there is no other practical option (i.e. Taradale)
  - Spillways to divert overflows into managed areas (i.e. Waiohiki)
- **It is unlikely to be practical to contain the new 500-year/0.2% AEP flood within a primary stopbank network alone.**



# Upper Tukituki Flood Control Scheme Review

HBRC Council Workshop

31 July 2024

The information presented in this workshop represents a preliminary list of potential options for consideration.

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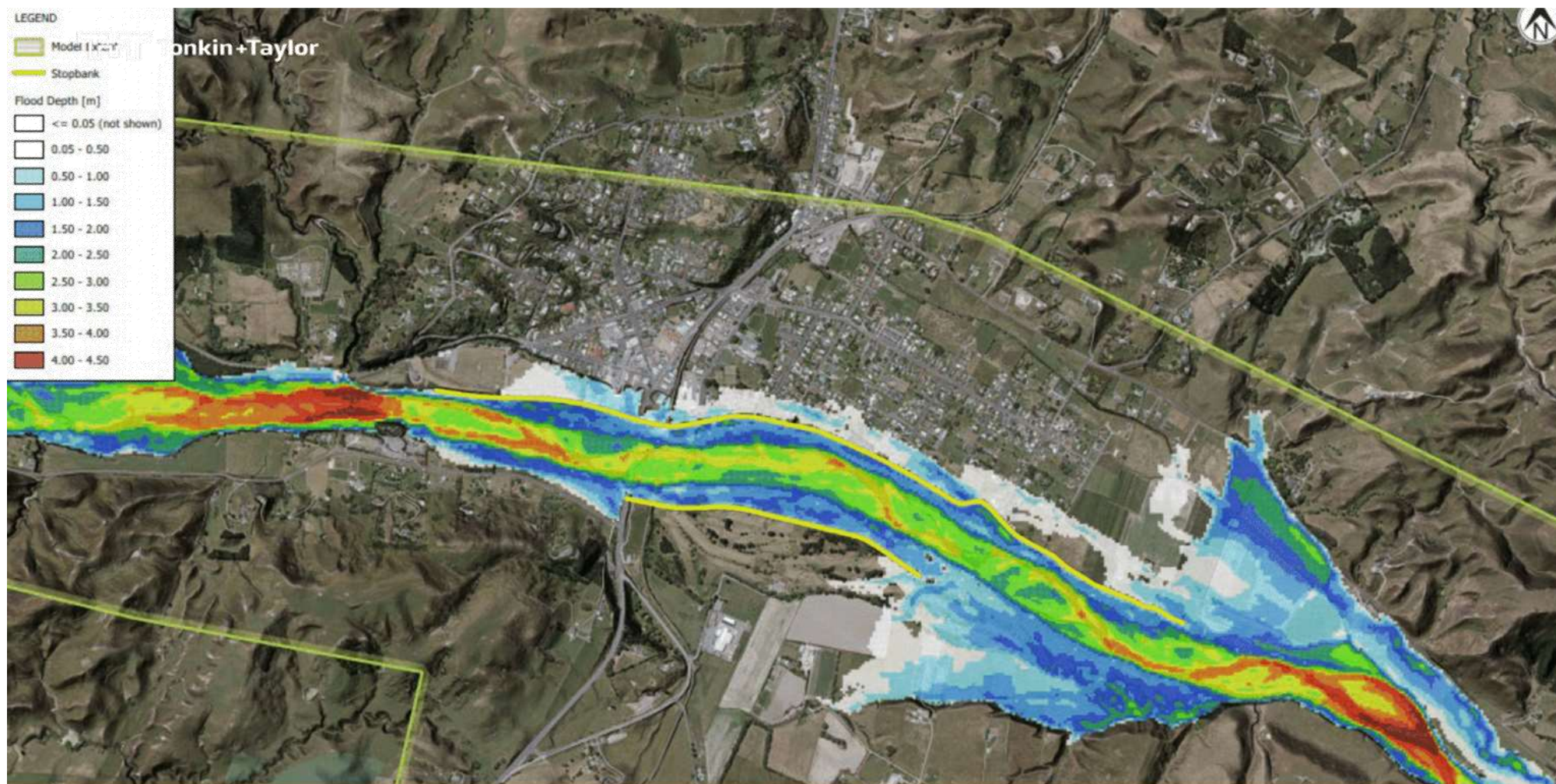
The proposals have not been approved or endorsed by the council.





## Purpose and agenda

1. Overview of the Upper Tukituki Flood Control Scheme review (what and why) (*Issue 1 report delivered to HBRC 18 June 2024*).
2. Assessed scheme performance during Cyclone Gabrielle.
3. Expected performance during future Level of Service (LoS) and overdesign events.
4. Shortlisted improvement opportunities.
5. Scheme review conclusions and recommendations.



*Overview of the UTTFCS review*

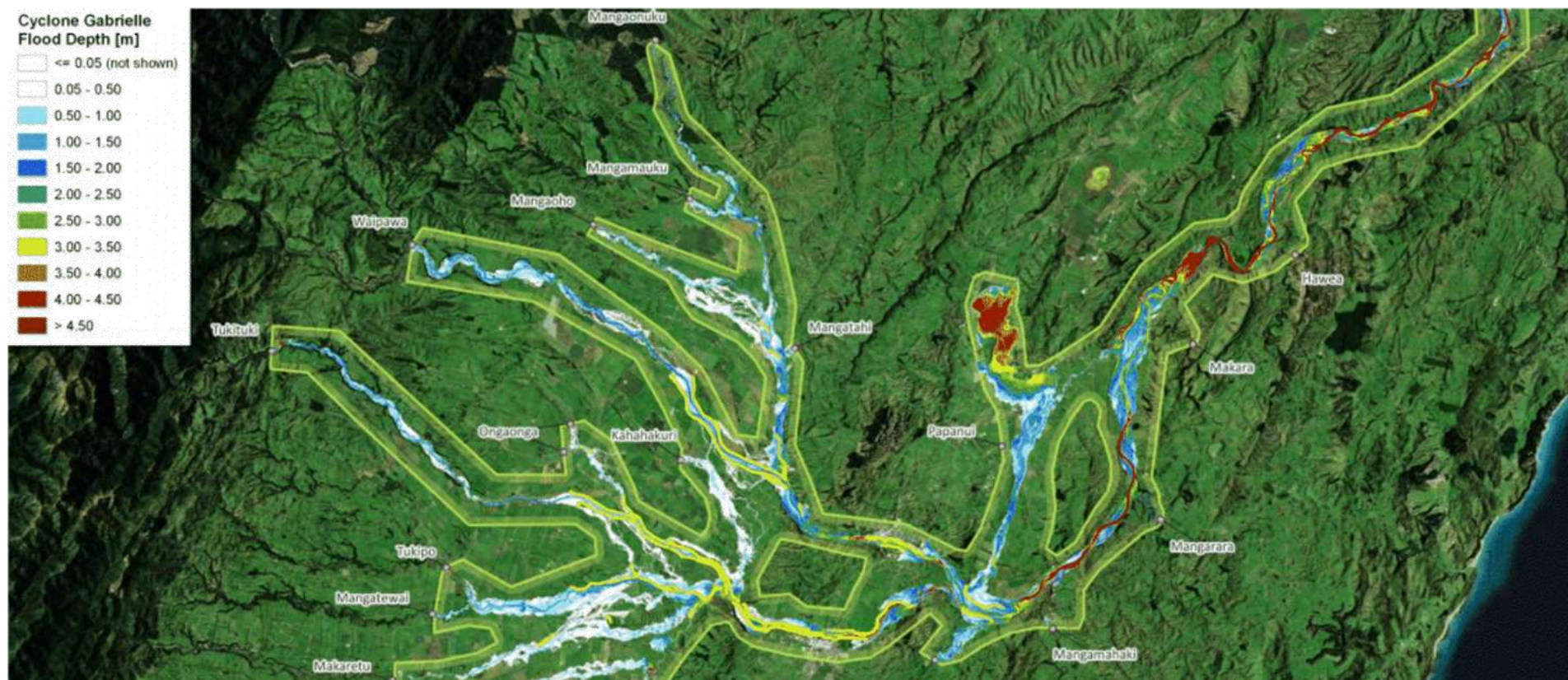


## Scheme review purpose

The purpose of the scheme review is to:

- Evaluate the effectiveness of the scheme in achieving the objectives.
- Evaluate the current Level of Service that the scheme provides.
- Identify the strengths and weaknesses of the scheme.
- Identify opportunities for improvements and recommend changes to the scheme, where appropriate
- Address emerging challenges that may affect the scheme (e.g. climate change, land use changes, over design event mitigation etc.).
- Ensure the scheme remains relevant to the changing needs of the stakeholders and the community.

# Assessed scheme performance and level of service (LoS)





## Cyclone Gabrielle

As per the T+T 2024 UTTFCS Review report, in terms of peak flows, the Cyclone Gabrielle event was assessed to be:

- Between a 500 to 1000-year ARI event in the mid-catchment areas covered by the scheme (Waipawa at RDS, Tukituki at Tapairu Road and Tukipo at SH50).
- A 300 year ARI event in the Makaroro River (upper catchment area).
- Cyclone Gabrielle would have been a 375 year ARI event at the Red Bridge site, but was closer to 70 year ARI due to Walker Rd breakout upstream.

These ARI estimates are pre-cyclone Gabrielle (based on flood frequency analyses that do not include the Cyclone Gabrielle event) (used for scheme performance in this event).

Post cyclone estimates (used to inform future scheme performance expectations) reduce the ARI to 250 to 400 year ARI in the mid catchment areas. This means the revised 250 year ARI overdraft event is similar to the observed Cyclone Gabrielle event in parts of the catchment.

## Assessed scheme performance

- Cyclone Gabrielle has been assessed as an overdesign level event for the UTTFCS.
- The UTTFCS generally performed as expected during Cyclone Gabrielle with the notable exception of the Walker Road stopbank failure.
- Overtopping damage at discrete locations along the scheme is attributed to overdesign level flows (i.e. the flood was bigger than the LoS event).
- Improvement opportunities have been identified using the performance observations and the hydraulic model. These predominantly focus on the overdesign event given the capacity for a revised LoS (100 year ARI) event appears adequate in many places. However, future climate change impacts have yet to be assessed but are expected to increase the frequency of large floods into the future (i.e. the 100 year ARI design flood may increase).
- Model limitations and outputs are described in the T+T 2024 model build report which should also be referred to when interpreting the presented model results and improvement options based on these.





## Assessed scheme performance

The Upper Tukituki Flood Control Scheme generally performed well during Cyclone Gabrielle in terms of LoS flood capacity and freeboard, noting:

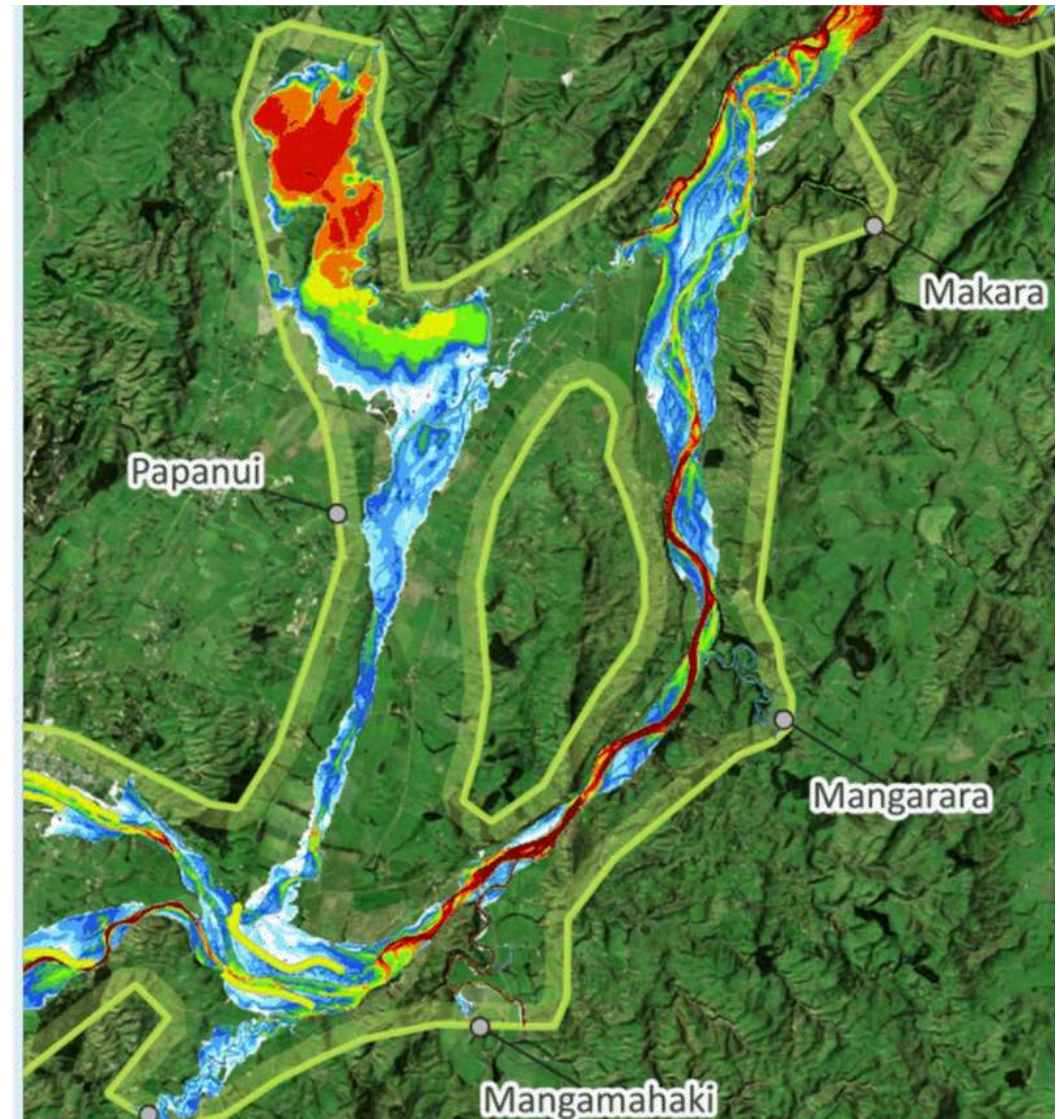
- Waipawa township stopbanks overtopped (due to overdesign flows).
- Walker Rd stopbank breach by structural failure (scour) (not overtopping).
- Smaller scale outflanking/overtopping of Tukituki River stopbanks (overdesign flows)
  - upstream near Ongaonga stream
  - on true left near Waipukurau
  - Taiparu Rd
- Waipawa River movement upstream of SH50
- Waipawa stopbanks just outflanked/overtopped near Mangaonuku Stream



## Categorisation of performance issues

The observed performance issues can be grouped as being caused by the following:

- Flood flows exceeded capacity (height and length)
- Adverse geometry
- Insufficient buffer and berm width
- Limited secondary/overdesign flow provisions





# Shortlisted improvement opportunities

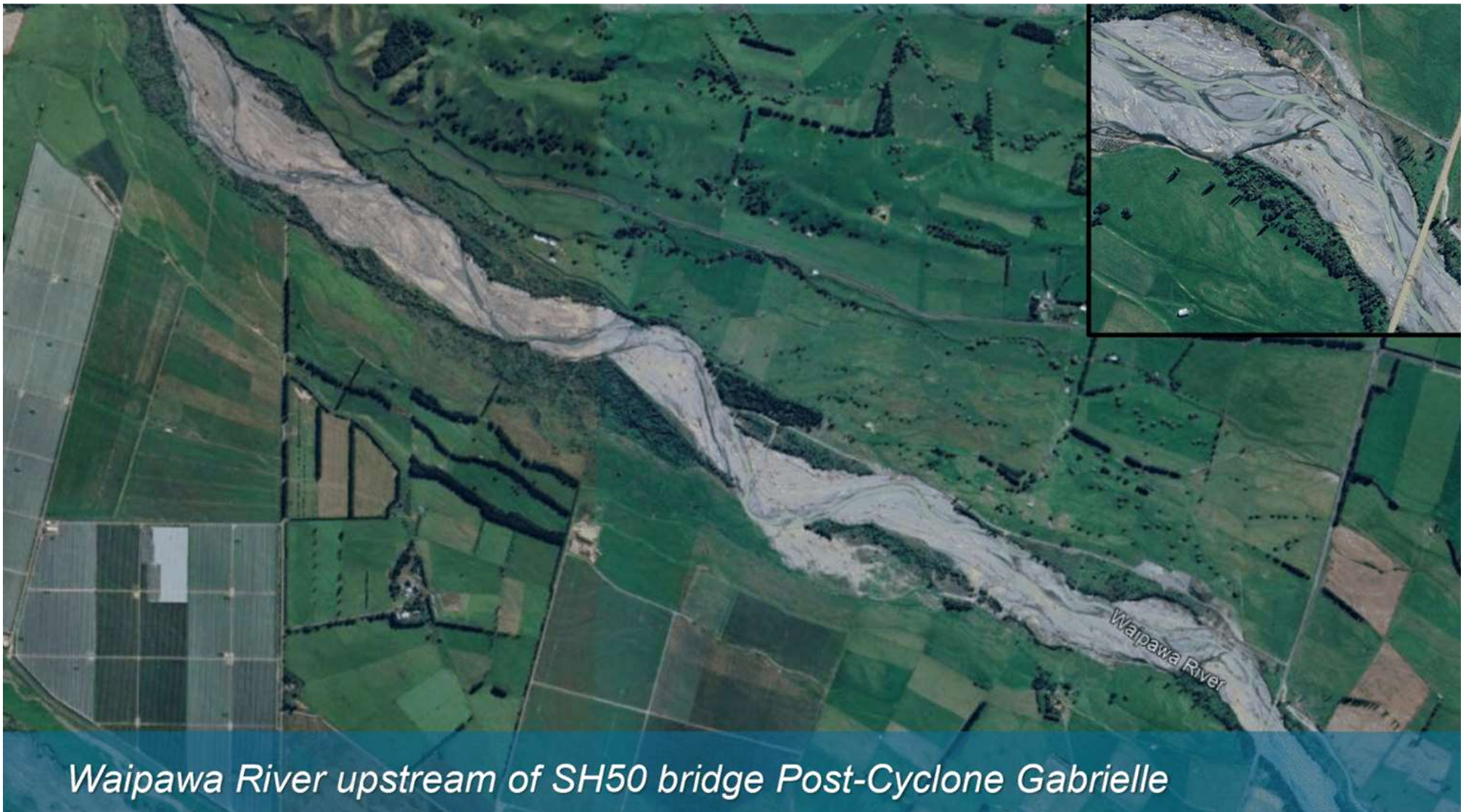


Old Waipawa River floodplain damage from Cyclone Gabrielle. Pourerere and Walker Rds Photo / Mark Mitchell

## Scheme performance expectations and improvement drivers/Qns for Council

- Given observed scheme performance, does the scheme require capacity increases or is the current level of service adequate? (i.e. repair/rebuild to current standard only)
- Are different levels of service acceptable for different locations? (i.e. stopbanks protecting dwellings versus pasture on low lying river terraces)
- Are there readily achievable improvements, especially for overdesign events? (and is 250 year ARI an appropriate criterion for this scheme and where)
- Are these potential improvements cost effective?





*Waipawa River upstream of SH50 bridge Post-Cyclone Gabrielle*



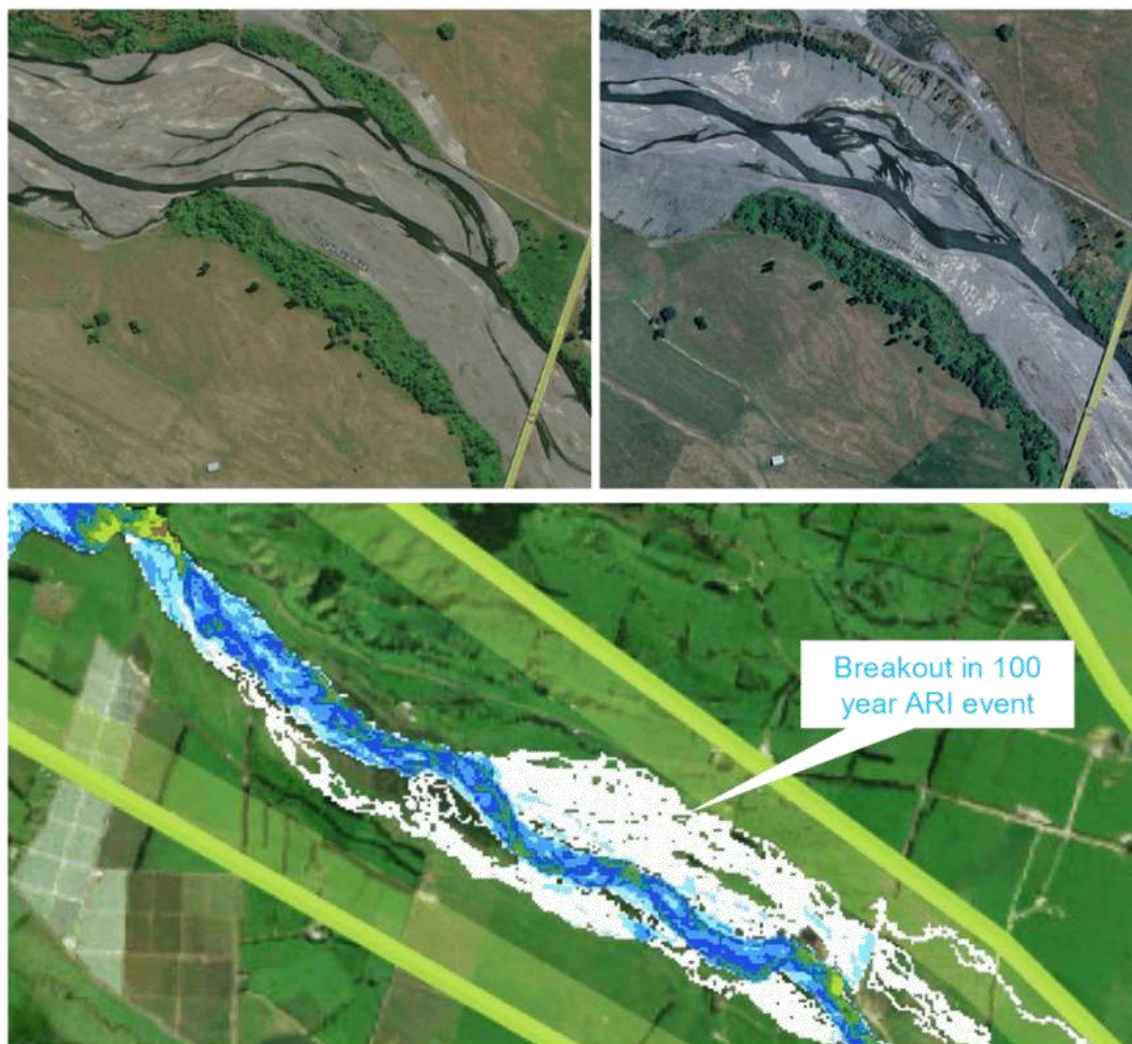
## Waipawa upstream of SH50

Observed performance: River scour to edge protection works due to geomorphological processes (and subsequent event scour).

Purpose: Edge protection was training/constraining river to protected SH50 bridge (which narrows the river).

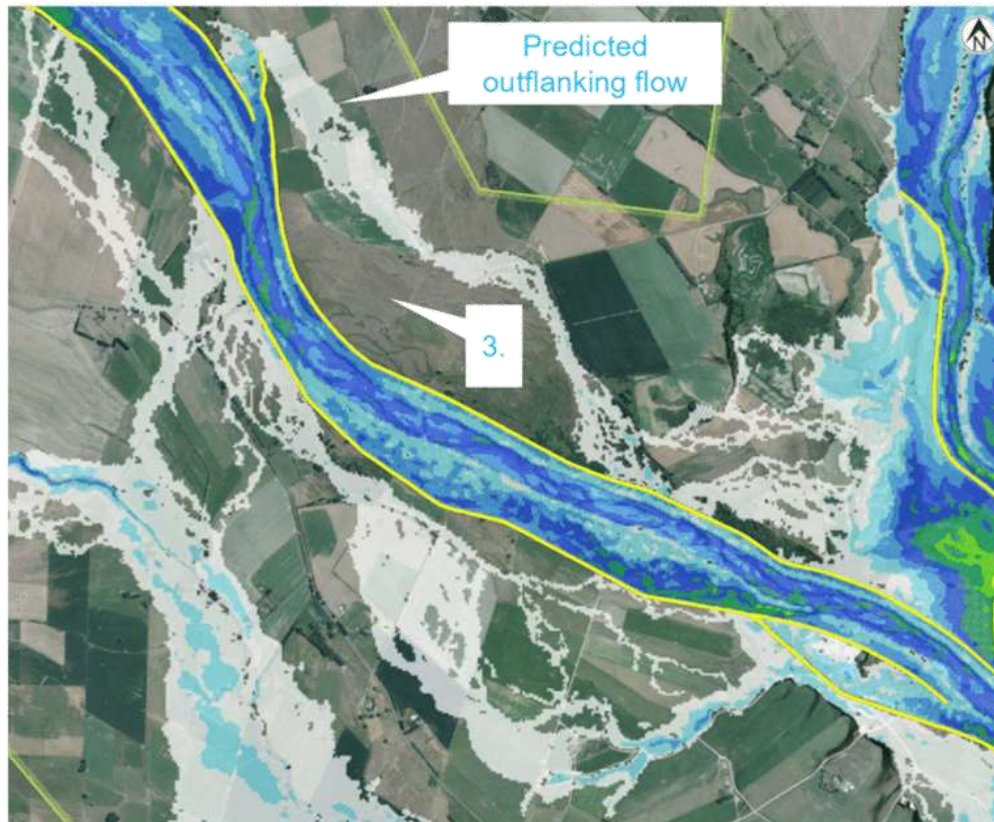
Options include:

1. Accept and repair
2. **Extend edge protection and widen buffer zone with fairway modifications upstream to constriction**
3. **Deflection bund on true left with heavy armour u/s of bridge (concentrates flow & scour under the bridge)**
4. **Extend bridge/secondary flowpath and remove/reduce narrowing at bridge (Needs discussion with NZTA)**





## Waipawa stopbanks downstream of SH50



Observed performance: Stopbanks overtopped on true left and outflanked on true left at local stream.

Modelled performance: Stopbanks overtop true right in 100 year ARI event and outflank on true left (potentially due to d/s constriction)

Purpose: Stopbanks are protecting the farmland.

Options include:

1. Protect right side by raising stopbanks and **develop formal overflow area on true left** (noting Mangaonuku Stream flooding).
2. Raise/extent all stopbanks to contain 250 year ARI event
3. **Secondary stopbank on true left to widen river flood area**

## Waldrom Rd stopbanks

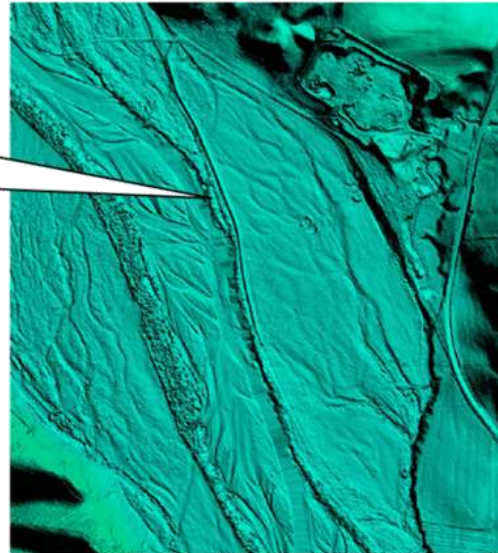
Observed performance: Stopbanks overtopped flooding water treatment plant.

Purpose: Bunds are protecting the farmland and CHB water treatment plant on the true left .

Options include (Need to be discussed with CHB, potentially not for HBRC):

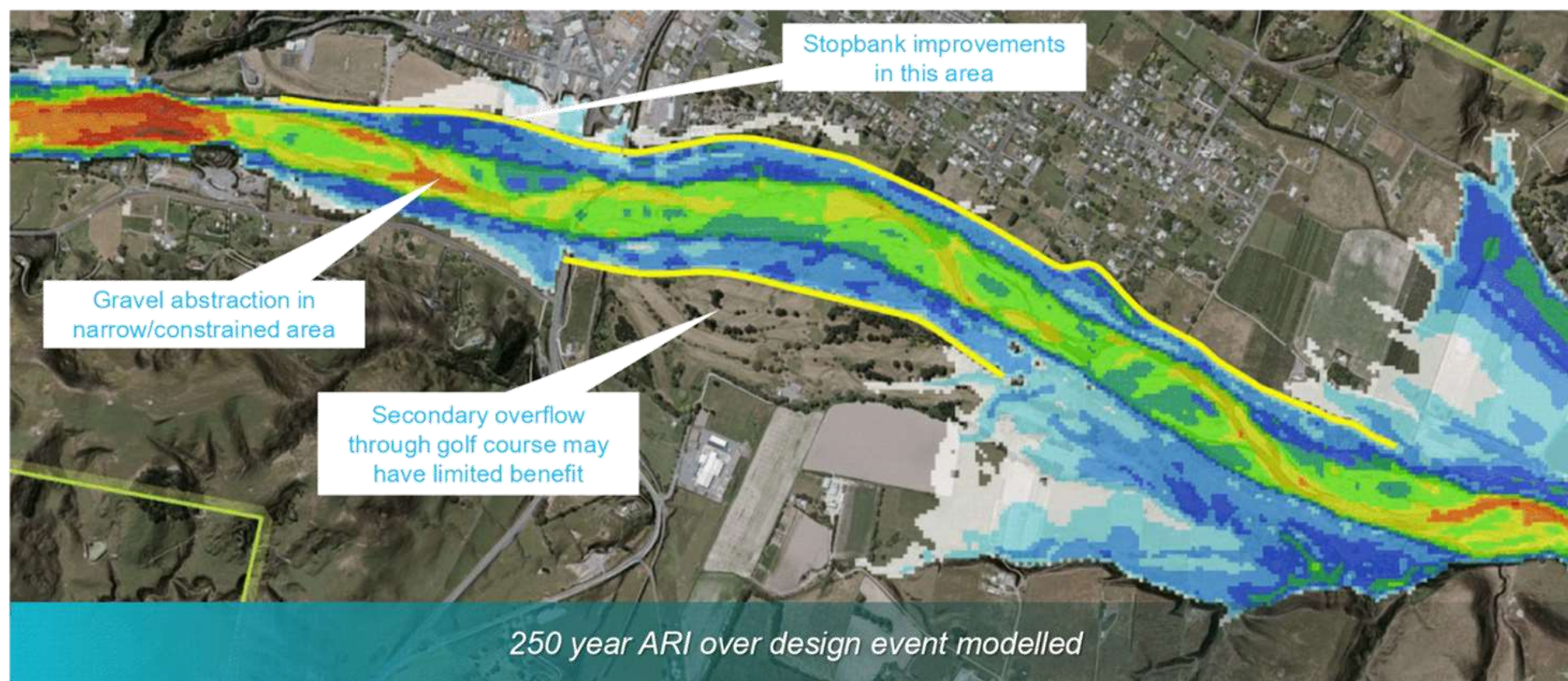
1. Rebuild to previous
2. Abandon and build new bunds around plant
3. Relocate water treatment plant to high ground.

CHB stopbanks, understood to be ~ 20 year ARI standard





## Waipawa at Waipawa Township



# Waipawa Township stopbanks

Observed performance: Stopbanks overtopped at Coronation Park and trapped flow led to secondary failure at SH2 flooding lower lying areas including the school.

Modelled performance: Reinstated stopbanks overtop in 250 year ARI design event.

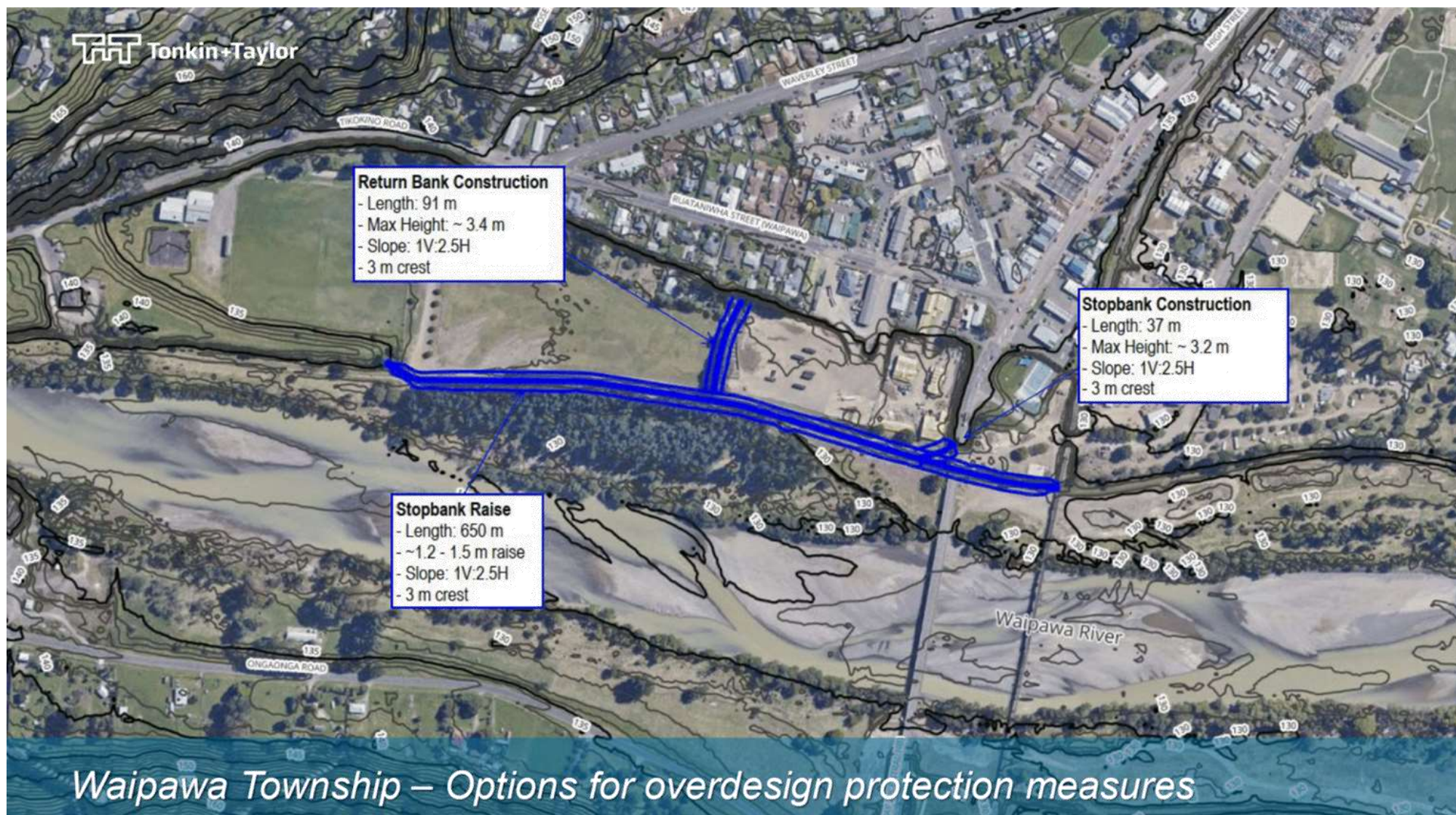
Purpose: Protecting township.

Options include:

1. Rebuild to previous and accept (rapid rebuild)
2. **Modify stopbanks to provide better resilience (higher stopbanks with cutoffs at SH2 bridge)**
3. Allow overflow at Coronation Park and purchase affected properties.
4. **Excavate gravel bed in this area to increase flood capacity (ongoing maintenance costs)**









## Waipawa at Walker Rd stopbanks

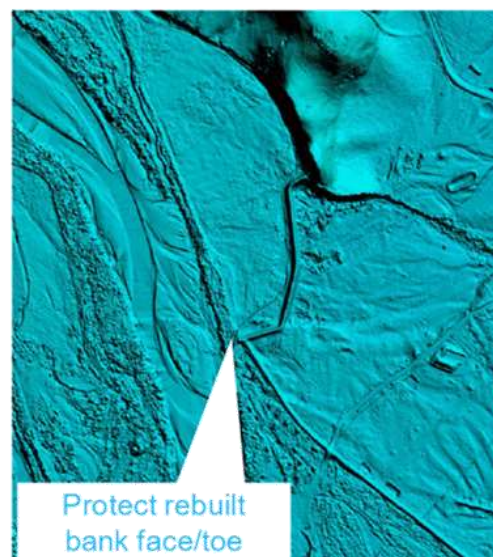
Observed performance: Failure of stopbank due to toe scour. Minor overtopping predicted by model in Cyclone Gabrielle (if had not failed prior)

Predicted performance: Just overtops in 250 year ARI design event.

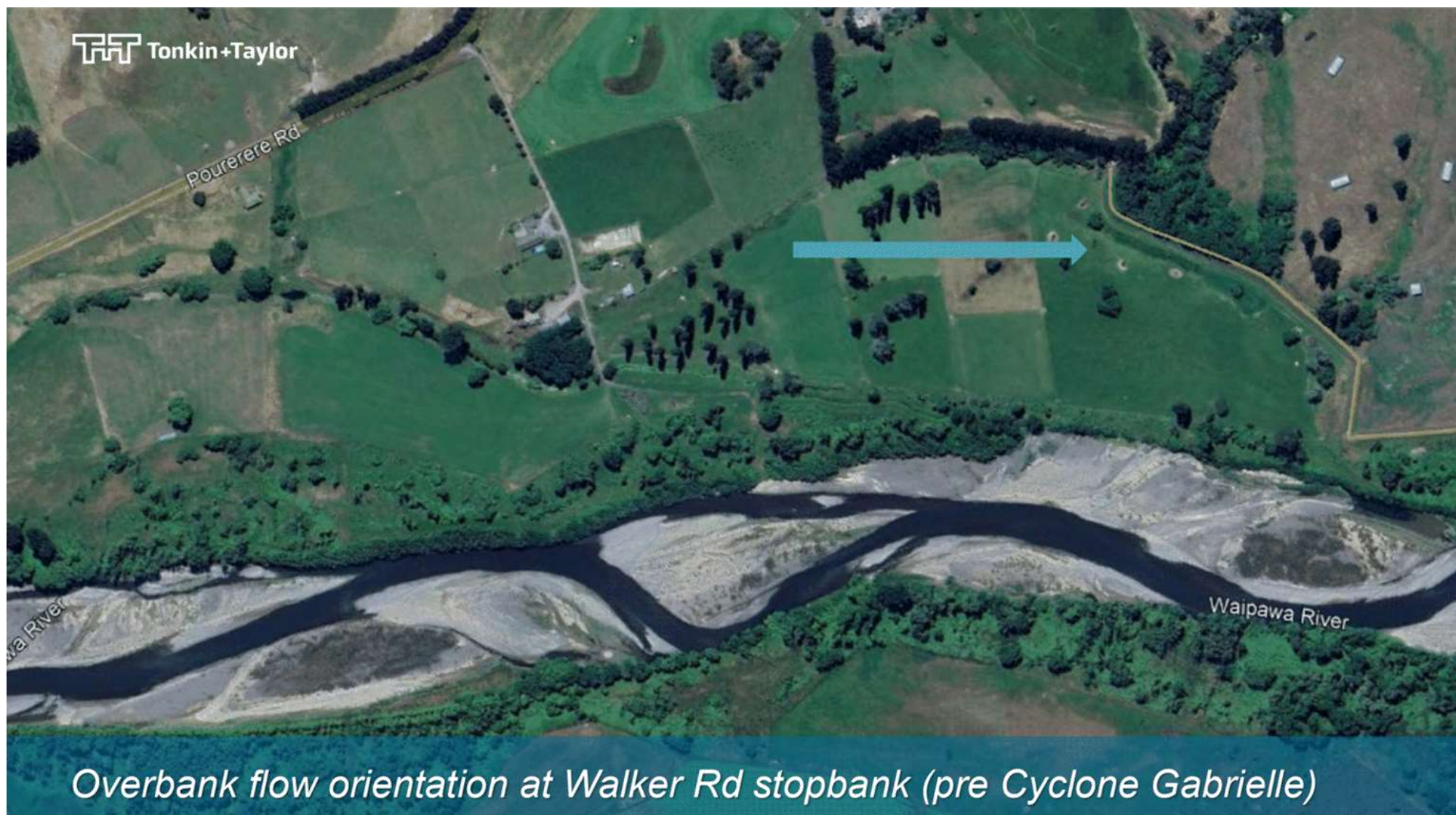
Purpose: Protection for Old Waipawa river bed and adjacent farmland.

Options include:

1. Repair to near previous (rapid rebuild) and accept minor LoS/overdesign event flooding
2. **Upgrade with scour/edge protection and landside filter protection (+ increased crest)**
3. Improve geometry with realigned stopbank.
4. **Secondary/replacement stopbanks further back (allow farmland to flood in larger events)**





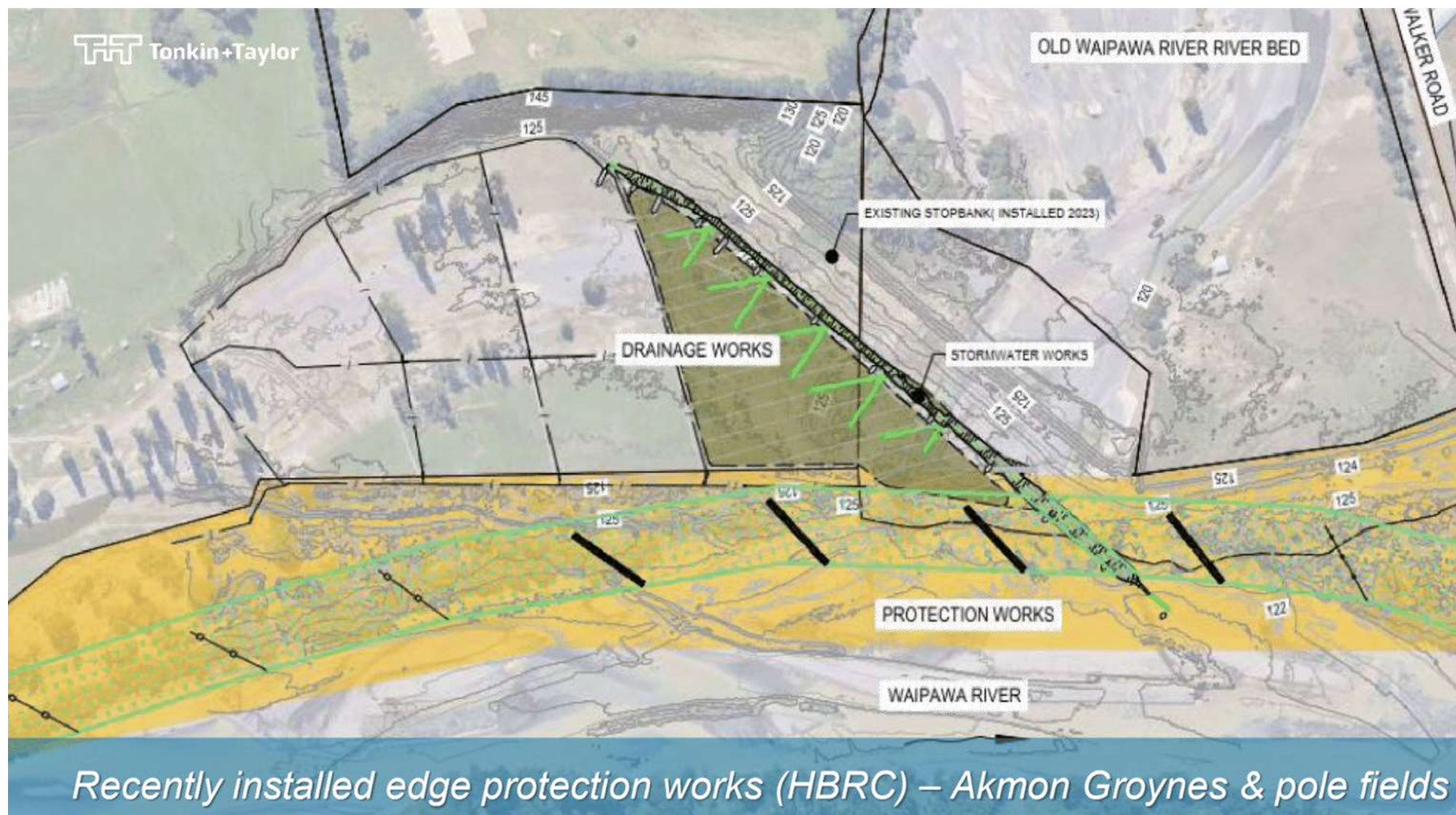




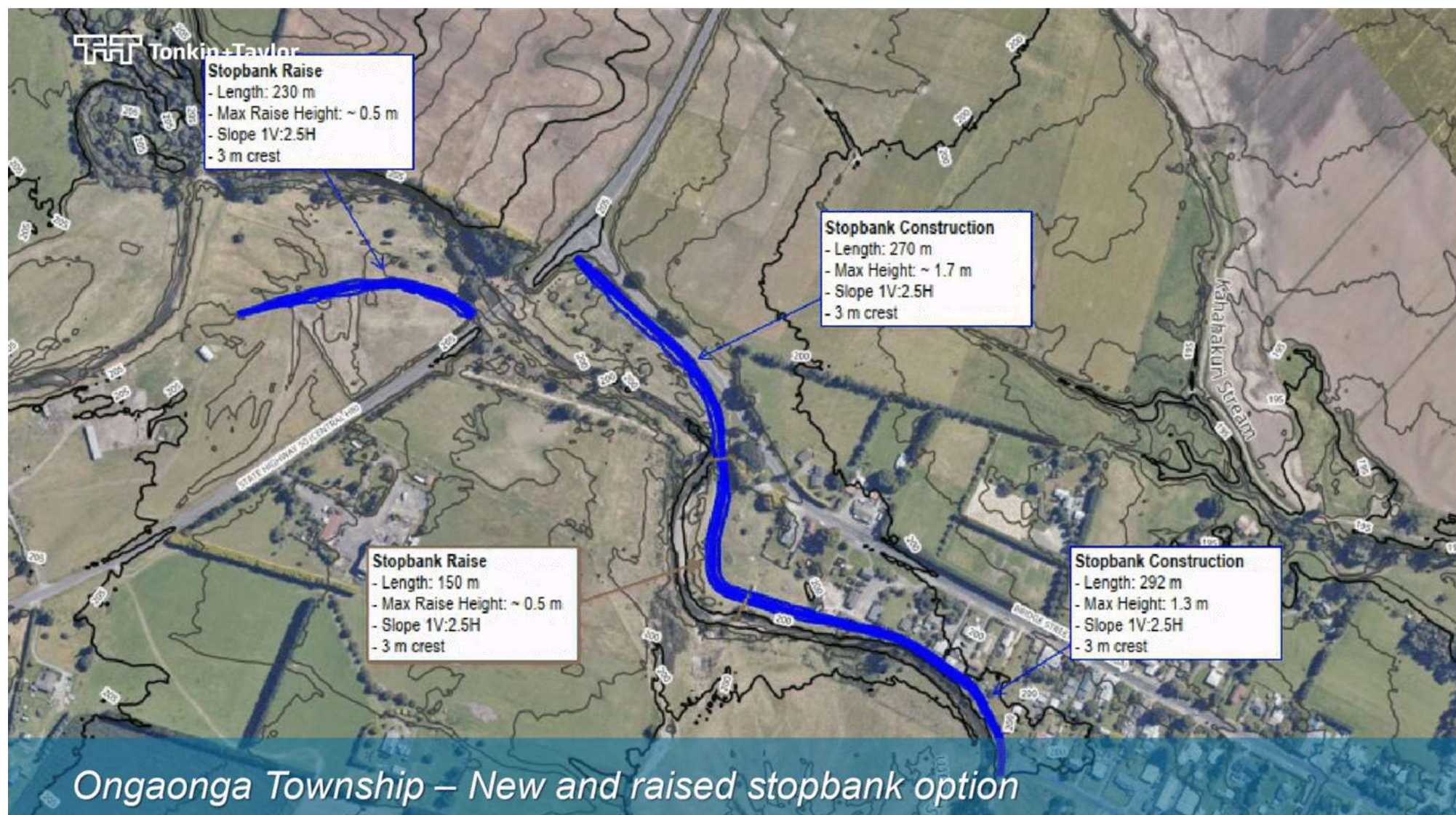


*Walker Rd failure mechanism (lateral erosion of riverside toe)*











## Tukituki at Ongaonga Stm

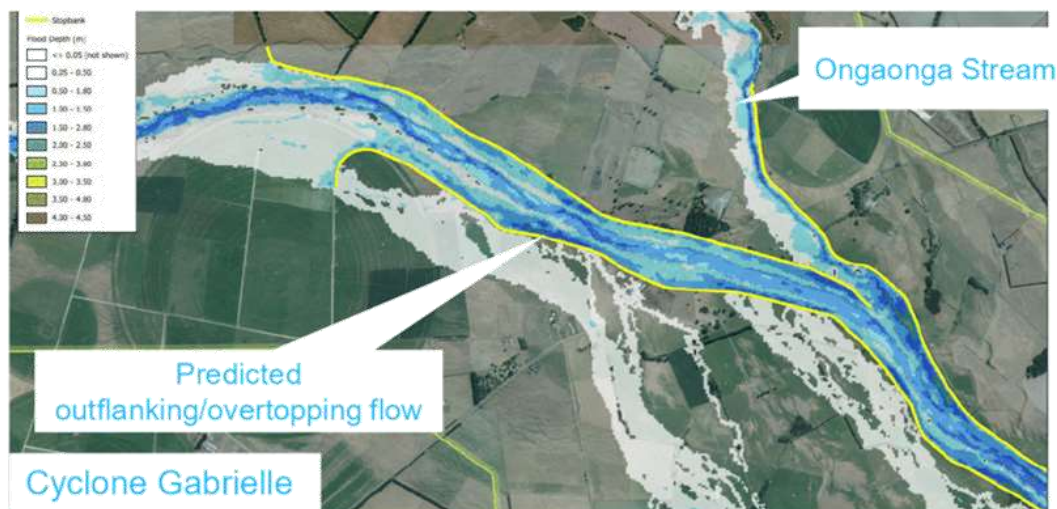
Observed performance: The stopbanks on the true right of the Tukituki River started to outflank and overtop in Cyclone Gabrielle.

Modelled performance: Stopbanks overtop and outflank on the true right of the Tukituki River in the 100 year ARI event.

Purpose: The landside area behind this bank is farm land and relatively contained.

Options include:

1. Increasing the stopbank height and extents on true left
2. Allowing overdesign flows in this area (noting large area impacted)
3. River is perched above surrounding land by several m – gravel abstraction in narrow corridor + long term gravel management to increase flood capacity.



## Tukituki D/S of Ongaonga Stm

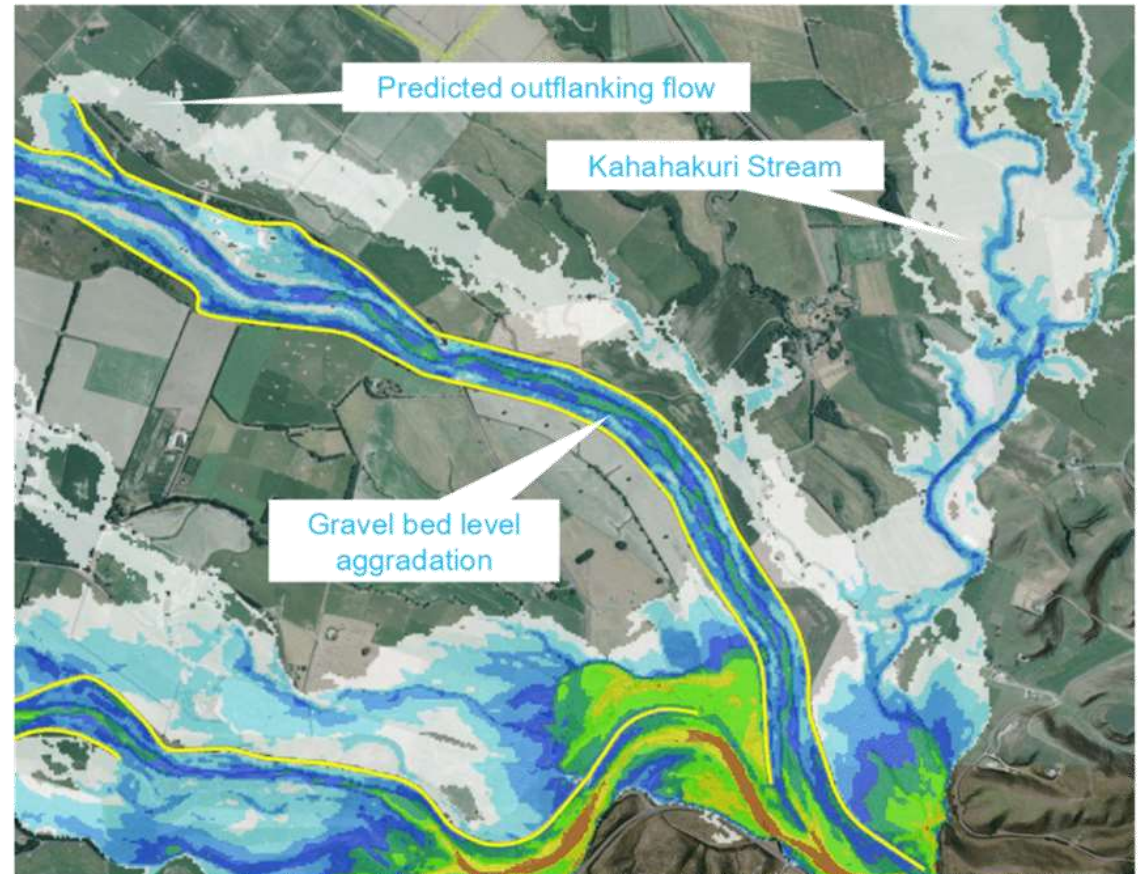
Observed performance: The stopbanks on the true left of the Tukituki River started to outflank in Cyclone Gabrielle.

Modelled performance: True left stopbanks outflank in 100 year ARI event and join with Kahahakuri Stream

Purpose: The landside area behind this bank is farm land that appears relatively contained without dwellings.

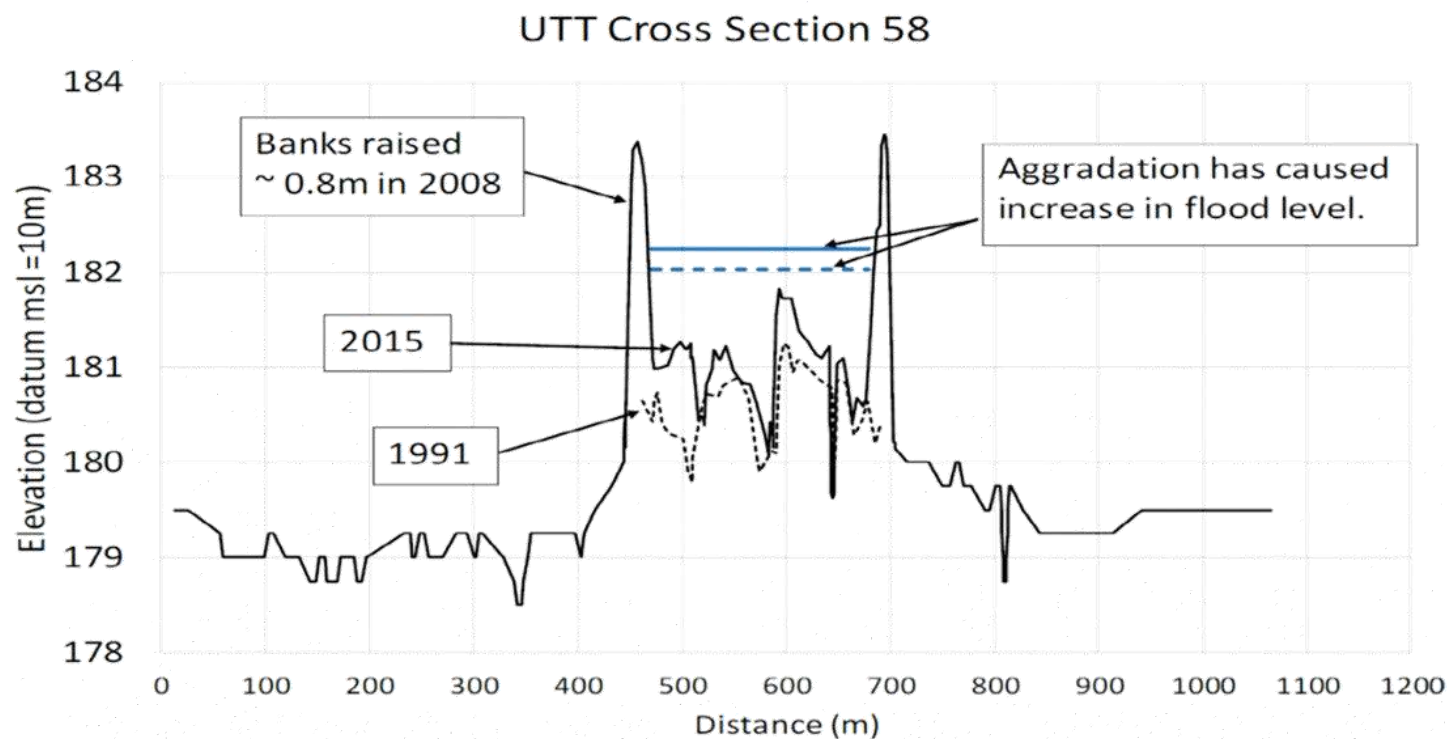
Options include:

1. **Increasing the stopbank extents at local stream** including Tukipo true left stopbank and local stream
2. Allowing oversize flows in this area (noting large area are impacted)
3. **Targeted gravel abstraction + long term gravel management to increase flood capacity.**





## Example of river perched above floodplain



*Gravel aggradation – Perched river reaches on the Tukituki and Waipawa Rivers*

## Tukipo U/S of confluence with Tukituki River

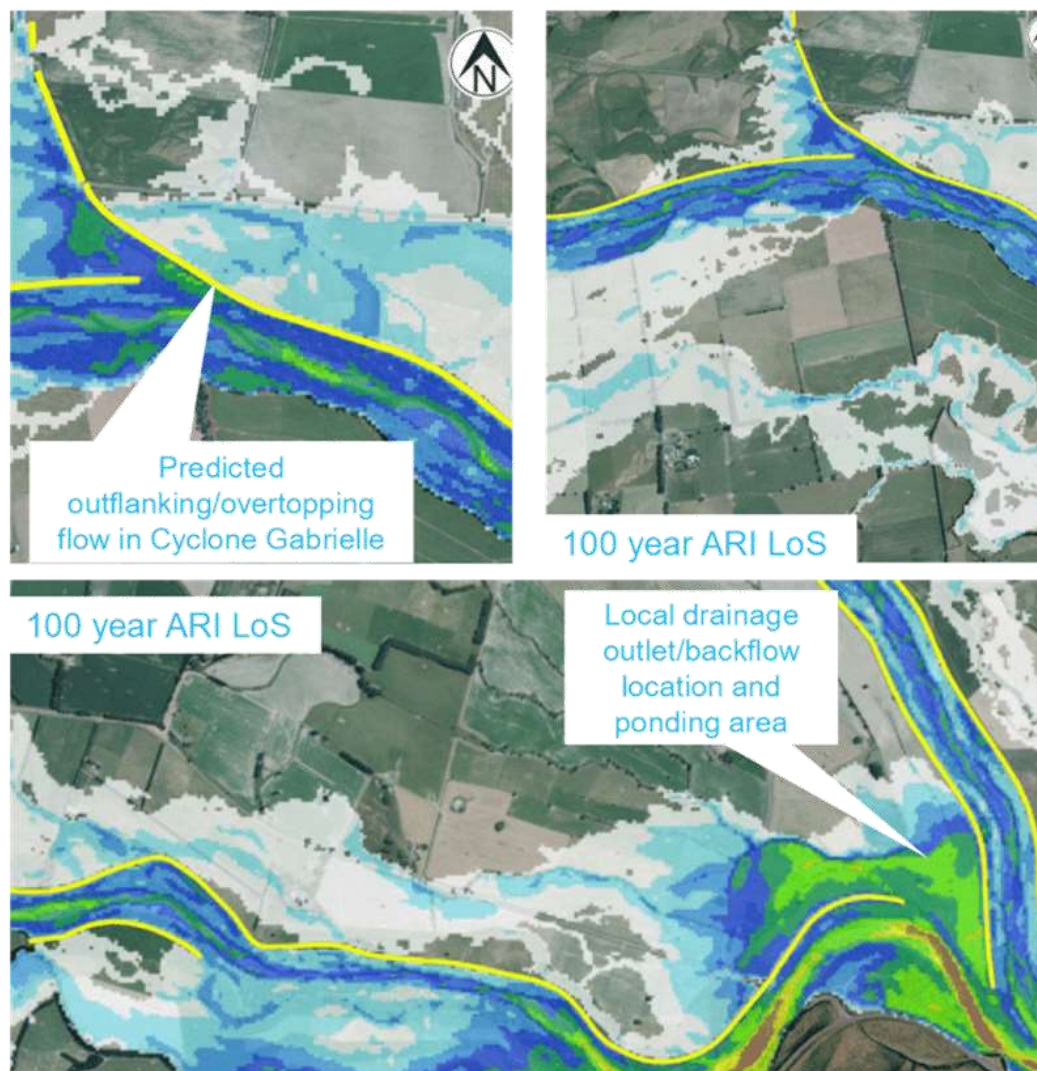
Observed performance: Stopbanks overtopped on true left flooding lower lying areas

Modelled performance: Stopbanks overtop in 100 year ARI design event.

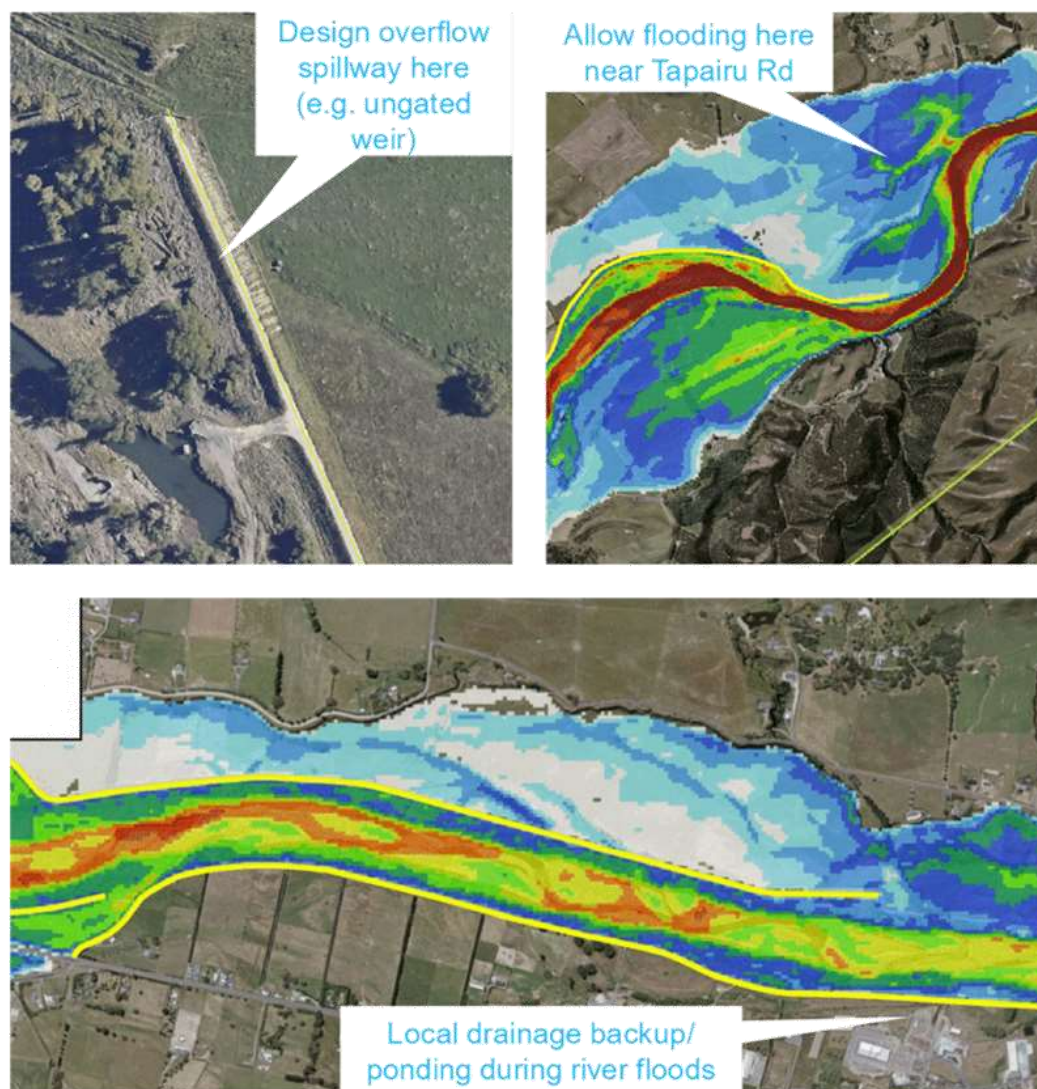
Purpose: Farmland and dwelling protection.

Options include:

1. Increase stopbank height and extent to contain revised 100 year or 250 year ARI events
2. Formal overflow area on true left







## Overflow spillway on true left Tukituki River at Waipukurau

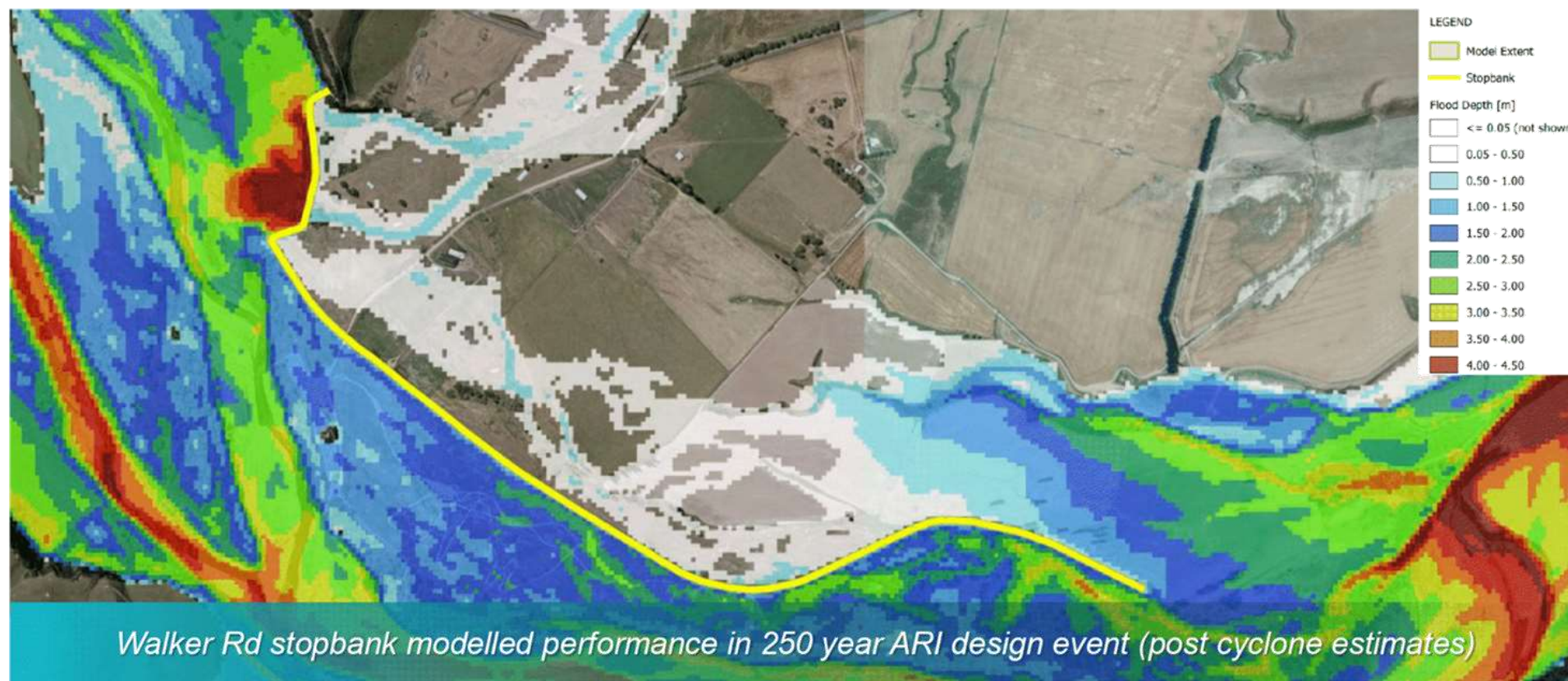
Observed performance: The stopbanks on the true left of the Tukituki River at Waipukurau (Lindsay water race tunnel) just overtopped.

Modelled performance: True left stopbanks overtop in 100 year ARI event.

Purpose: The landside area behind this bank is farm land that appears relatively contained without dwellings.

Opportunity: **Formally allowing overdesign flows in this area** may reduce the pressure on the adjacent and downstream stopbanks (enhanced protection for Waipukurau and downstream areas). Preventing overtopping in 100 and 250 year ARI events would require stopbank raising and increase extents.

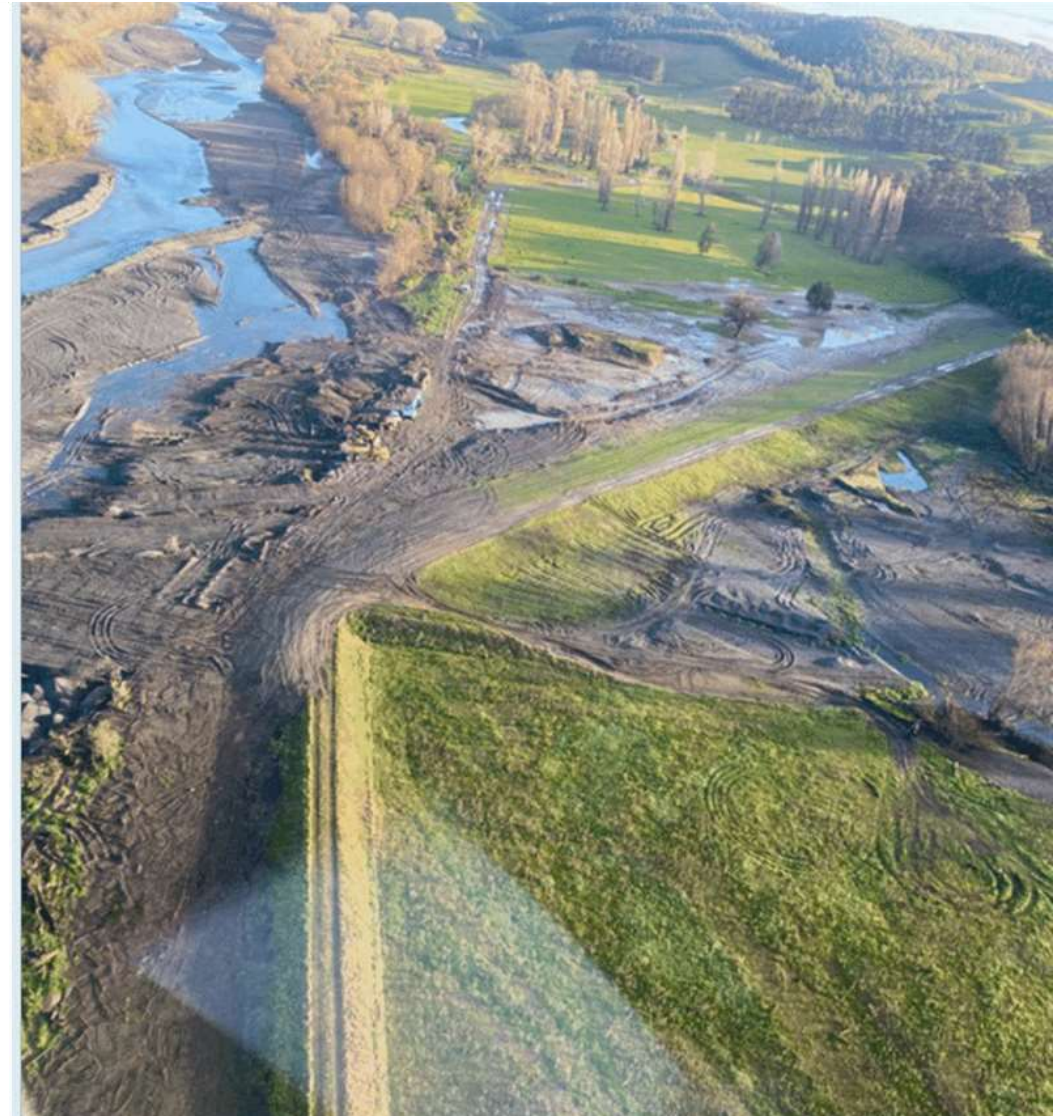
## Scheme review recommendations





## Conclusions

1. Scheme currently well managed within constraints and performing to LoS with some exceptions.
2. Cyclone Gabrielle was an overdesign event and resulted in significantly improved understanding of the scheme limitations.
3. There remains capacity within the scheme and targeted upgrades can improve performance.
4. Current Asset Management Policies and Plans are robust, well developed, and generally enabling effective scheme management.
5. HBRC management structure enables and encourages sound scheme management with the constraints.







## Recommendations

1. Improved AM implementation may be possible, such as:
  - a. file management (centralised and digital record keeping).
  - b. Retain inter-group/team mobility and flexibility.
  - c. Enhance vegetation management and frequency in river beds and reporting links.
  - d. Active channel and live edge/berm maintenance near bridges.
  - e. Strategy for Chilean Needle Grass.
2. Facilitate targeted gravel abstraction (e.g. Waipawa Township and Tukituki River between stopbanks).
3. Targeted scheme upgrades (esp. Walker Rd, Waipawa township, SH50 and Tukituki River).