ARTICULATED PANEL REVETMENTS

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Background

The Rangitata Diversion Race (RDR) conveys water across the Canterbury Plains, crossing Taylors Stream and both north and south branches of the Ashburton River. Flow is conveyed beneath the riverbeds via a pressurised pipe (siphon). The race and siphon headwalls are contained by dams with concrete revetements.

Following a significant storm event in the Ashburton River Catchment, several pieces of infrastructure were damaged around the region. Among them were a series of RDR concrete revetments (example below), each protecting the dams from scour at the margins of braided rivers. Riley was engaged to design a repair solution for seven sites.

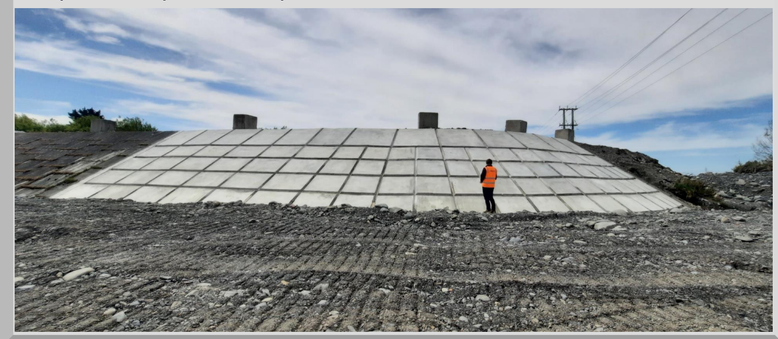
Design Components

- Concept design models to help understand the three-dimensional aspects (example model shown in the panel below).
- Scour assessment including scour depth calculations.
- Structural design of concrete panels, anchors, and steel strands.
- Sizing rock riprap to provide additional protection to the revetment.
- Silt fences and cofferdams for erosion and sediment control during construction.

Construction

As each site was further uncovered during construction, new challenges were presented. Effective collaboration between the designers, contractor, and client allowed solutions to be promptly implemented for the following challenges:

- Constructing around historic infrastructure (1930s onwards) with limited as-built information.
- Working within the river corridor and associated seepage.
- Varying slope gradients of the embankment leading to complex panel geometries.
- Unexpected ground conditions (clay) in the riverbed.
- Further damage to the existing panels and concrete toe, previously hidden by the riverbed.



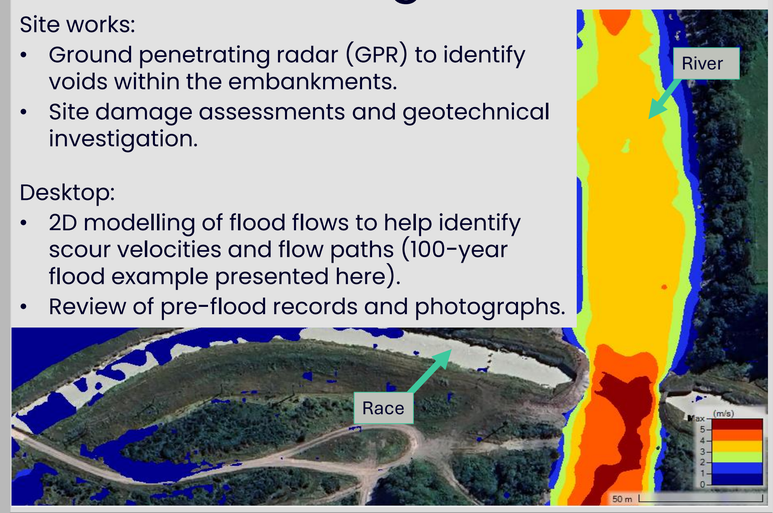
Investigation

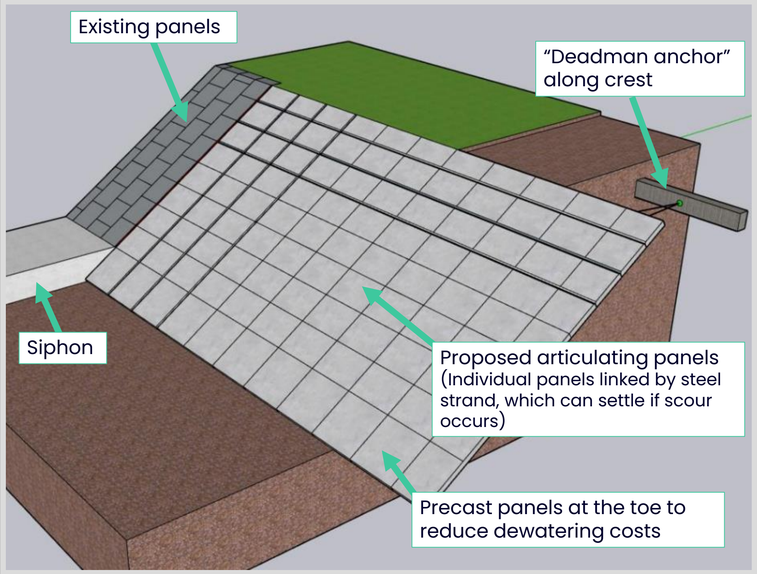
Site works:

- Ground penetrating radar (GPR) to identify voids within the embankments.
- Site damage assessments and geotechnical investigation.

Desktop:

- 2D modelling of flood flows to help identify scour velocities and flow paths (100-year flood example presented here).
- Review of pre-flood records and photographs.





Learnings

- Engineered solutions in dynamic environments should include early warning systems before catastrophic failure (in this case, allowing for panel deformation if scouring occurs).
- Utilising a base design that is adaptable to various sites saves time and cost at both the design and construction phases.
- Proof that positive relationships between the designer and contractor streamlines the construction process.

Acknowledgements

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