

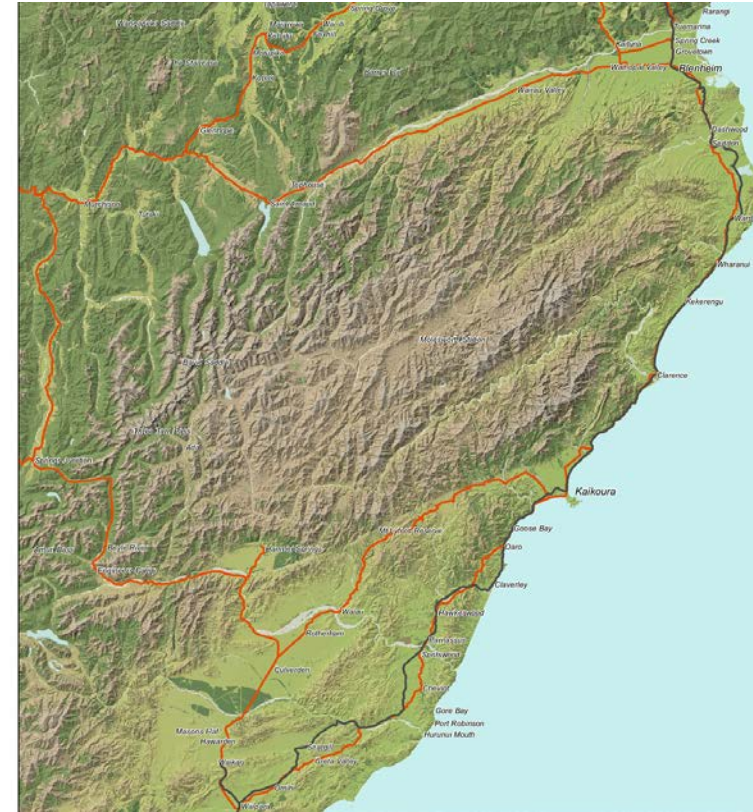
# Using remote monitoring to allow safe running of trains post the Kaikoura Earthquake

*Daniel Headifen, KiwiRail and Zeb Paterson, Engeo*



# The Main North Line

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# Extensive Damage To Slopes

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# Remote Monitoring Fences

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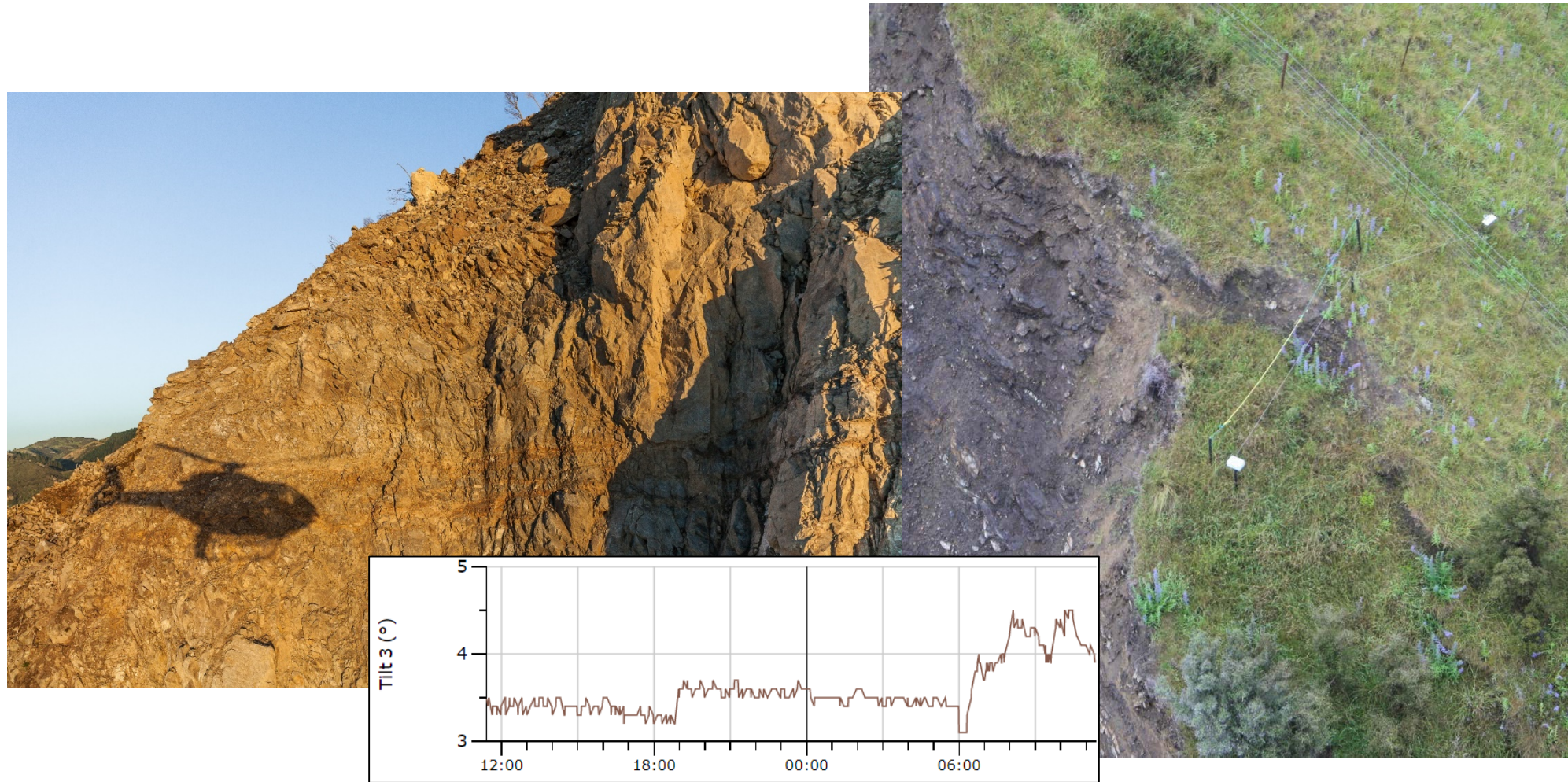
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## Remote Monitoring Fences

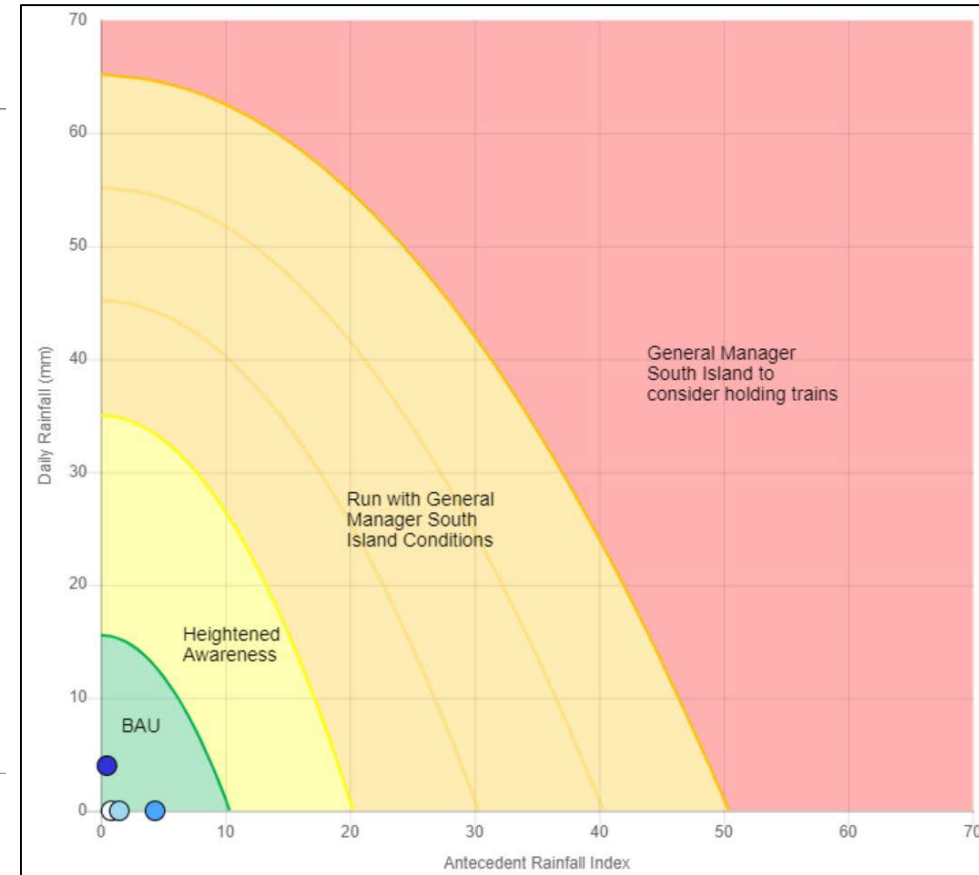
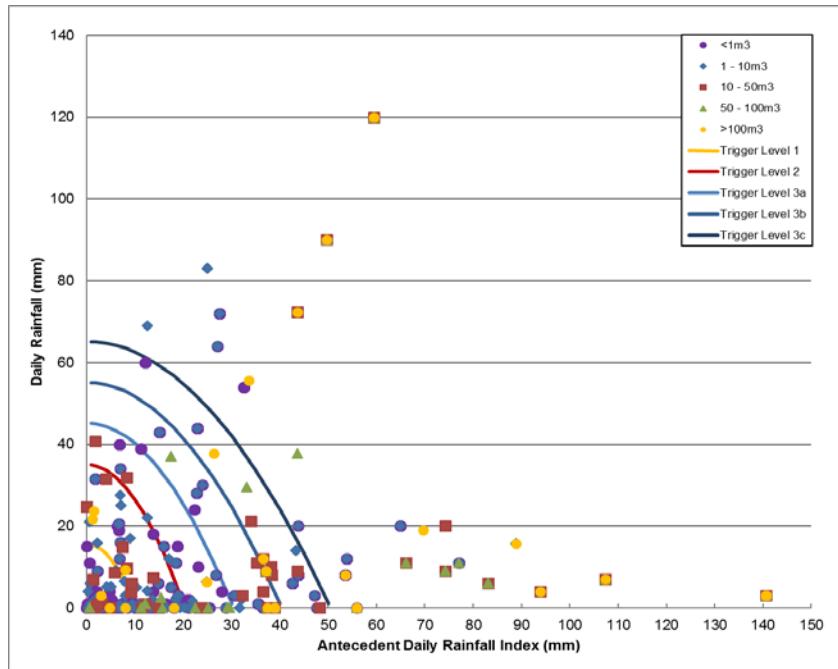




# Specialist Geotech Monitoring



# Operational Controls





# Construction Phase

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**Construction of  
Permanent Works**



**Review  
Performance**



**Disestablish Monitoring &  
Increase Thresholds**





# Lessons learnt

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Slip 2



15.Sep 2017 07:17:15:012



# Ongoing uses by KiwiRail

Region	Upper NI	Lower NI	WN region	West Coast	Upper SI	Lower SI	Comments
Date Main lines in region	NIMT, ECMT, Auckland	NIMT, PNGL, MNPL	NIMT, WRAPA, Wellington	MIDLND, SNL, HKTCA	MNL, MIDLND, Christchurch	MSL	
Monday, 16 September 2019							1. Heavy rain develops West Coast. Totals reach 100 mm for alpine MIDLND areas, and 50+ mm other areas of West Coast and Buller. 2. Strong northwest wind gusts (90+ km/h) develop eastern areas of South Island pm, and south of a line Napier to Whanganui for North Island evening, and also about coastal parts of Westland and Buller evening/tonight. <u>Risk 120+ km/h gusts MIDLND line east of Arthurs Pass for alpine/foothills/upper plains from evening, and for Marlborough and lower North Island tonight.</u>
Tuesday, 17 September 2019							Rain clears West Coast/Buller by dawn. <u>Strong wind gusts ease most South Island areas by around dawn, and in Southland and North Island areas by about midday.</u>
Wednesday, 18 September 2019							No significant weather.
Thursday, 19 September 2019							No significant weather.
Friday, 20 September 2019							No significant weather.
Non-impacting weather expected							
Active weather - but with minimal impact expected (see comments). Note that 'active weather' is based on 24-hour rainfall totals >25 mm, wind gusts >80 km/h, and snow accumulation >5 cm etc.							
Significant weather expected - potential for impacts on network at some locations (see underlined comments). Additional email updates to be issued with focus on high risk areas.							
Significant weather expected - potential for widespread impacts on network (see underlined bold comments). Additional email updates to be issued with focus on high risk areas.							





# Stronger Connections. Better New Zealand.

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