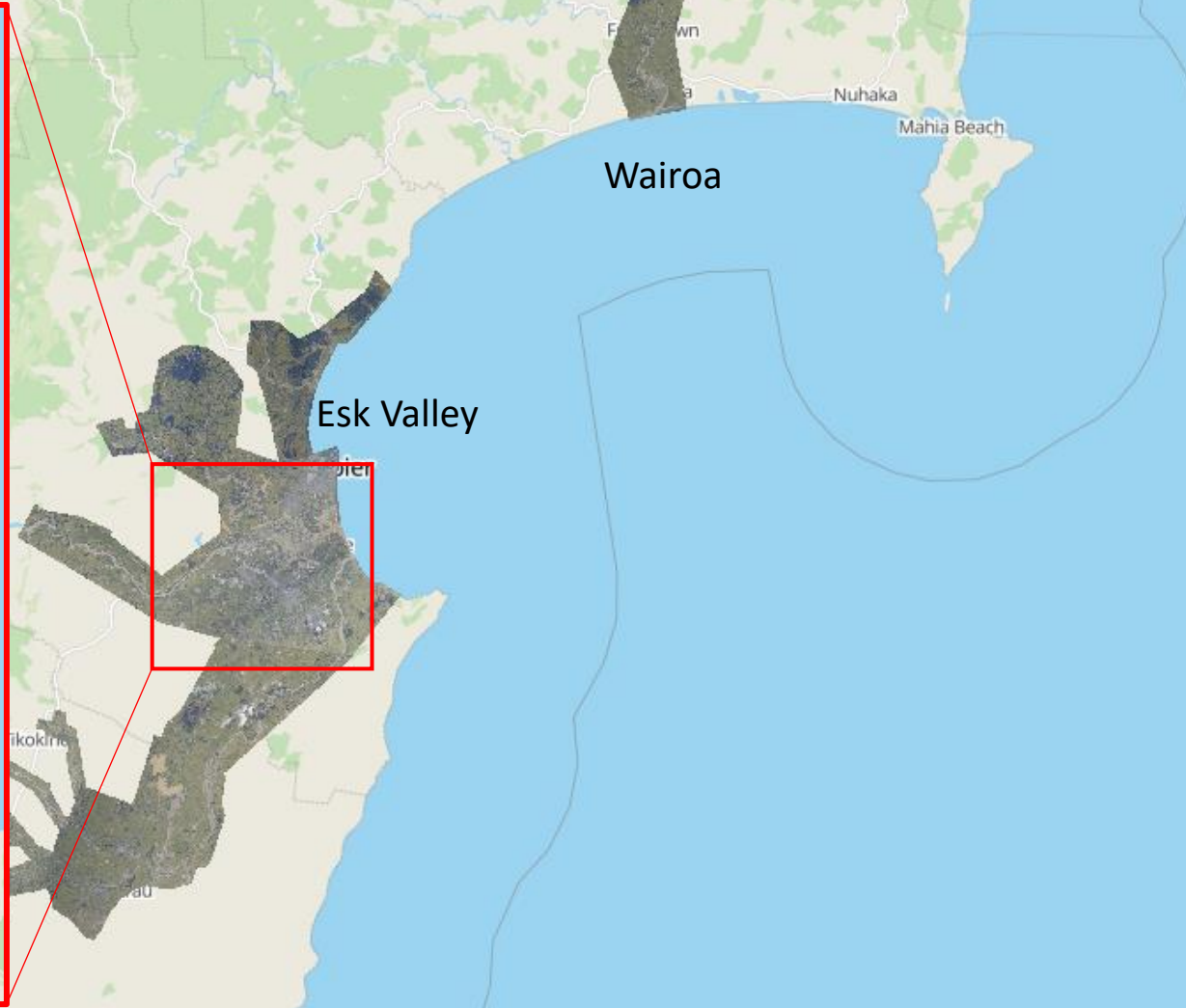
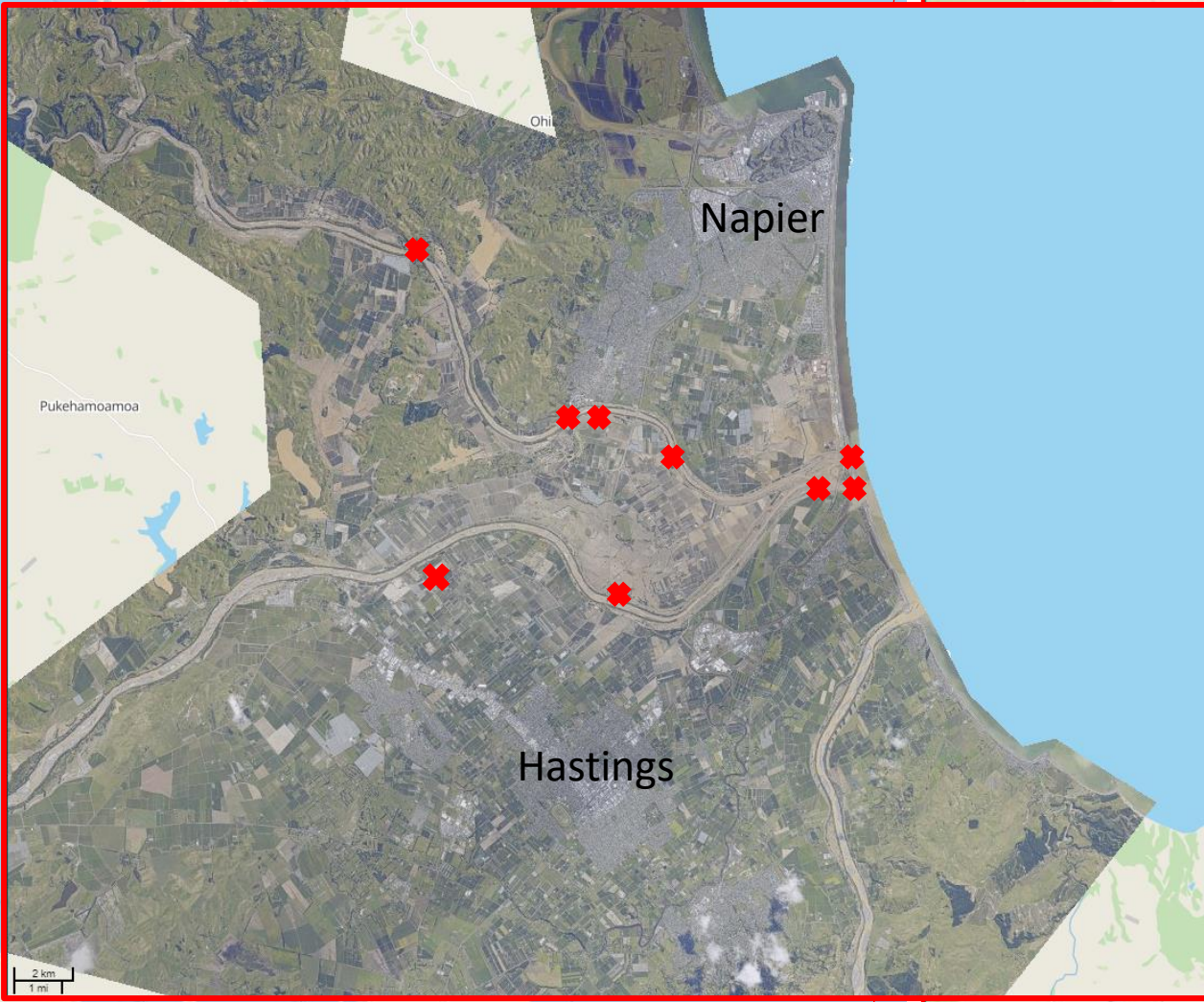
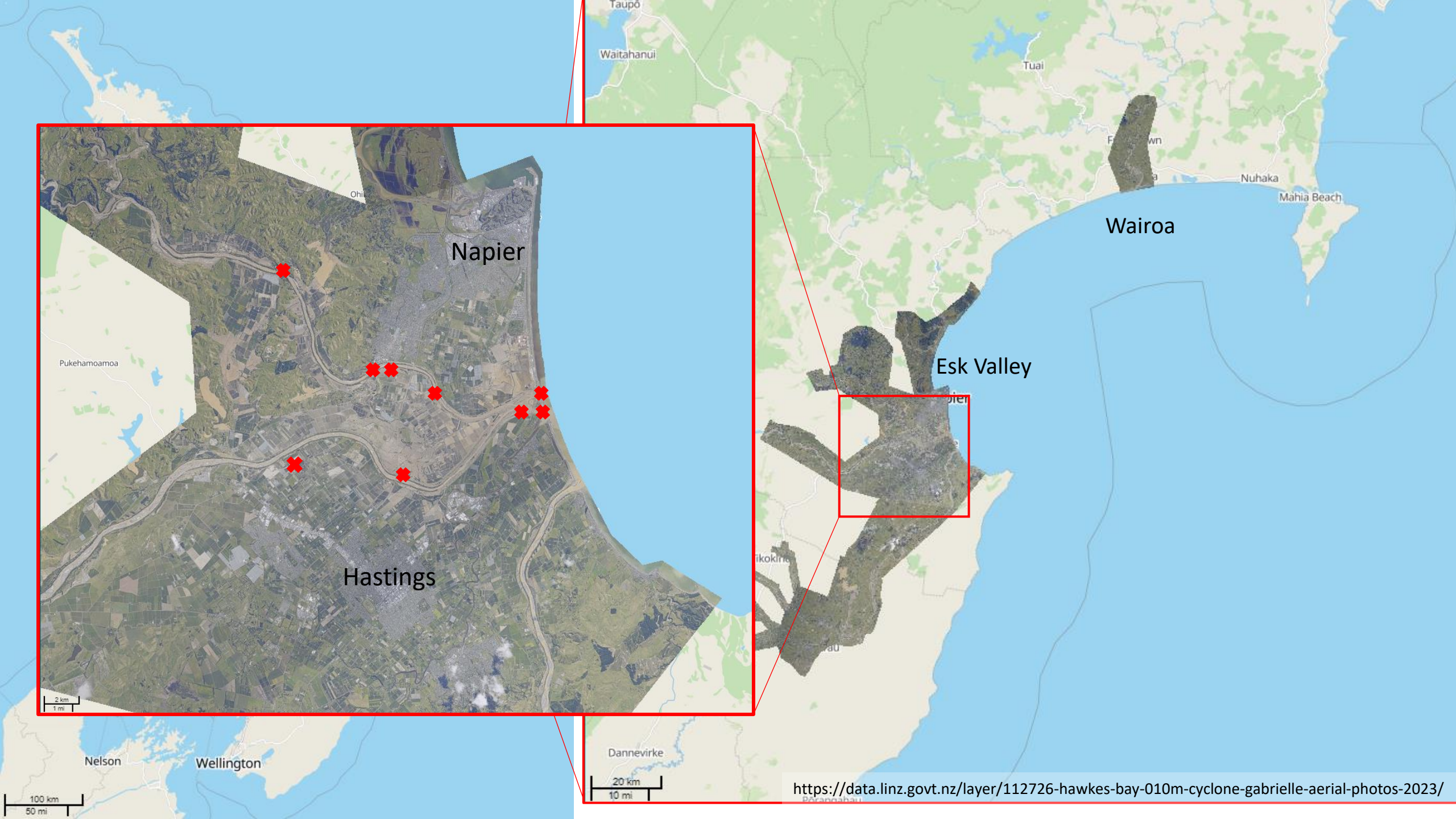


Hawkes Bay flood protection infrastructure: **Preliminary observations on embankment performance following Cyclone Gabrielle**

Dr Kaley Crawford-Flett

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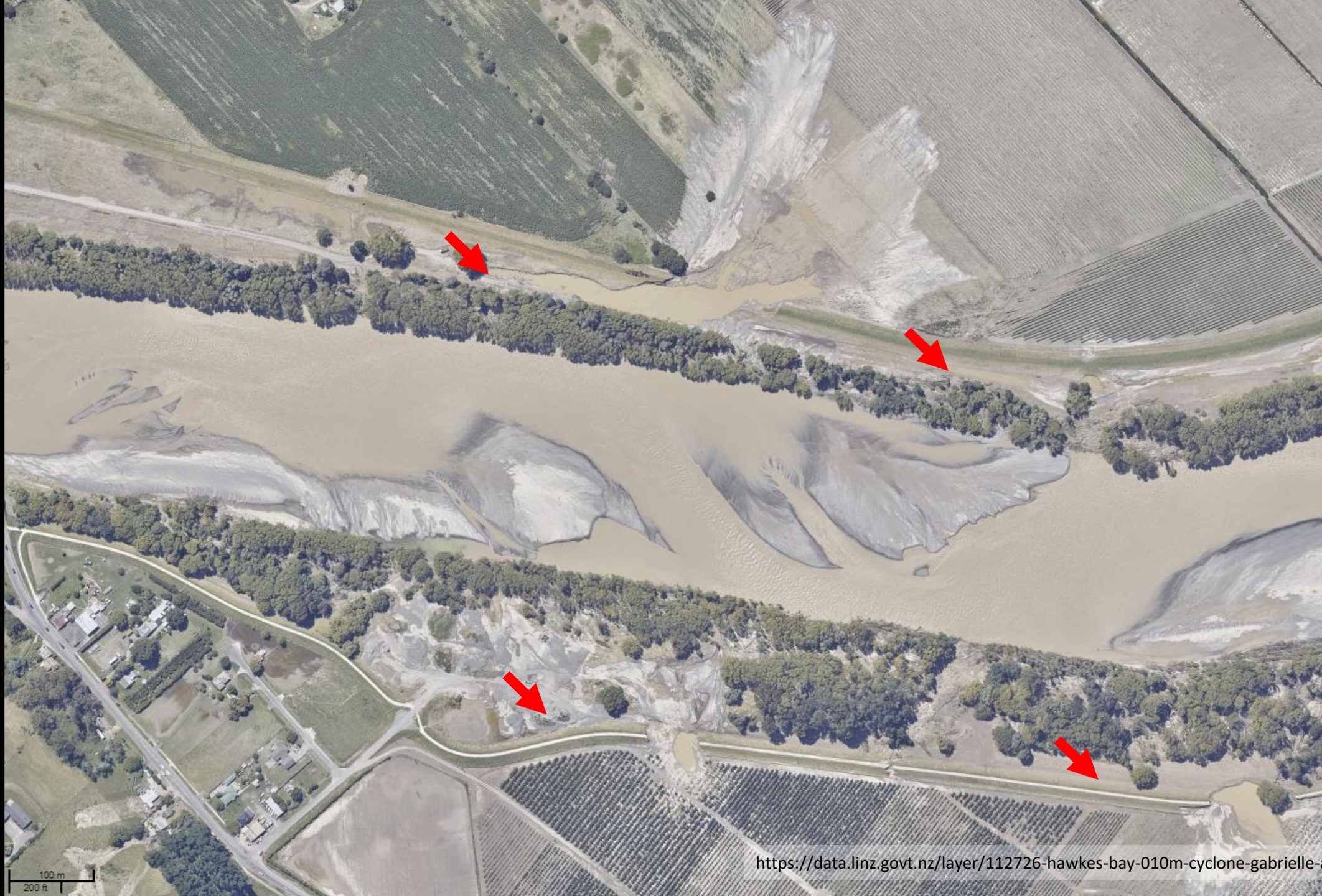


<https://data.linz.govt.nz/layer/112726-hawkes-bay-010m-cyclone-gabrielle-aerial-photos-2023/>



Stopbanks and related infrastructure: *A short overview*

- Incomplete overview from Tutaekuri and Ngaruroro Rivers
- (not shown here: Esk Valley, Central Hawkes Bay)
- Estimated 3-5 km(?) of cumulative breach length





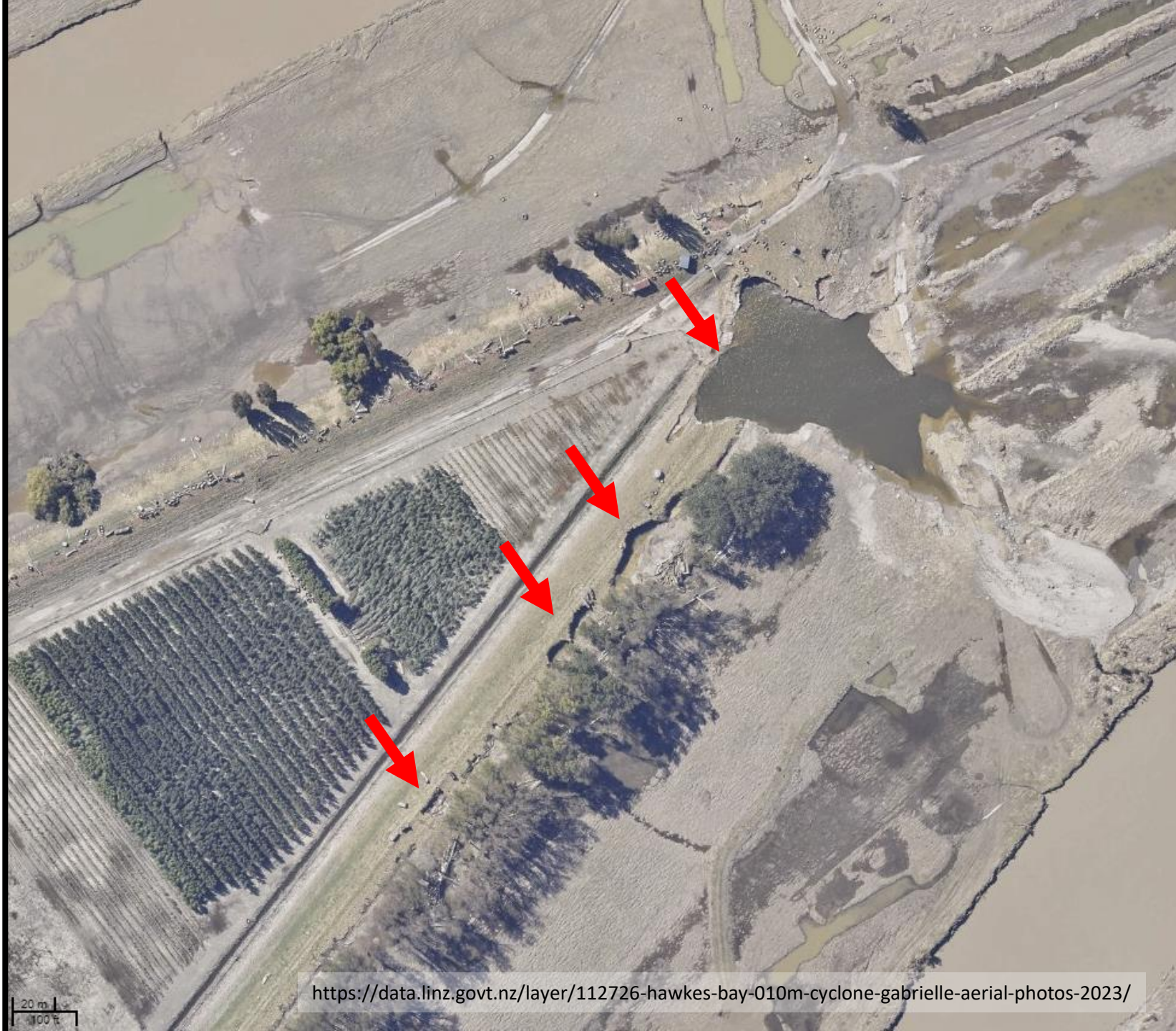


20 m
100 ft

<https://data.linz.govt.nz/layer/112726-hawkes-bay-010m-cyclone-gabrielle-aerial-photos-2023/>







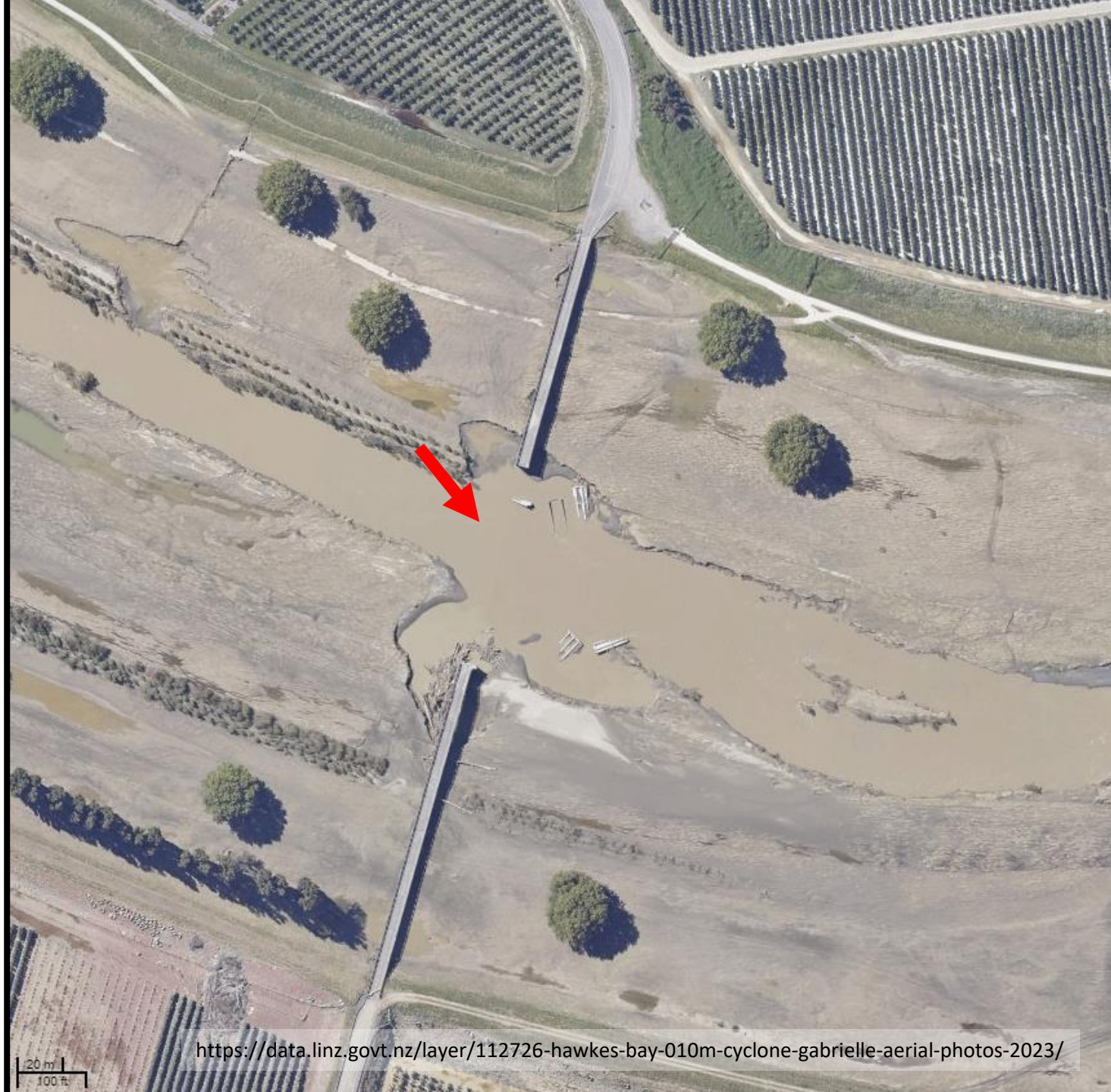
20 m
100 ft

<https://data.linz.govt.nz/layer/112726-hawkes-bay-010m-cyclone-gabrielle-aerial-photos-2023/>



~80 m breach length





<https://data.linz.govt.nz/layer/112726-hawkes-bay-010m-cyclone-gabrielle-aerial-photos-2023/>

20 m
100 ft









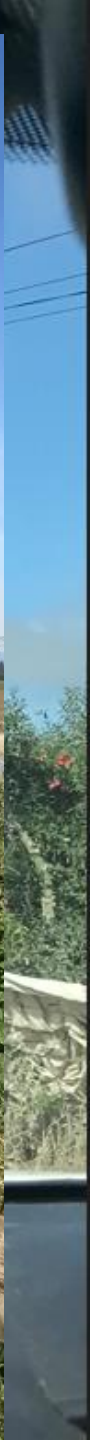
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20 m
100 ft



Infrastructure, people, and property

- Huge impacts
- Easy to ignore/forget from afar
- Food production, agriculture, horticulture





Dams and related infrastructure:

A short overview

- Extreme event response – other priorities: people/property/stopbanks/roads/bridges
- Ongoing access challenges
- Opportunity to spend time with HBRC engineers, 2-3 weeks post-event
 - First walk-over for some structures (local landowners provide ‘feet on ground’)
- 106 dams recorded in HB (NZ Inventory of Dams, NZID)
 - 3 m to 17 m in recorded height
 - Up to 1.9 million m³ reservoir volume
 - Many more undocumented (+ smaller dams)
- Uncoordinated reports on breaches and erosion (media, farmers)
 - Many undocumented/not in NZID

Dam engineering community, ad-hoc response:

- Media reports
- Farmer/client relationships
- Satellite imagery (outside of LINZ coverage)

Forwarding to council/other authorities:

- Further investigation/response
- Added to flight paths



Dams and related infrastructure:

A short overview – HB flood detention dams

- Flood detention dams (Regional and City councils)
 - Around 17 council-owned detention dams in Hastings-Napier (ownership history unclear, overlap)
 - (mainly) 6 m to 15 m in height
 - 38,000 m³ to 835,000 m³ reservoir volume
 - Some large and urban
 - One significant rural scheme – five large dams in catchment (farmland)
 - Late 1970s to early 1980s construction
- Council dam performance generally as-expected for event of this magnitude:
 - Some overtopping
 - No full breach (uncontrolled release)
 - Erosion of grass-lined auxiliary/emergency spillways, some significant

Dams and related infrastructure – walk-over inspections (12 dams)

- Many challenges associated with ‘dry’ (flood detention) dams
- Outlet blockages (part 1)
 - Gate control when equipment sits below reservoir level
 - Knife gates present many challenges (again)
 - Not the design intent... embankment and spillway loading?
 - Emergency planning?



Dams and related infrastructure – walk-over inspections

- Outlet blockages (part 2)
 - Gate outlet control when equipment sits below reservoir level
 - Rural dams unable to drain, full and spilling for weeks
 - Performing outside of design intent
 - Emergency planning?
- Emergency or auxiliary spillway operations
 - First opportunity (in 40 + years) to observe performance in extreme events
 - Erosion in grass-lined channels - some significant (performed, survived, but compromised)
 - Ongoing performance philosophy?



Pump dewatering

Dams and related infrastructure:

Some performance themes

- Immediate response priorities and access - sometimes weeks until inspections can (do) occur
- Performance and safety themes:
 - Emergency/auxiliary spillways – first ‘commissioning’ for some dams
 - Gate control under load – inability to control; design and operational shortcomings
 - Farm dams with little/no engineering input
 - Record-keeping and responsibilities
- Implications for impending Building (Dam Safety) Regulation (2022), coming into effect 2024