TSC
THE SURVEYING COMPANY

TUKITUKI LAND CARE

TUKITUKI RIVER LIDAR SURVEY

Precision & Innovation

WHO IS TSC?

The Surveying Company is a Hawke's Bay-based land development consultancy with offices in Hastings and Waipukurau.
We provide land surveying, 3D laser scanning, aerial drone mapping, civil engineering surveys, town planning, and subdivision design.
Using advanced GPS, laser scanning, and drone technology, we deliver accurate data to support landowners, developers, councils, and engineers across residential, rural, commercial, and infrastructure projects.

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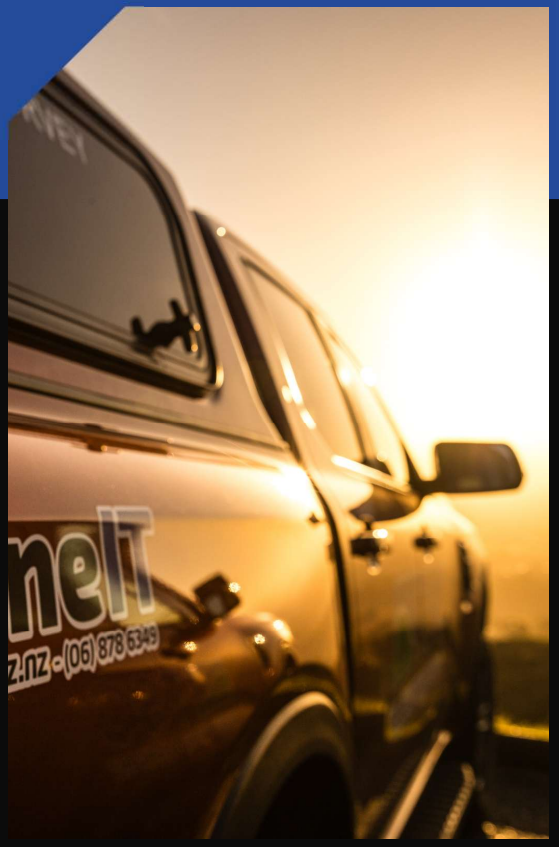
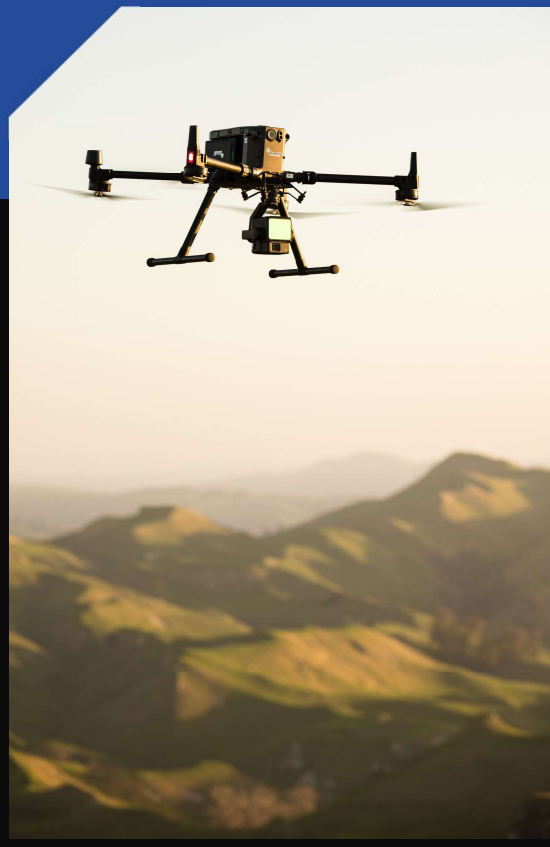
Project Overview

The Survey Company conducted a detailed study of the river using modern imaging and empirical data to inform better river management and infrastructure protection. The project produced high-resolution LiDAR and visual datasets, allowing comparison with 2020 data, identification of key risk areas, and a robust baseline to guide future decision-making on flood capacity, gravel extraction, and river profile changes.

BASELINE **INSIGHTS**





The Challenges - Data collection

Changing river profile
The river is a dynamic system (gravel movement, flooding, vegetation, bank collapse), so capturing accurate snapshots and comparisons (especially vs 2020 LiDAR) is complex.

Line of sight
Given the terrain and obstructions, maintaining line of sight of the drone was challenging in places, especially when balancing flight times, batteries, distances to flight start points and capture density.

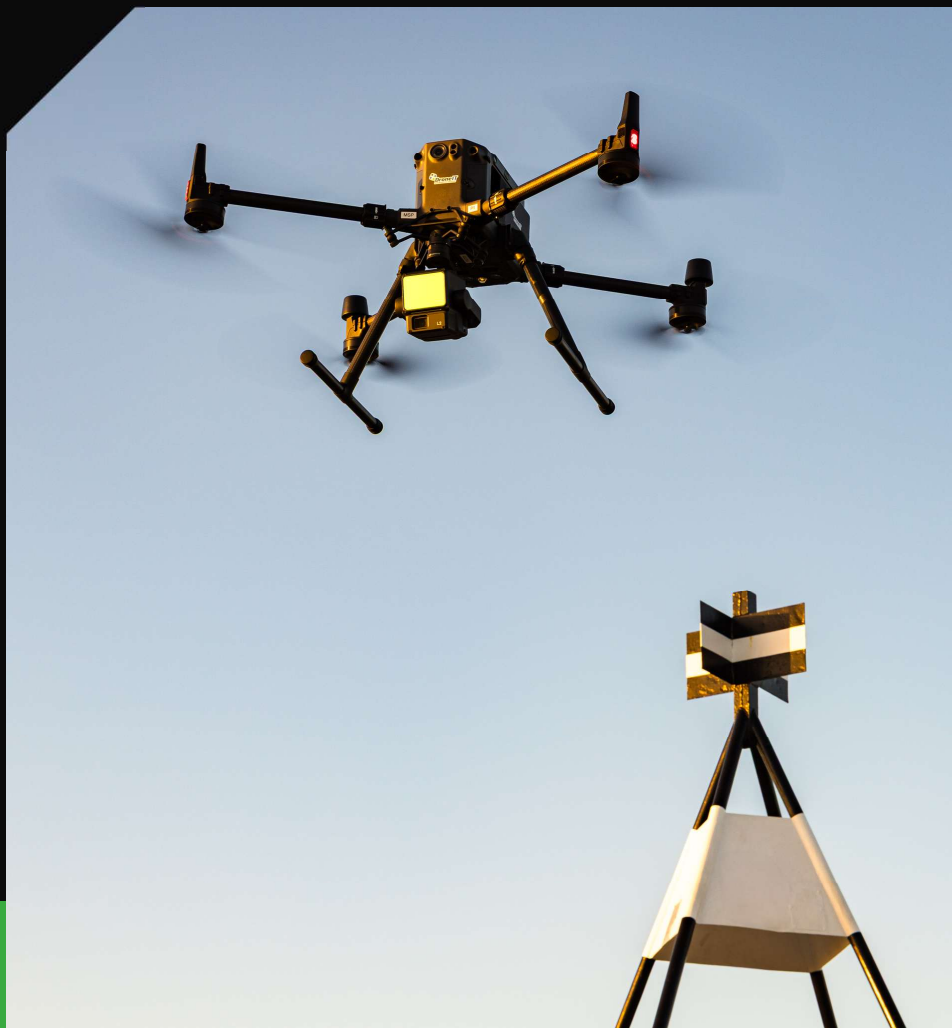
Weather and river conditions
Timing data collection to avoid high flow, poor visibility, or dangerous river conditions.

The Challenges - Technical & Analysis

Data integration
Combining various data sources: LiDAR, KML files, historic datasets, 2020 survey, current imagery, and making these directly comparable using survey techniques to tie to coordinate systems.

Data sizes
Managing huge datasets including 3D point information and aerial photography. We measured 261 points / m^2, which is over 2billion points over the whole corridor.

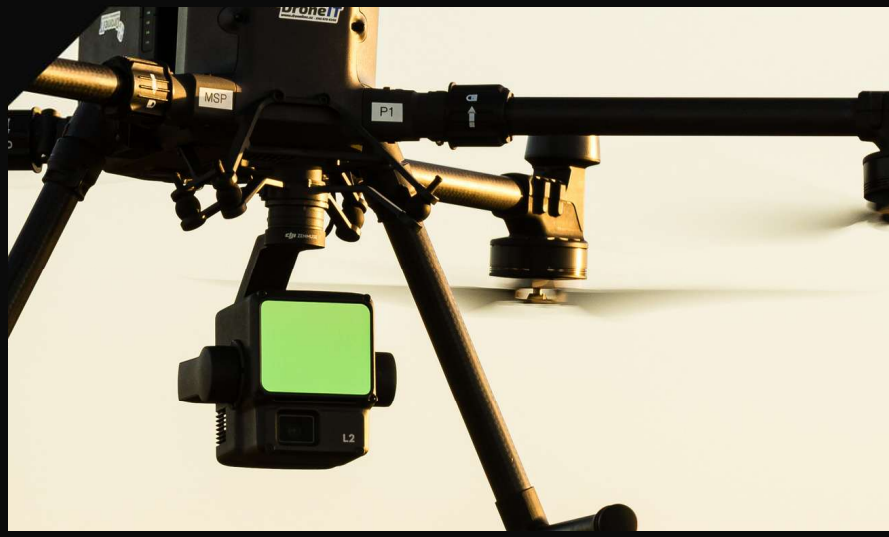
Data interpretation
Turning raw imagery and elevation data into meaningful insight e.g. reducing raw point data which includes everything, down to a sparse terrain model.

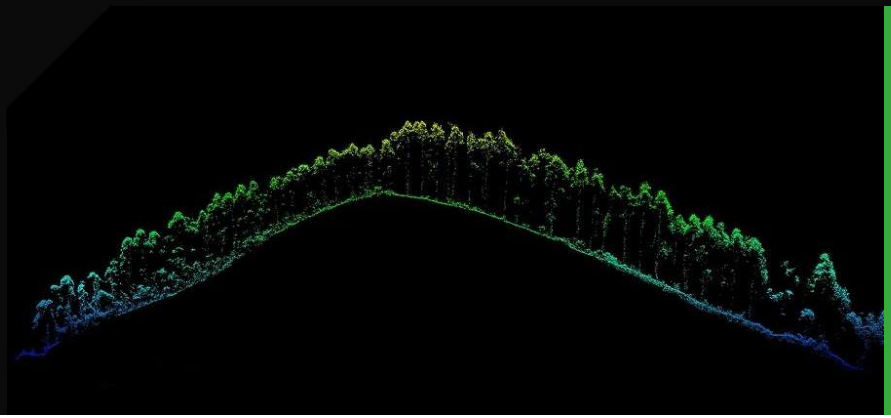


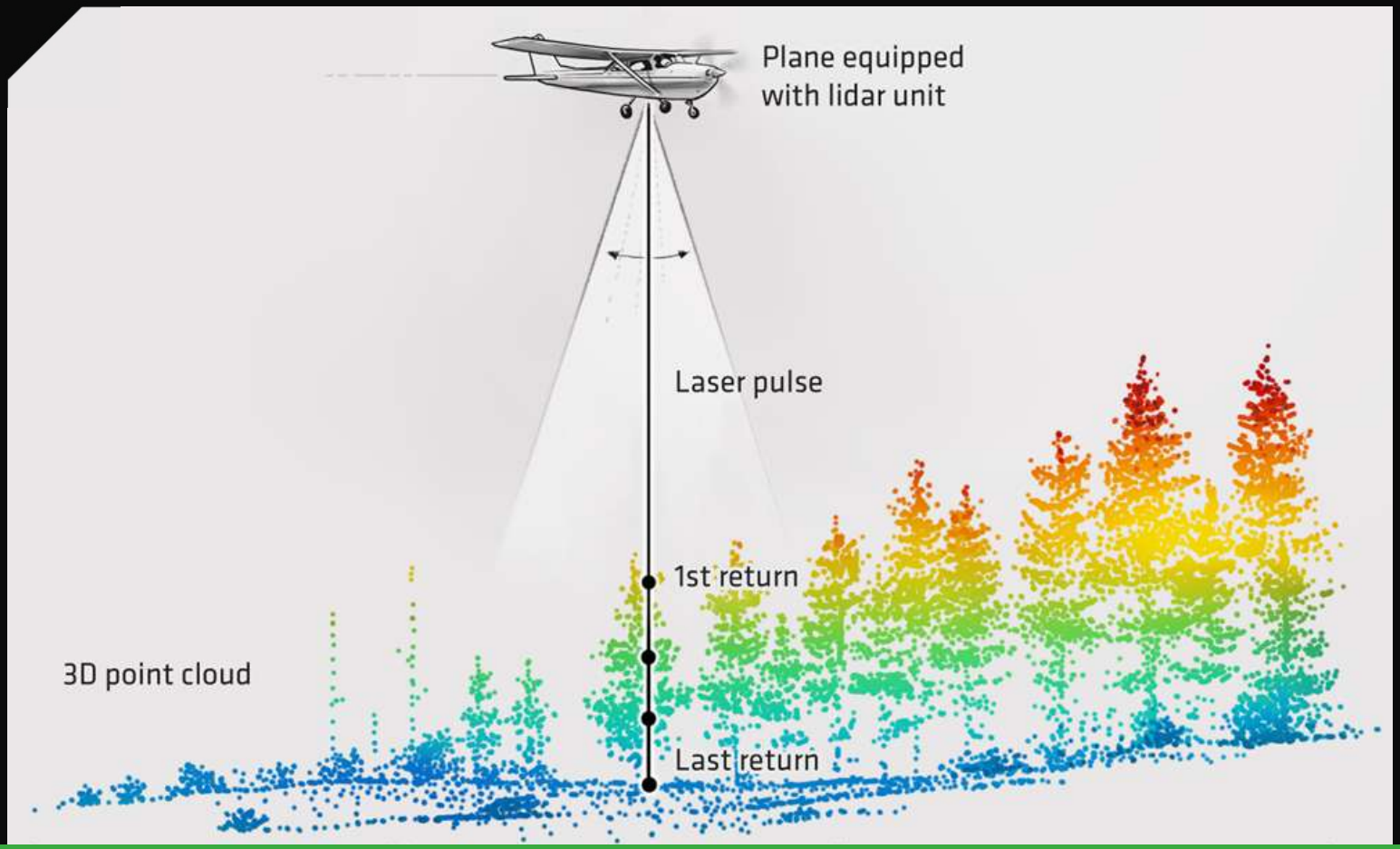
LiDAR

What is LiDAR?

LiDAR is a surveying technology that uses laser pulses to measure the shape of the ground and objects. The LiDAR sensor on our drone sends out thousands of laser beams every second, which bounce off the riverbed, banks, trees, and structures. Many of these beams can reflect off multiple surfaces (for example, the top of vegetation and then the ground below) — this is called a return. Our LiDAR can record up to 5 returns per laser pulse, which helps us see through vegetation and accurately map the riverbed. With this, the we can capture up to 1.2 million points per second. It also measures changes in height with an accuracy of around 3 centimetres.






Plane equipped
with lidar unit
Laser pulse
1st return
3D point cloud
Last return

Failing groyne

Pines in channel

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Bridge protection

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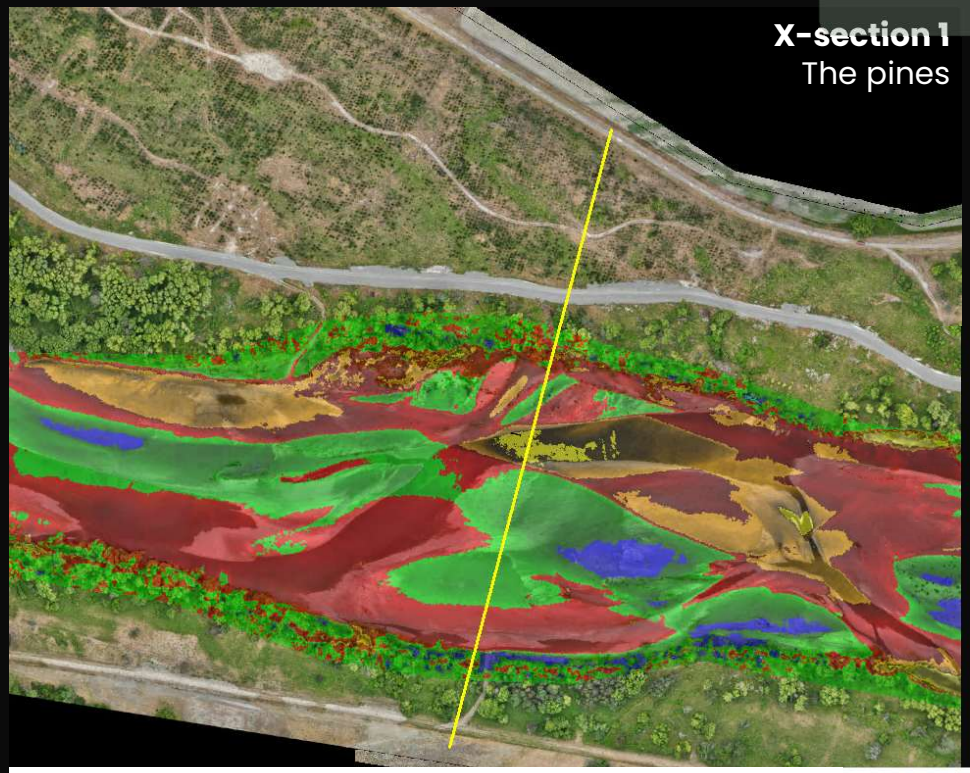
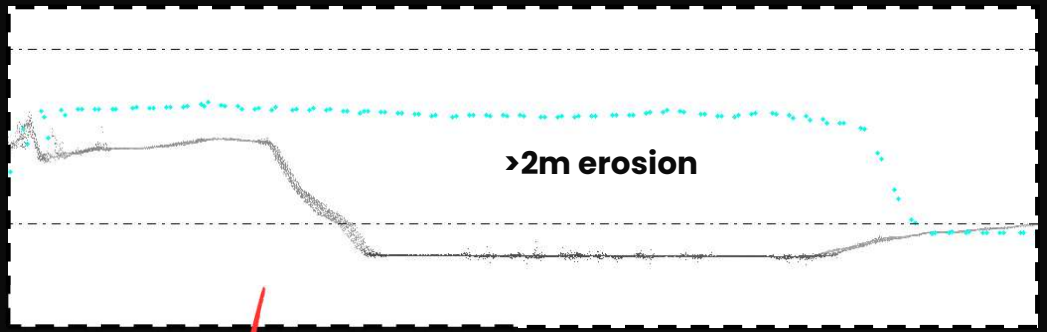
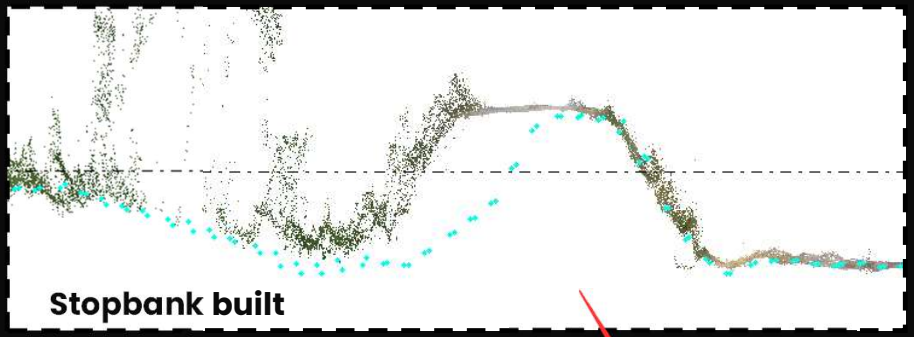
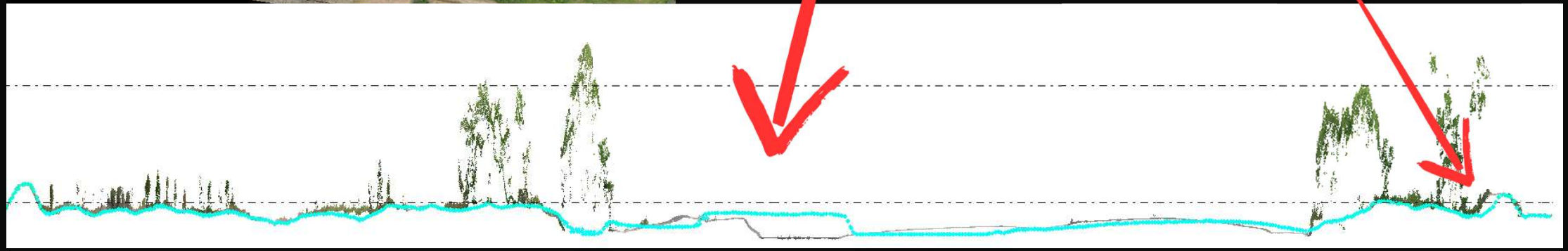


X-section 1
The pines







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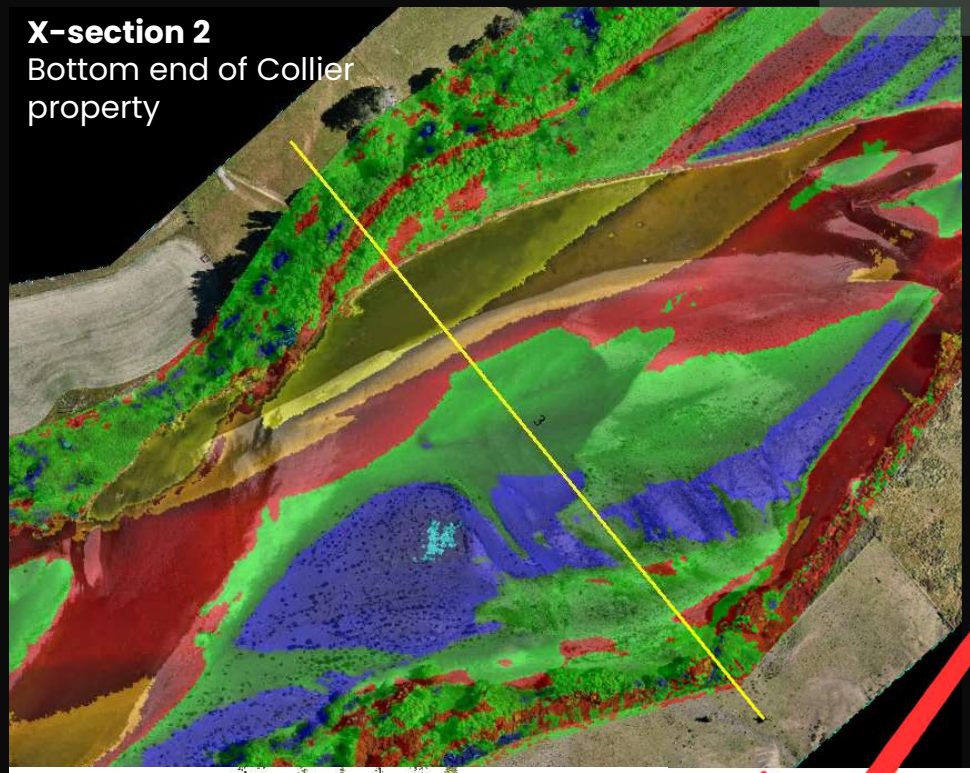
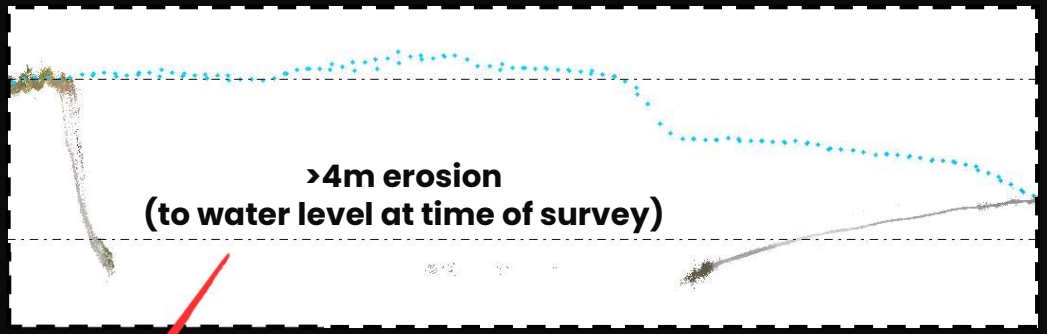
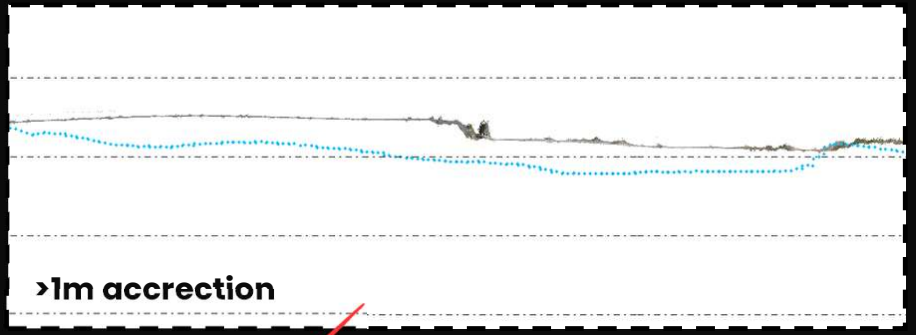
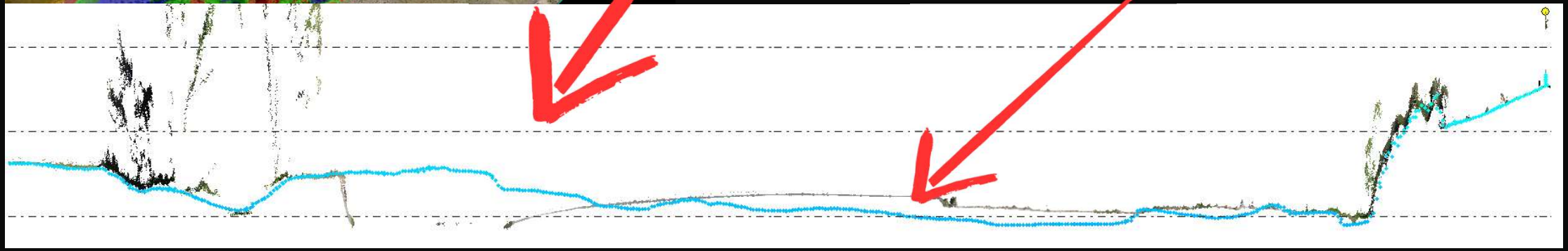
X-section 2
Bottom end of Collier property









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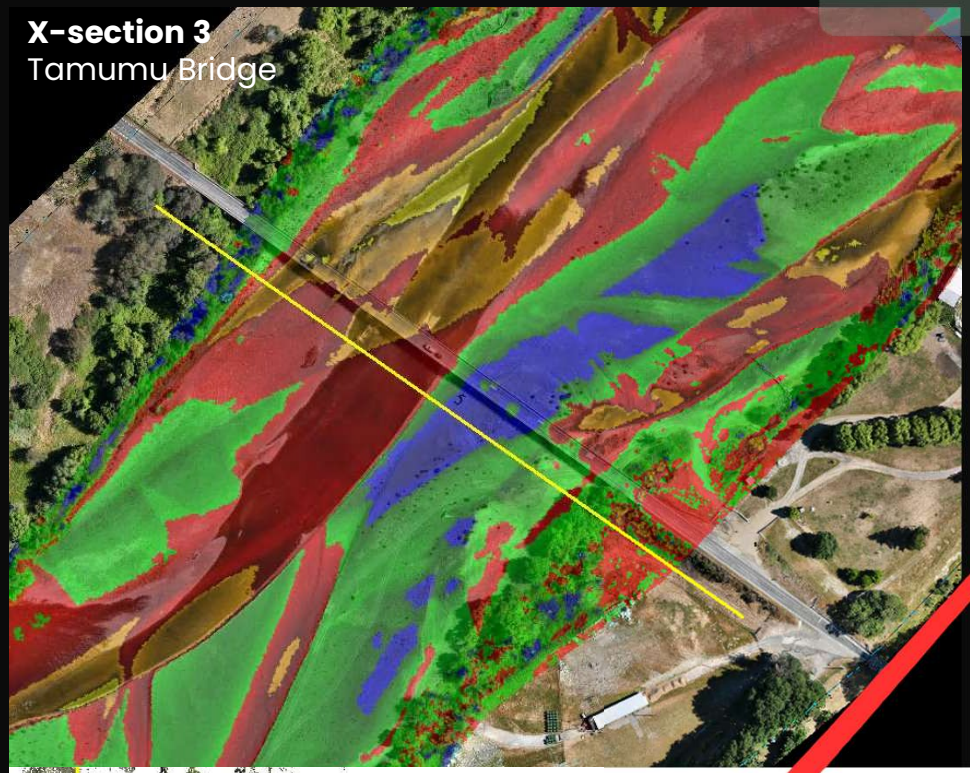
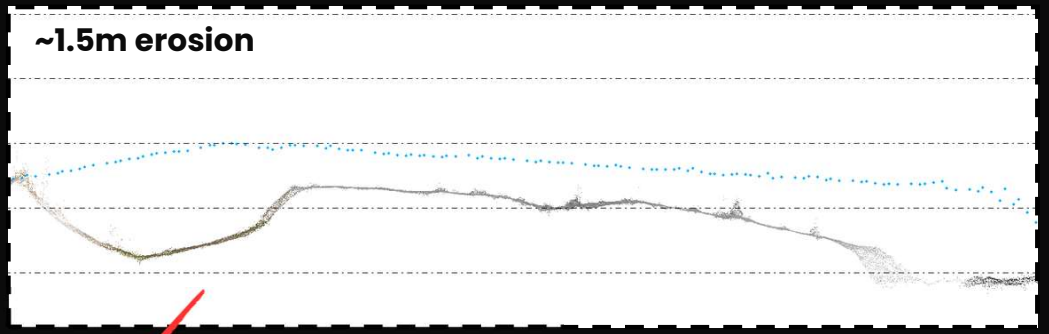
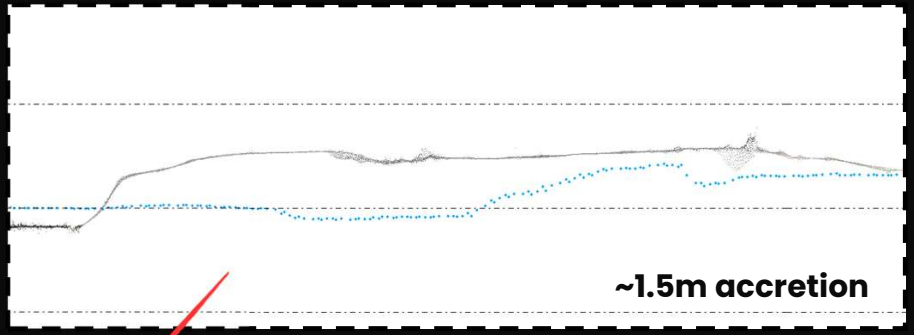
X-section 3
Tamumu Bridge

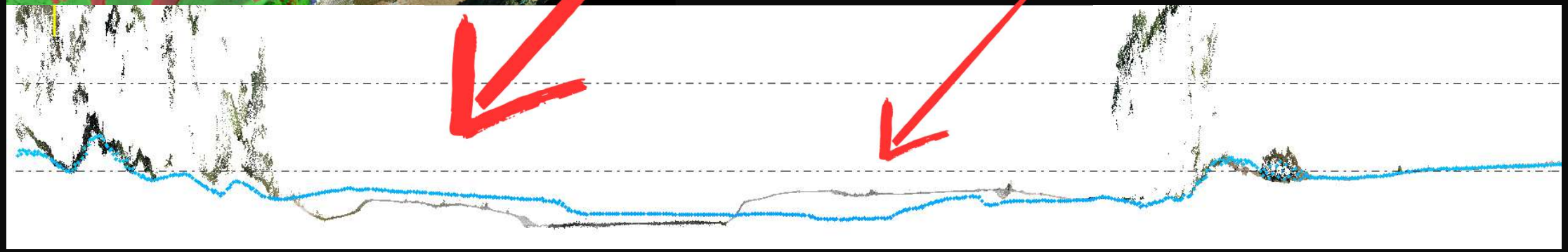


~1.5m erosion



~1.5m accretion





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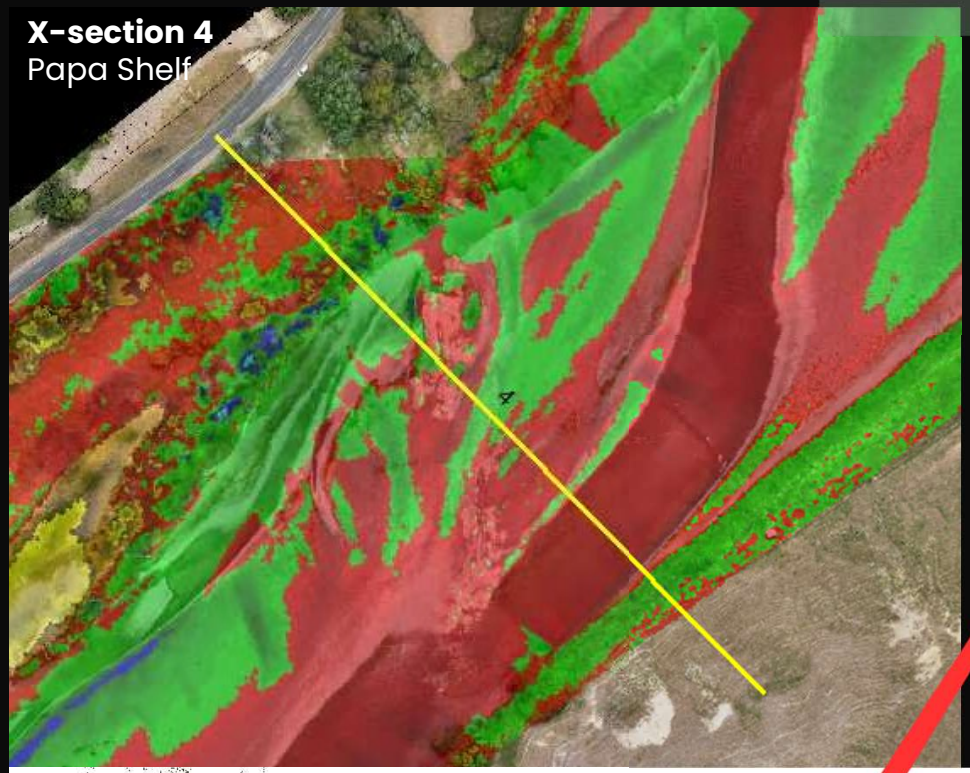
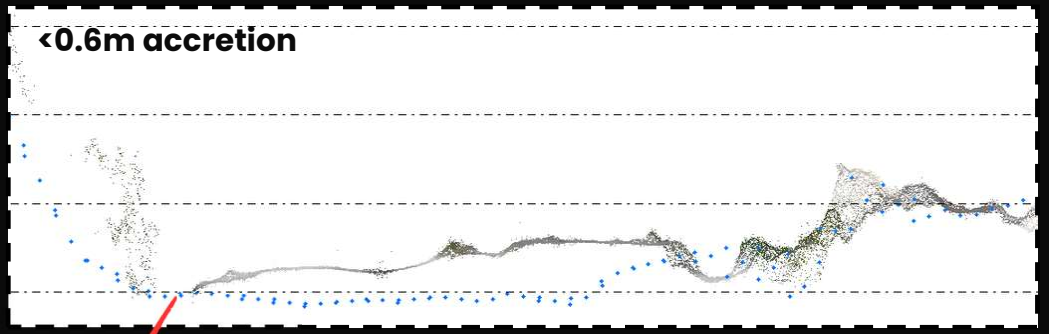
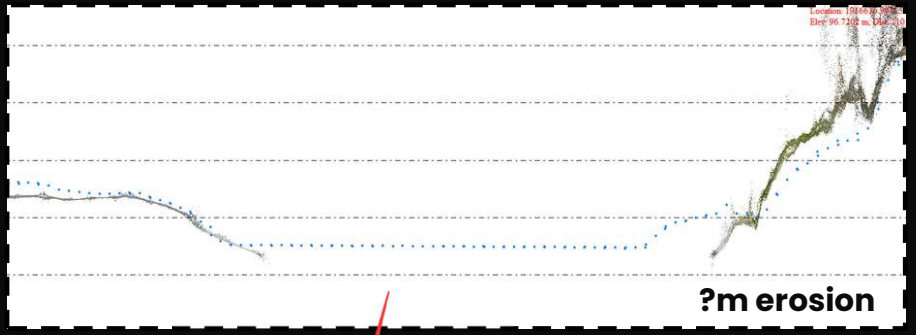
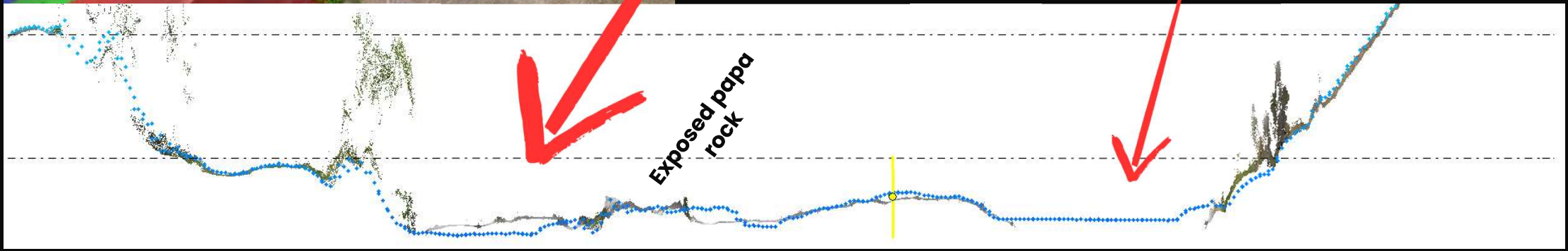
X-section 4
Papa Shelf









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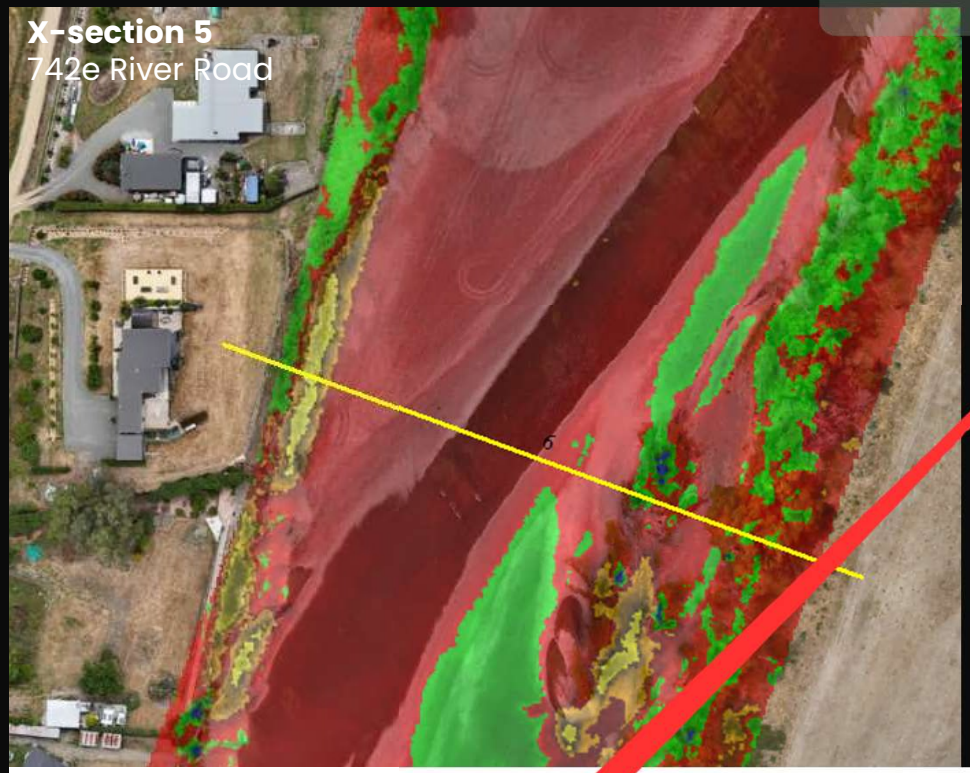

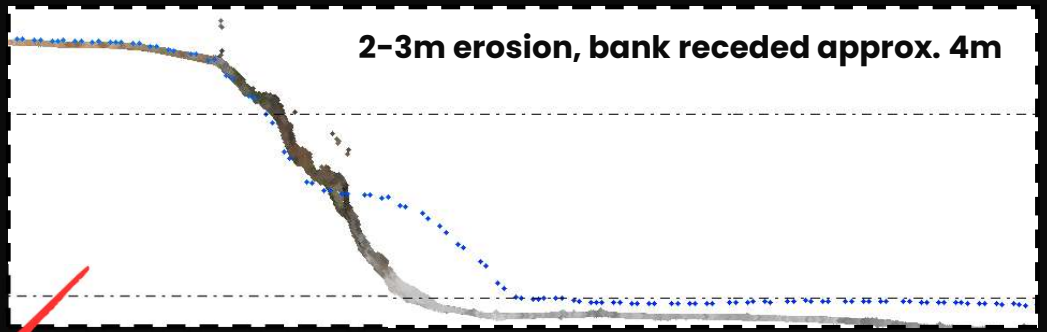

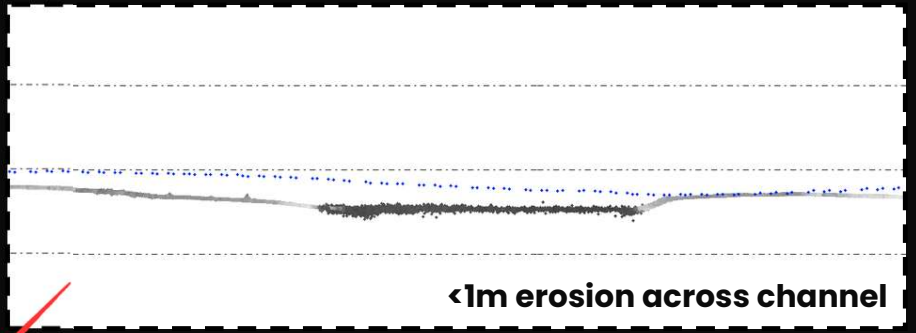

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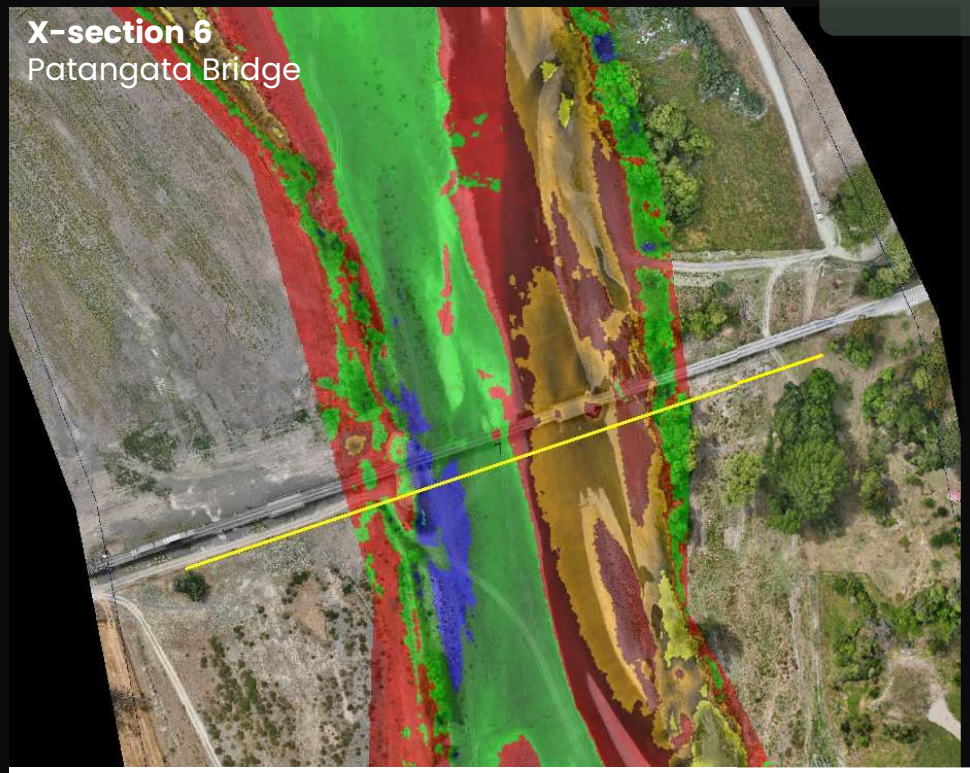
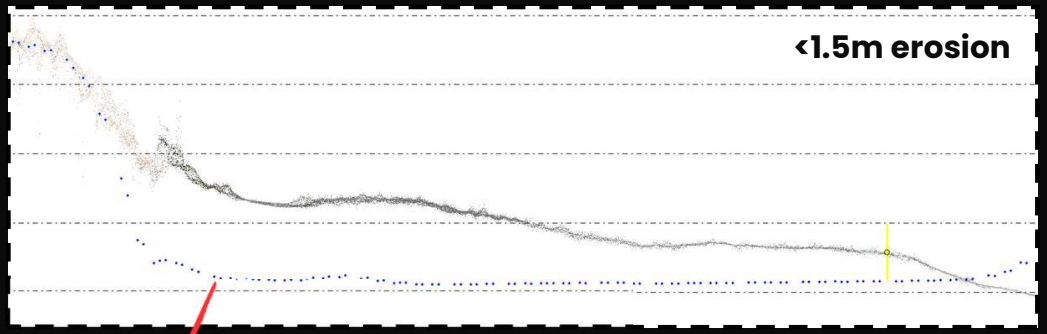
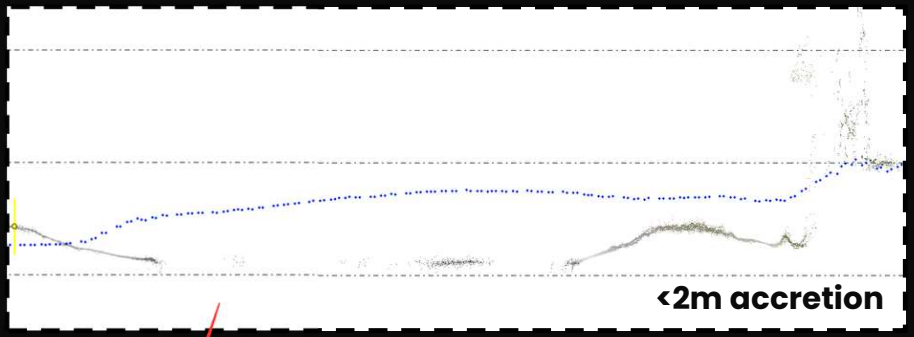
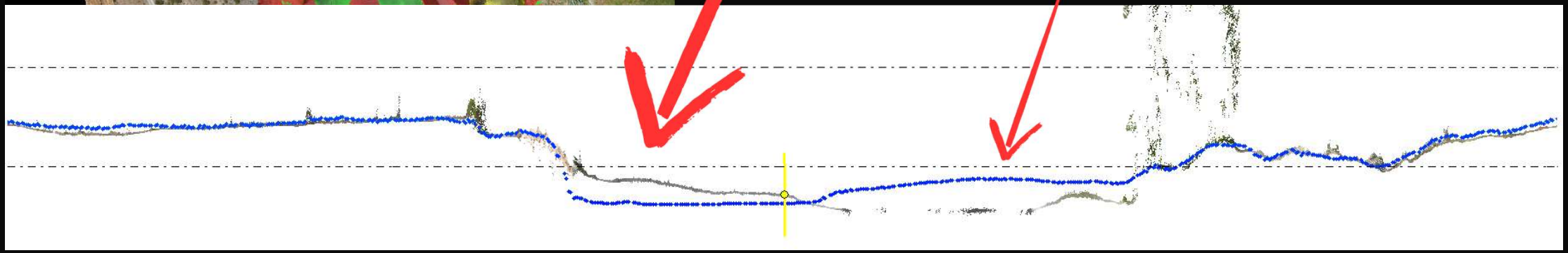
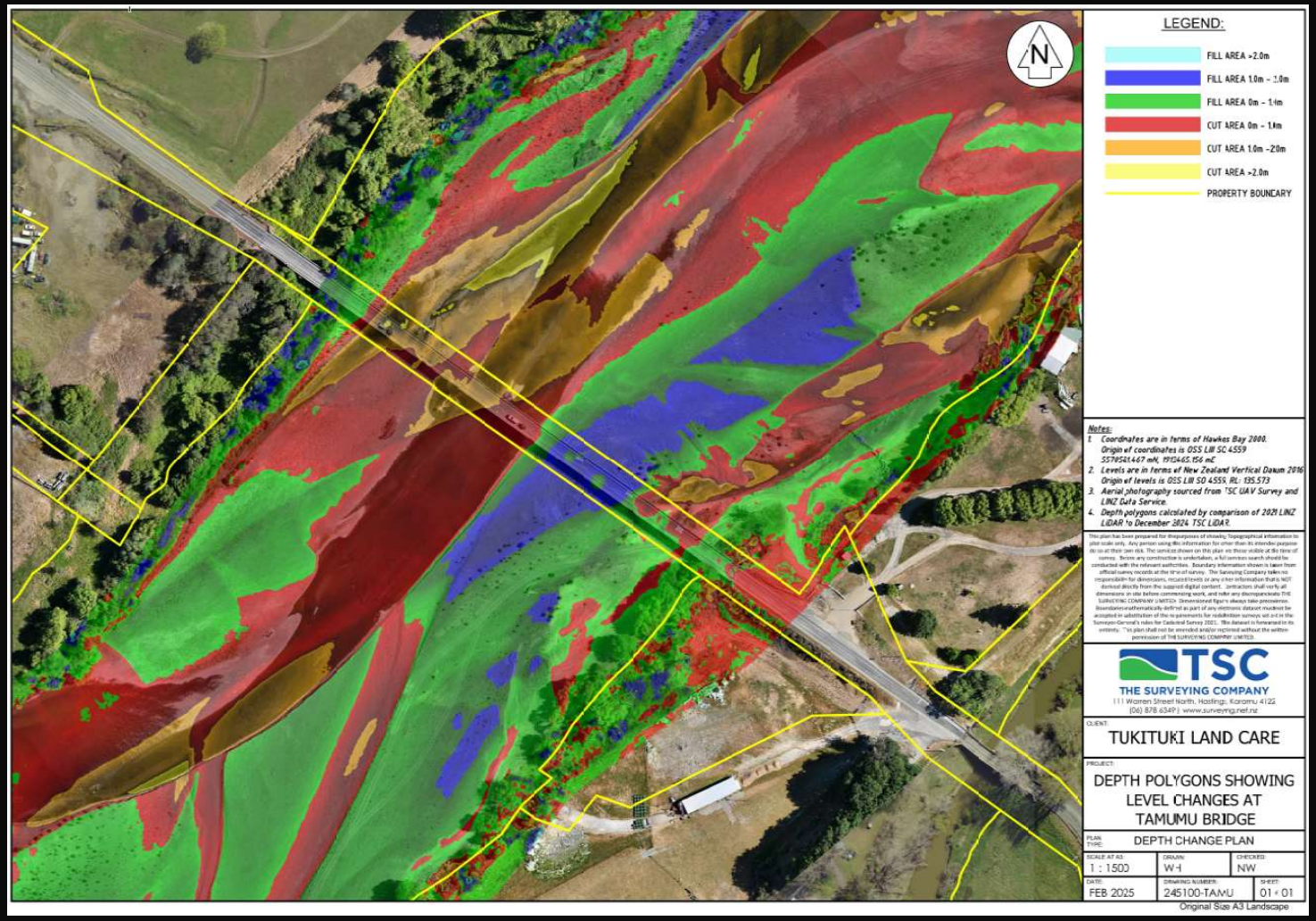




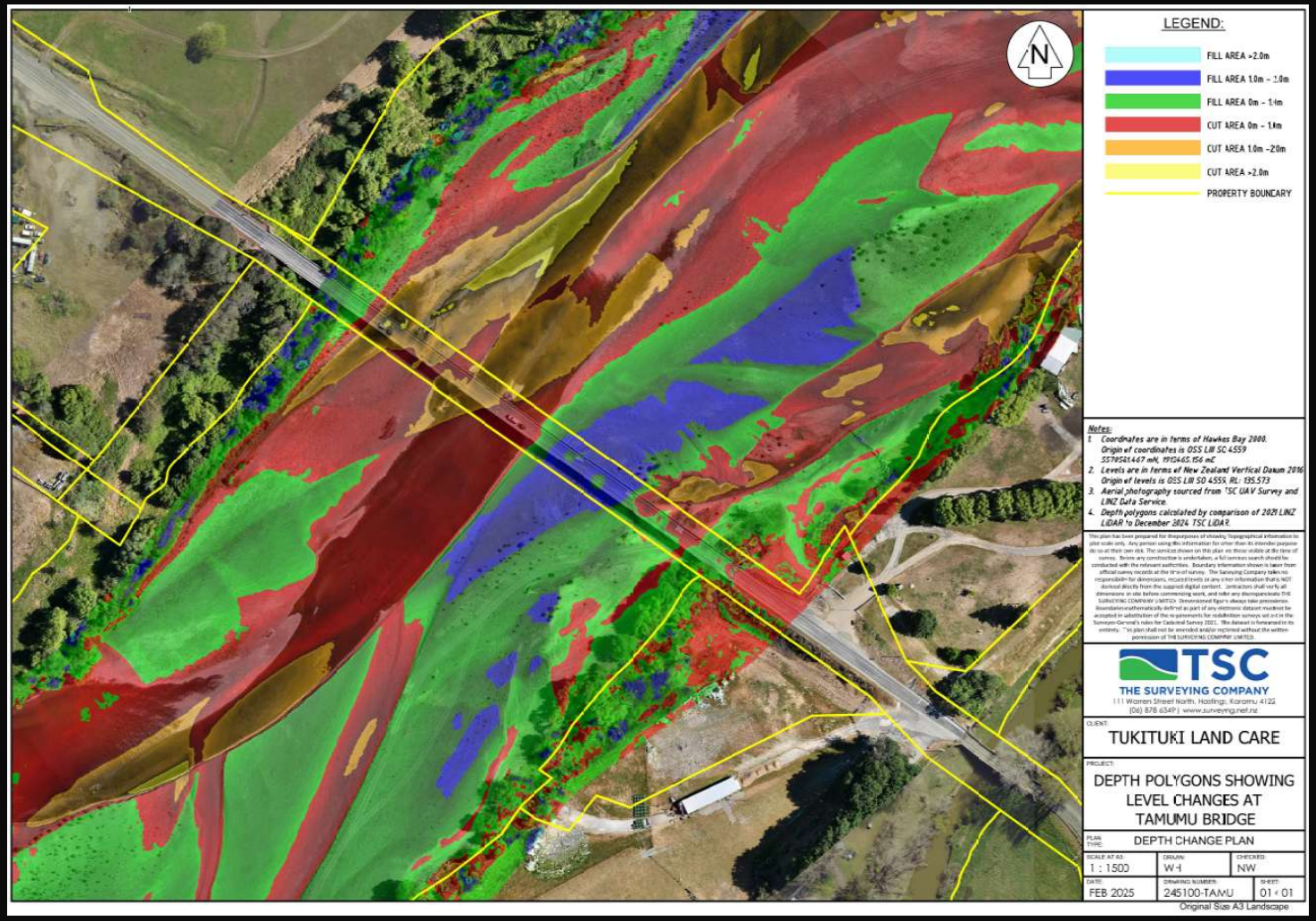






What this map shows.

- This is a depth difference map comparing HBRC and TSC LiDAR surveys to show how the riverbed and surrounding area have changed in height.
- The colour-coded areas represent where material has been either:
  - Cut (erosion or material removed)
  - Filled (deposition or material added)
- The colour coding depicts the depth change categories:
  - Light Blue: Fill ≥ 2 m
  - Dark Blue: Fill 1–2 m
  - Green: Fill 0.1–1 m
  - Red: Cut 0.1–1 m
  - Orange: Cut 1–2 m
  - Yellow: Cut ≥ 2 m



How has the riverbed changed at Tamamu Bridge?

LiDAR data shows significant erosion (≥ 2 m) through the main channel, with active deposition along margins. The bridge zone shows areas of deep scour, highlighting the importance of ongoing monitoring

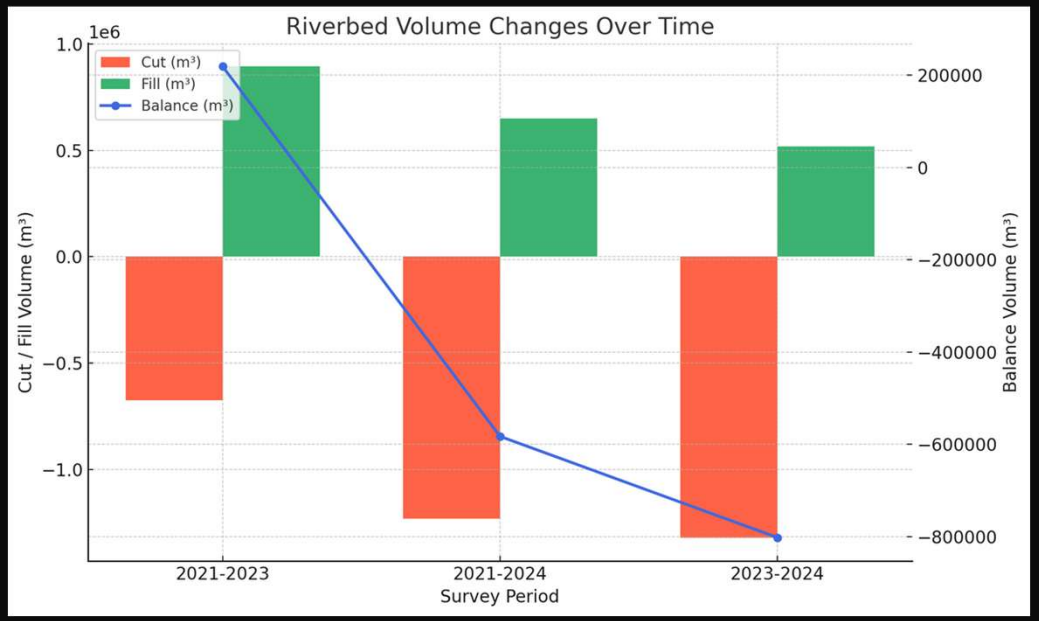
- Large net loss of material through this area from high-energy flows linked to Gabriel.
- Active channel migration and bed lowering evident.
- The presence of a large scour hole (yellow/red) around the bridge piers shows extent of erosion.
- Results support the broader trend seen in volume analysis (net material loss 2023–2024).

A changing river

Our survey shows that the riverbed is changing over time. From 2021 to 2023, more material was deposited in the river than was removed. But between 2023 and 2024, the river lost a large amount of material — about 800,000 cubic metres. This shows that erosion or gravel movement has increased recently, due to both Cyclone Gabriel and ongoing gravel extraction.

Keeping track of these changes can help understand how the river is behaving and provide information for decision makers manage any risks to infrastructure and the environment.

Date From	Date To	Cut (m³)	Fill (m³)	Balance (m³)
2021	2023	-675,487	894,796	219,309
2021	2024	-1,233,050	650,466	-582,583
2023	2024	-1,321,126	519,166	-801,959



Possible Next Steps

Complete Analysis
- Define and analyse specific gravel build-up areas or other areas of interest

Strengthen Accountability Argument
- Align survey results with council cross-section data (where available)
- If possible, compare volume changes with council extraction records

Monitoring & Repeat Surveys
- Bi / Tri - annual full river survey (if budget allows)
- Define trigger points for post-flood surveys
- Continue 360° imagery capture at existing locations (repeatable baseline)

Prepare for Wider Engagement
- TSC can provide support to TLC if they choose to initiate discussion with HBRC

Future Improvements
- Add flow history context to volume change analysis
- Develop bed level / gravel volume trend graphs at key areas.

Get in touch

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Questions