TREC's experience integrating design and construction software with GIS

John Carter- 18th June 2025

Transport Rebuild East Coast

NZ TRANSPORT AGENCY WAKA KOTAHI | KiwiRail

Te Kāwanatanga o Aotearoa
New Zealand Government

SH2 Devil's Elbow, 2023

Transport Rebuild East Coast

Transport Rebuild East Coast (**TREC**) Alliance

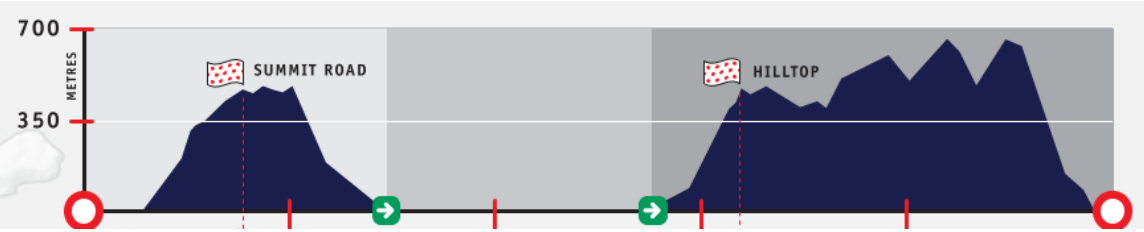
Set up by: NZTA and KiwiRail

Aim: to plan, organise and deliver much of the recovery and rebuild work needed on the highway and rail networks in

Te Tairāwhiti (Gisborne) and

Te Matau a Māui (Hawke's Bay)

In conjunction with local businesses and contractors.



Cyclone Hale aftermath: Firefighter bikes two hours over rugged terrain to deliver supplies to Tairāwhiti community

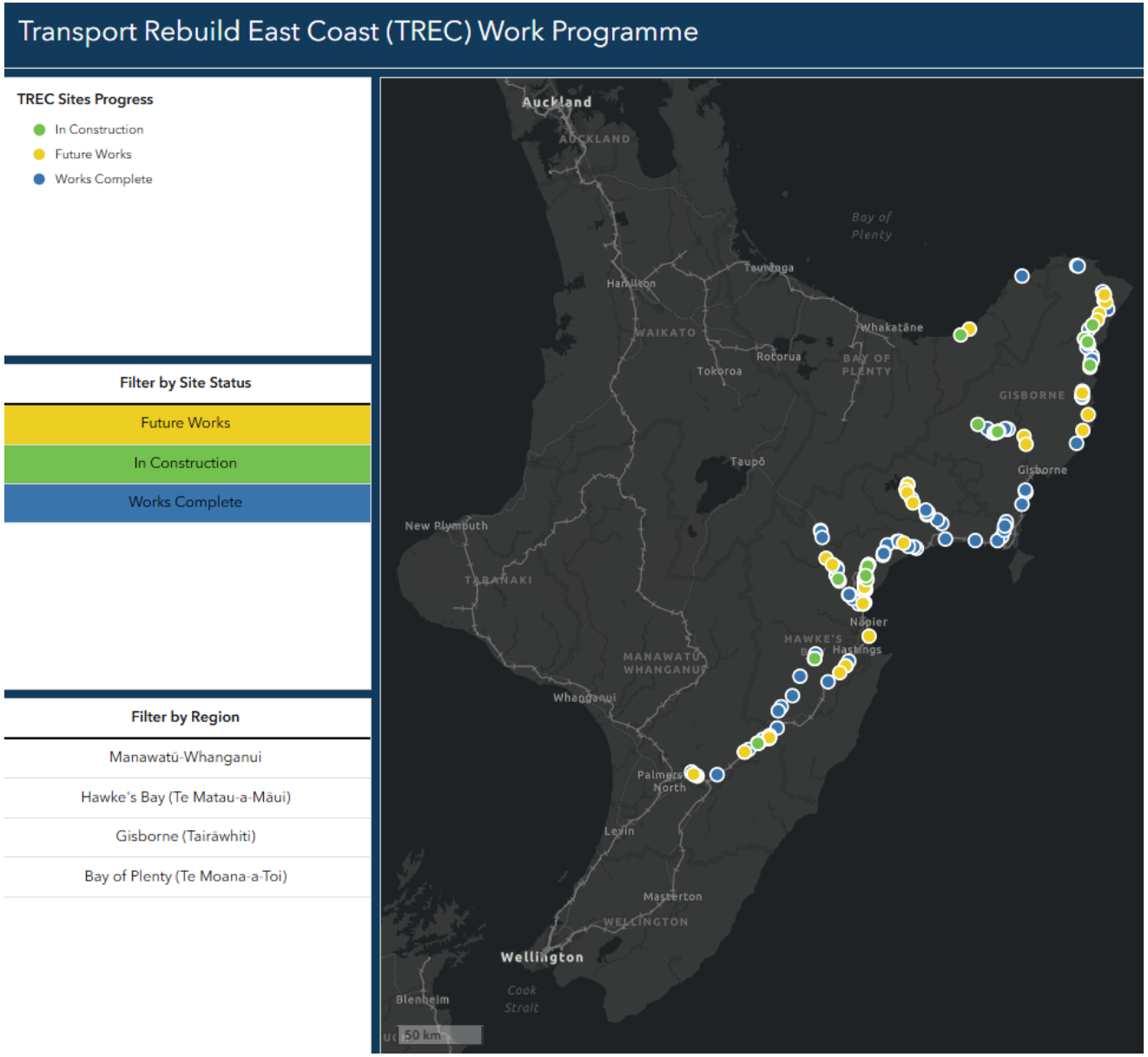
2:47 pm on 13 January 2023

Share this

Monty Manuel biked across rugged terrain to deliver the supplies. Photo: Supplied / Gisborne District Council

TREC Locations

- Recovery with a wide Geographic spread TREC has multiple site offices and main offices in **Napier** and **Gisborne**.
- Over **80%** of the projects are completed now.
- Physical works is expected to be complete **mid-2026**.
- Supporting offices in **Christchurch** and **Auckland**.



Transport Rebuild East Coast

NZ TRANSPORT AGENCY WAKA KOTAHI | KiwiRail

Off to a Flying Start

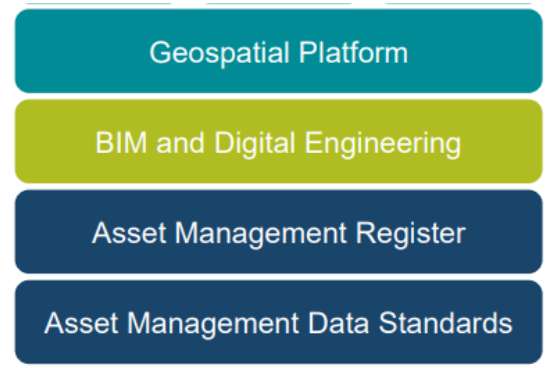
Transport Rebuild East Coast

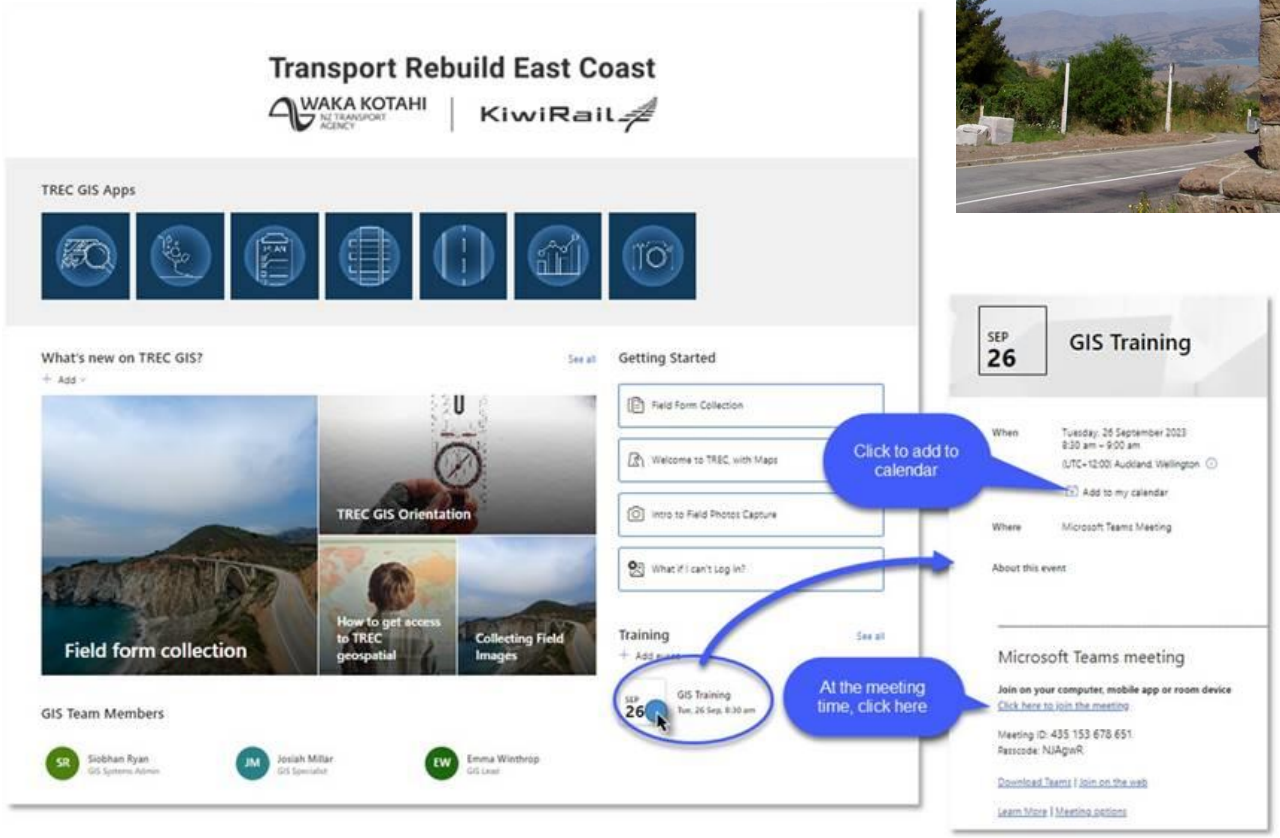
NZ TRANSPORT AGENCY WAKA KOTAHI | KiwiRail

Strong Foundations – Guiding new staff

GIS capability in the rebuilding infrastructure

- Build off past recoveries (NCTIR & SCIRT)
- BYOD – growing staff by Dec 2023
- NZTA Digital Enablement Strategy
- KiwiRail existing systems.
- Easy directions: Guides, news and help documents. Induction meetings.

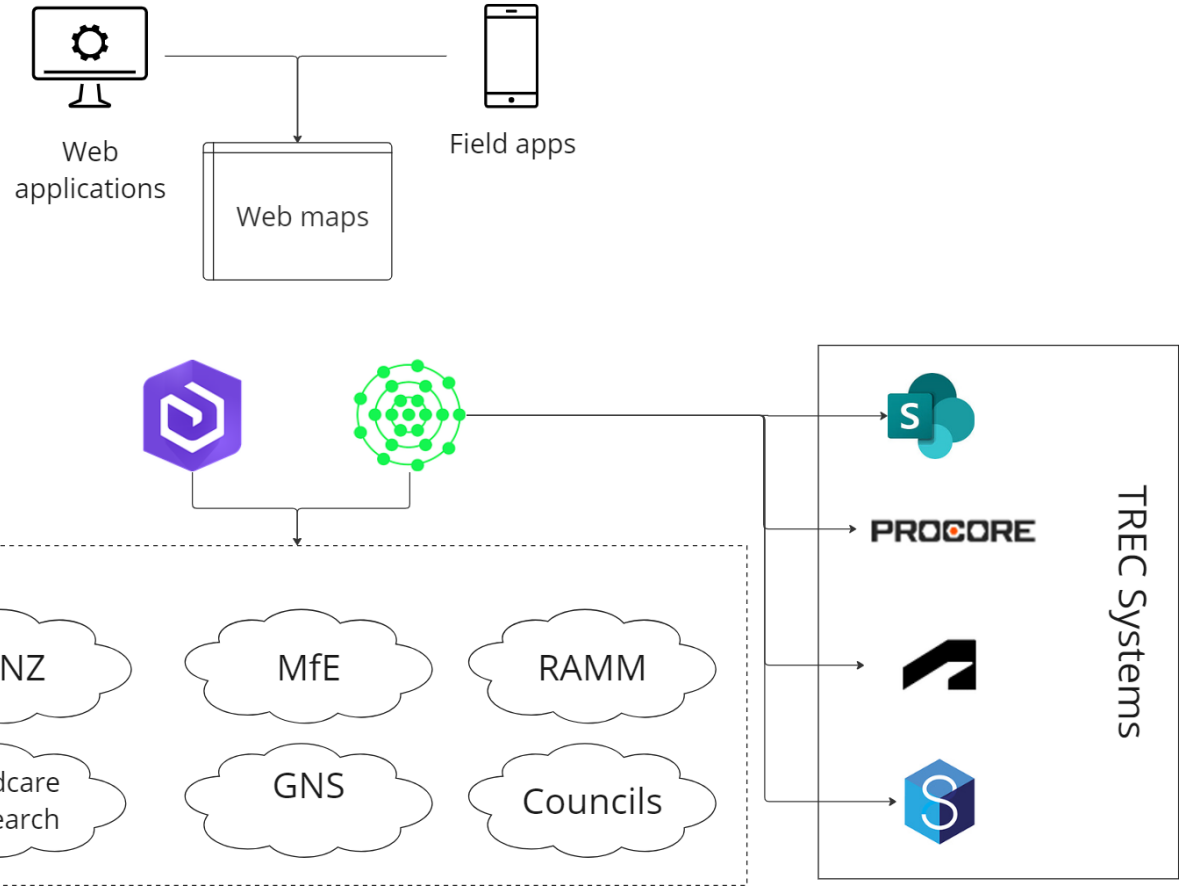




Strong Foundations – TREC Systems

TREC GIS uses NZTA's hosted Azure cloud environment with an Enterprise ArcGIS Portal and FME Flow.

- Jira request system with almost every request using FME Form as a starting point.
- CDEs: SharePoint, ArcGIS Enterprise followed by 12D Synergy & Autodesk Construction Cloud
- Procore (Construction Management Tool)
- FME Flow on Azure



FME Supporting Design: LINZ Public Data

LINZ Elevation DEMs and AWS Cloud optimised Tiffs

Transport Rebuild East Coast

NZ TRANSPORT AGENCY WAKA KOTAHI | KiwiRail

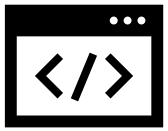
TREC Design Assessment

Design - Assessing damage, supporting business cases and as-builts for handover

- Experience Builder Apps used in Workshops to capture damage- Corridor Assessments

- Corridor business cases with 100s of faults along the highways
  - Corridor Assessment Workshop
  - ***Concept Design editing and QS Integration and costings with FME***
  - ***Concept Design Viewer***

- Design Options: Three major project business cases
  - Devil's Elbow
  - Eskdale
  - Mangahauini Gorge



- Design data from Digital Engineering Team
  - Design data from 12D Synergy brought into GIS from drawings and models
  - **FME used to covert DE data 12d Synergy Connection**

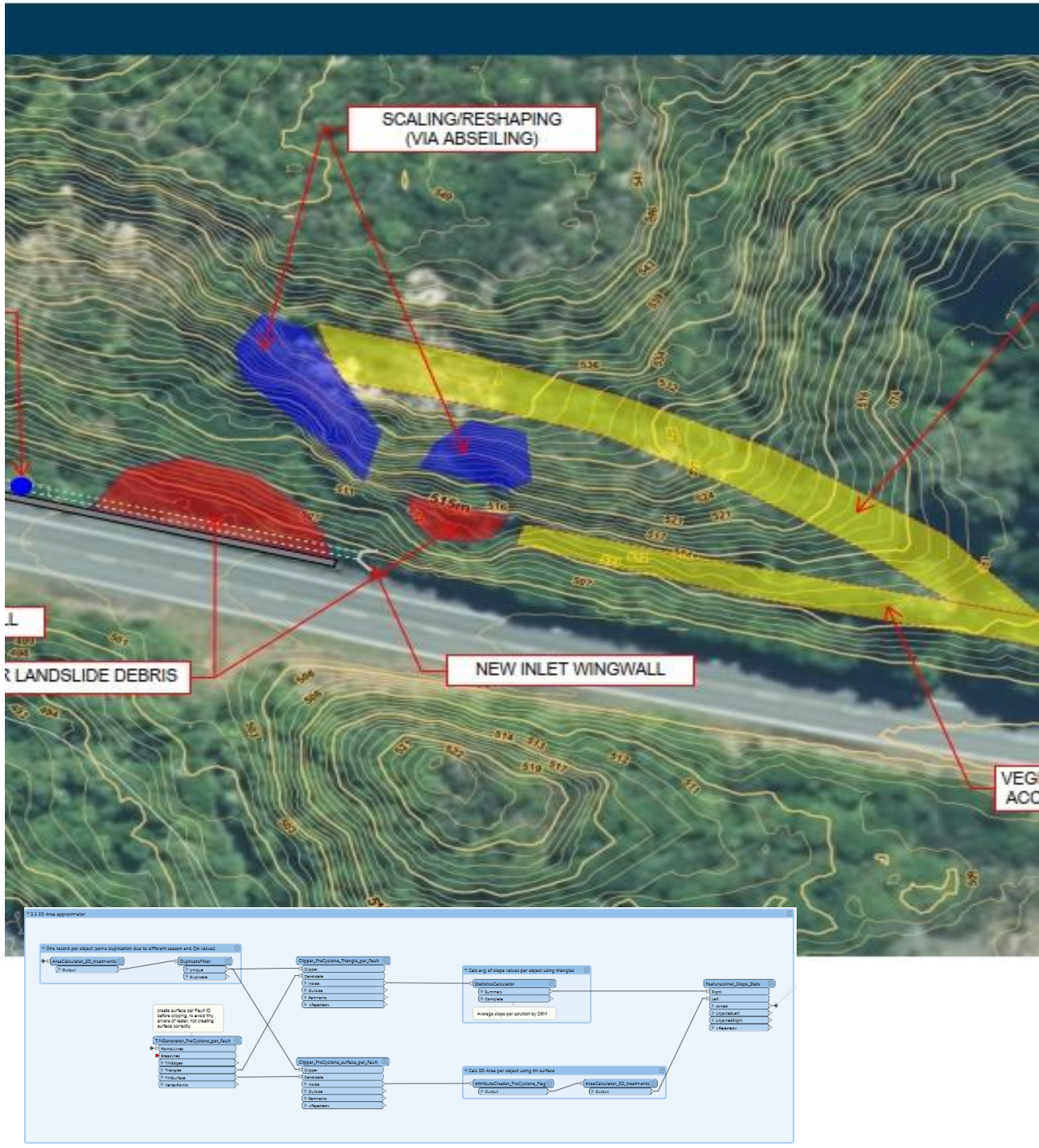
- Survey Team Elevation and imagery
  - ***Elevation Imagery*** stored on Autodesk Construction Cloud
  - ***FME using ACC API and Web Connections***

- Captured as-built data into Asset Management Data Standard AMDS
  - Producing a central database and packages for Handover to NZTA and KiwiRail

Business case concept design solution

Simple Standard Designs to Costing (QS)

- Concept Design + QS integration
- Key Challenge: business case inputs for SH2 and SH5 corridors including 123 Fault locations
- Concept designs with rich calculated attribution derived and merged from multiple data domains (~40 solution types) by FME to provide quantities output as XLSX for QS
- Uniform, automated, repeatable results - avoiding CutNPaste
- Recent experience of more “traditional” approach took ~25 people about 8 weeks of design time for 100 sites
- Integrated GIS/FME process used a design team of 6 FTEs to complete all the pricing of 123 sites in approximately 10 weeks (including 2 for the QS)
- Approximately 8-10 hours per site at business case stage, currently approximately >2500 hours saved



LINZ Elevation Data

Elevation 1m Gids available AWS Public Cloud

- The STAC Catalog https://nz-elevation.s3-ap-southeast-2.amazonaws.com/catalog.json is the entry point of the LINZ elevation data.
- It points to the different STAC Collections representing a dataset.
- Same can be done for nz-imagery collection

Project Boundary/ Area of Interest (AOI) → Read in Json Extents → Read in Tiles & Geom → Read in COG Geotiffs inside AOI → Create DEM Contours Project, Reformat (DXF)

https://nz-elevation.s3.ap-southeast-2.amazonaws.com/catalog.json
Filter or parameter for sorting out the 1m DEMs, DSMs, nz contour dem_8m visual, Hillshades

E.G https://nz-elevation.s3.ap-southeast-2.amazonaws.com/hawkes-bay/hawkes-bay_2023/dem_1m/2193/collection.json

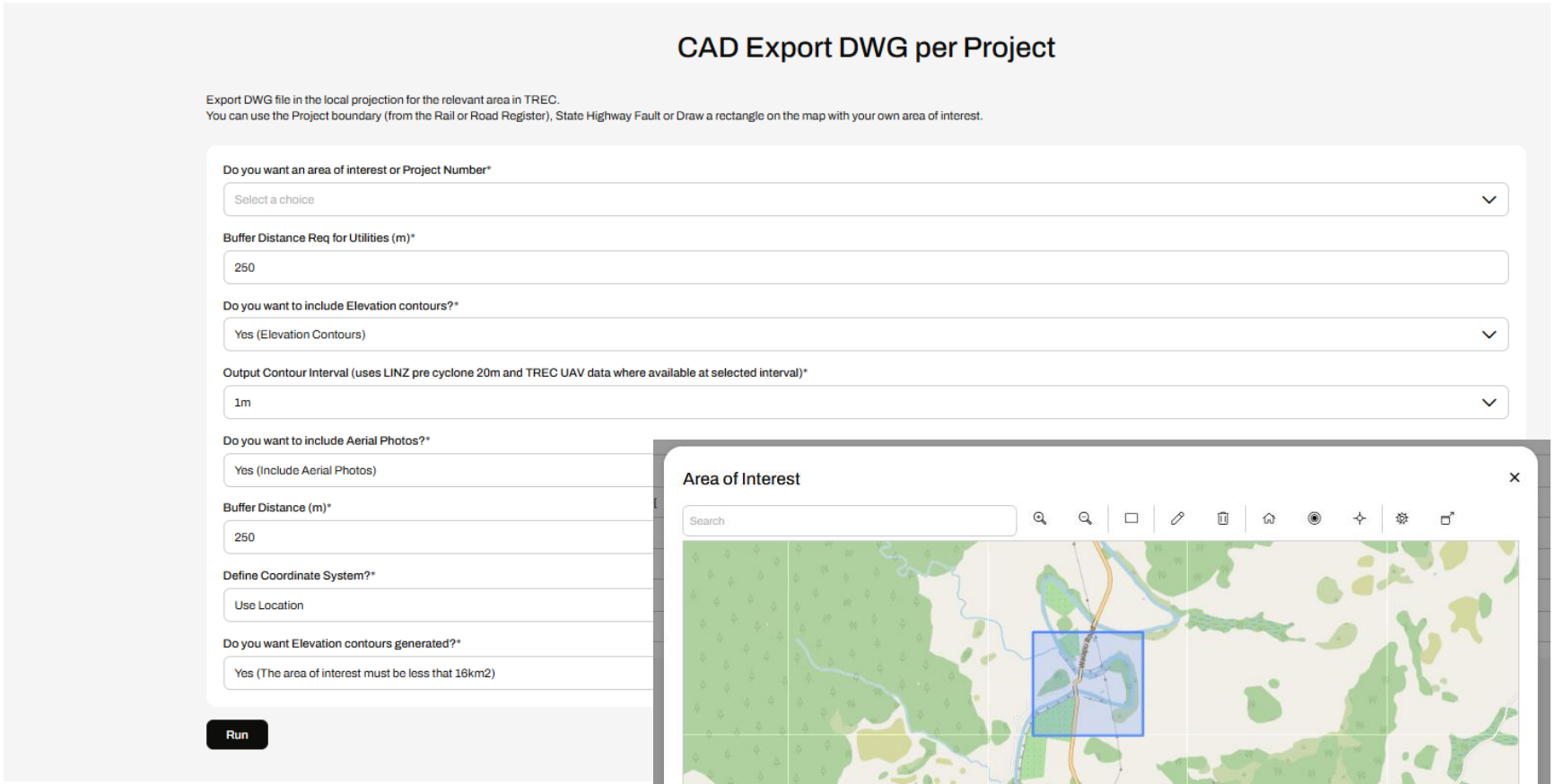
FME v2022-2023
COG reader error: Cannot open TIFF file due to missing codec. Alternative use API
2024- bug fixed ☺

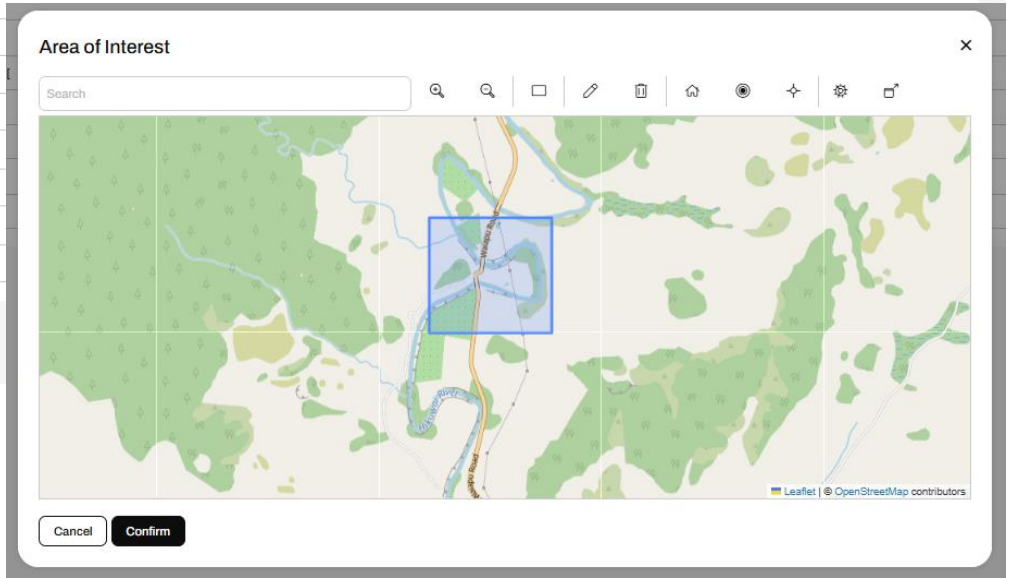
CAD Export Tool – Self Service Flow App

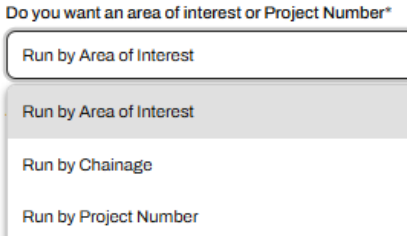
Using LINZ AWS Data in FME

Transport Rebuild East Coast

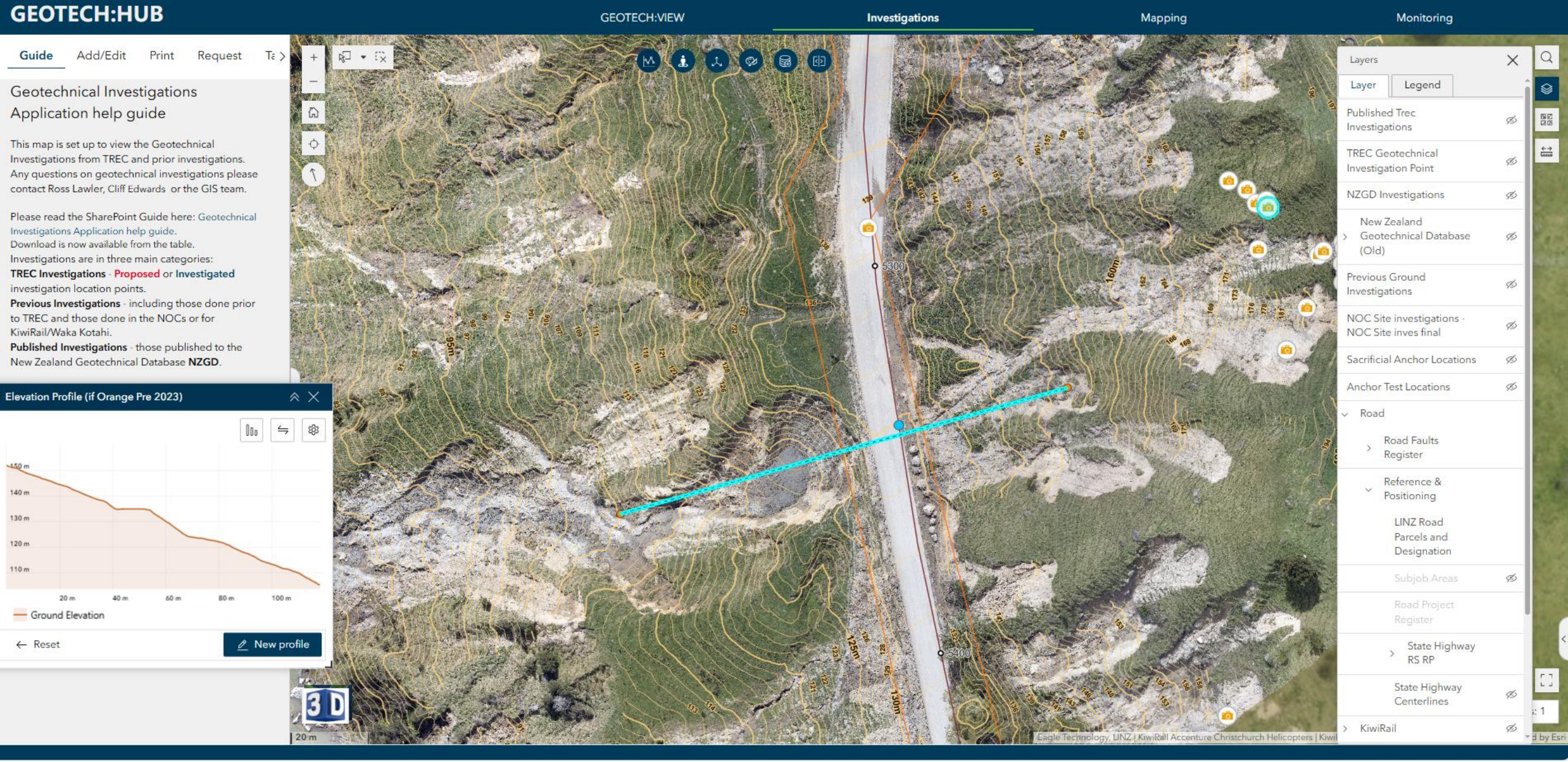
WAKA KOTAHI NZ TRANSPORT AGENCY | KiwiRail







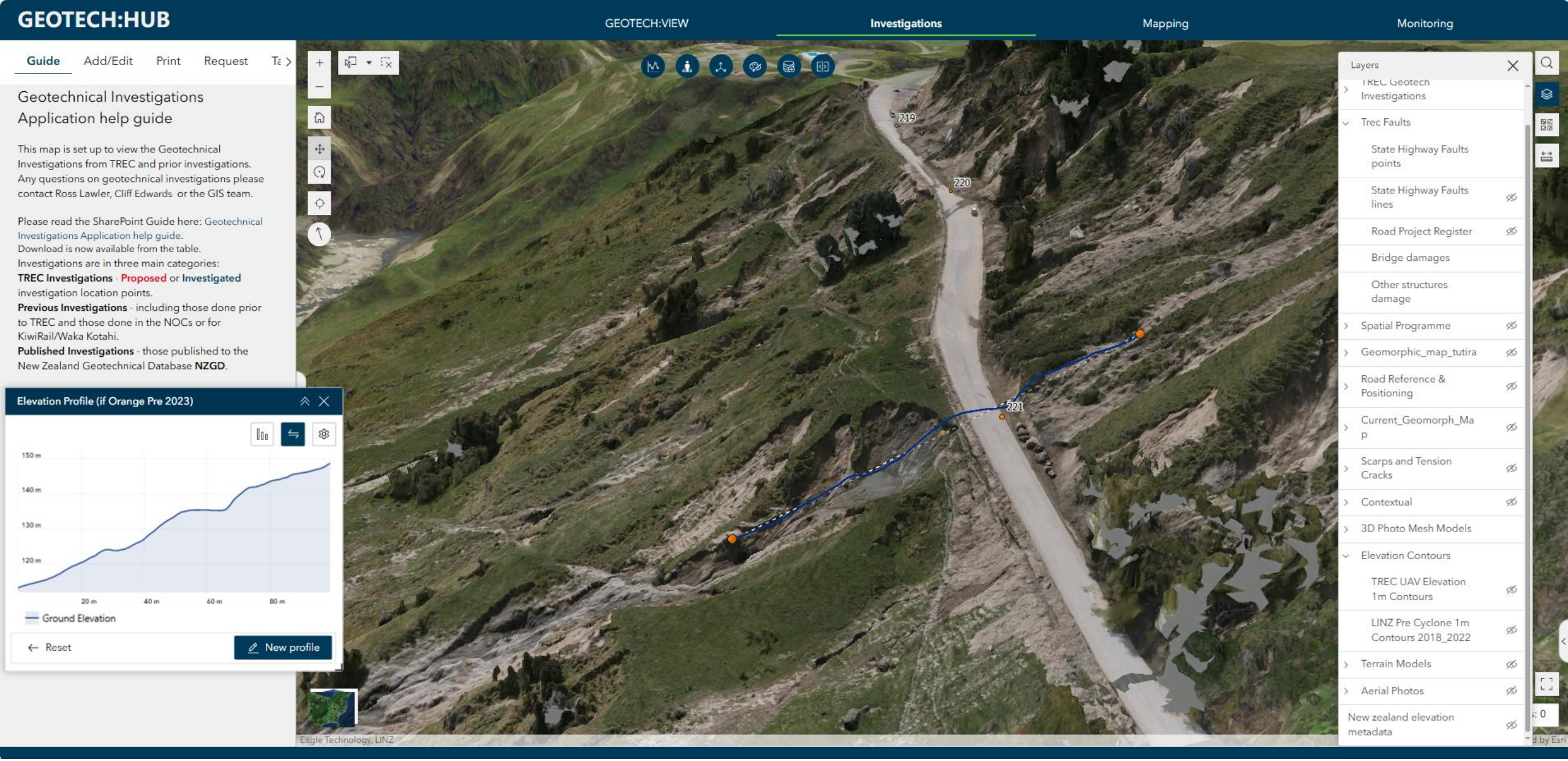
- Parameter for Project, RSRP/Chainage (NZTA SH or KiwiRail Kms) or select AOI from Map.
- Includes Key GIS data and Utilities
- Select Contour Interval generated
- Allow for buffering to capture features and topography surrounding the site.
- Uses the Digital Engineering DWG templates and exported in local projection for design.
- Point in time data for versioning.



Transport Rebuild East Coast

NZ TRANSPORT AGENCY WAKA KOTAHI | KiwiRail

Experience Builder 2D/ 3D Maps



Transport Rebuild East Coast

NZ TRANSPORT AGENCY WAKA KOTAHI | KiwiRail

Experience Builder 2D/ 3D Maps

FME Integrating Autodesk Construction Cloud and GIS Portal

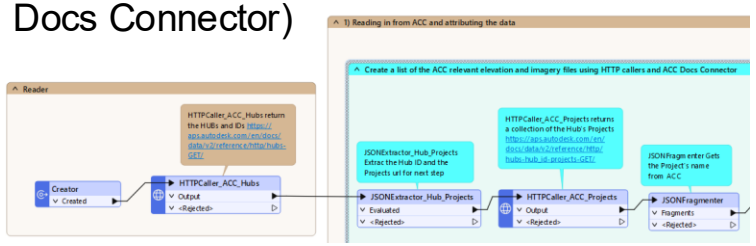
Transport Rebuild East Coast

NZ TRANSPORT AGENCY WAKA KOTAHI | KiwiRail

TREC Survey Data - ACC

Elevation and Imagery Captured by UAV in Autodesk Construction Cloud

- The Survey Data initially was stored in SharePoint but moved to ACC for standard formats and naming
- Custom Fields and lots of Projects
- GIS created an elevation footprint layer and an imagery footprint layer
- FME – to automate
- ACC – Web connection (Custom Integration (for API) or Apps for ACC Docs Connector)



AUTODESK Construction Cloud

Hub with Projects for different Recovery Zones

Web Connection – set up in ACC with Admin

2 Options FME Autodesk Docs Connector or API

Data Management API

Version 2

Hubs > Projects > Folders > Search (Filter by type etc.) Page (limit 100)

API
+ Faster
+ Custom Fields
+ Filter

Download data Update extents, metadata in GIS Portal

GIS Footprint layers (Elevation & Imagery)

Survey Files can be large (filtering and change detectors help with limits of FME Flow)

Thank you to...

TREC's GIS Team:

Jason Ridley (TREC's FME Enablement Lead)

Josiah Millar (TREC's GIS Analyst)

Emma Winthrop (NZTA)

Karl Henderson (TREC's ACC and asset admin)

NZTA and KiwiRail:

The NZTA GIS Intel and Systems team lead by Peter Willoughby

Andrew Shakes from KiwiRail.

Andrew Douglas-Clifford (Tonkin + Taylor)

LINZ Team

Transport Rebuild East Coast

NZ TRANSPORT AGENCY WAKA KOTAHI | KiwiRail

Rail

Ashhurst Rail Bridge

Tairāwhiti

Whakaari Bluff

38 Hawke's Bay

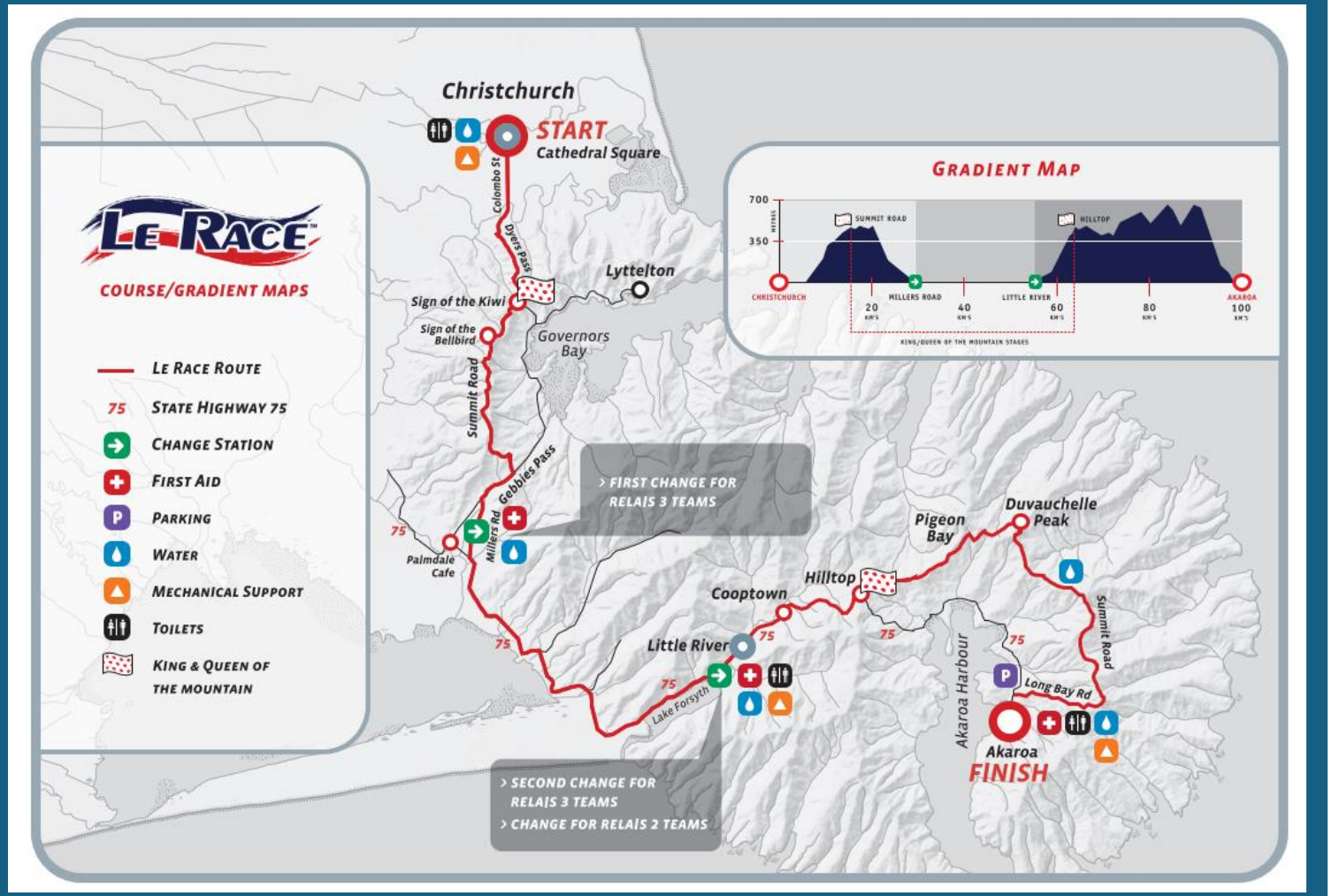
Piripiri Scour

Questions

Transport Rebuild East Coast

NZ TRANSPORT AGENCY WAKA KOTAHI | KiwiRail

Theme



Transport Rebuild East Coast

NZ TRANSPORT AGENCY WAKA KOTAHI | KiwiRail