



Surveying the Damage after a 7.8 Earthquake



Created in cooperation
with Eliot Sinclair

In November 2016, after a long period of seismic activity in the South Island of New Zealand, there was another significant 7.8 magnitude earthquake that caused major land movement and heavily impacted the seaside town of Kaikoura.

Solution

- Trimble R8 GNSS Receiver
- Trimble SX10 Total Station
- Trimble Business Center
- Trimble RealWorks
- Trimble HydroPro

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This land movement was primarily an uplift in the seabed that affected all the coastal roads and marinas. Kaikoura sits on the main state highway running through the South Island which was impassable in both directions following the quake. Only a heavily damaged inland route was available and open for a few short predetermined times each day.

Eliot Sinclair, a premiere surveying, engineering and planning firm based out of Christchurch, New Zealand, was approached to conduct a survey of the South Bay marina area. Fishing and tourism boats were only able to use the marina around high tide due to the seabed change and subsequent lack of water. The purpose of the survey was to understand the current state of the area in order to plan the remedial action.

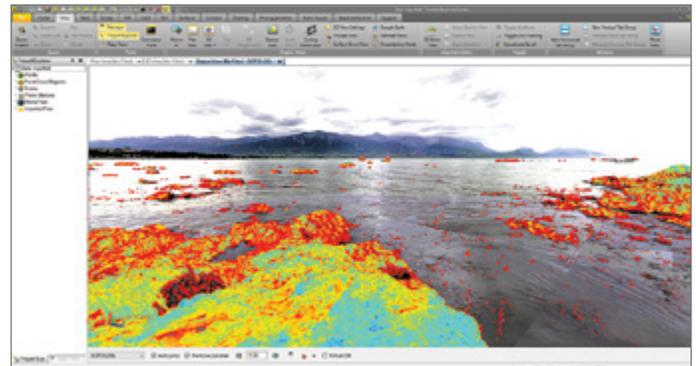
There were significant challenges with the survey including getting to the site, as well as restricted windows for data capture having to work around the tides. There was also the complicating factor of having to reestablish control after the land movement, as well as dealing with both land and sea based data acquisition. Eliot Sinclair used a range of data collection and processing tools including the Trimble SX10 Scanning Total Station, Trimble R8 GNSS Receivers, Trimble Business Center, Trimble RealWorks and Trimble HydroPro.

Once on site, a tide gauge and tide pole was setup in the marina and chart datum was re-benchmarked. Single Beam Echo Sounders (SBES) were also used on two vessels to generate seabed survey data. One was a local fishing vessel that was outfitted, the other was a small Orion RIB that Eliot Sinclair transported up from Christchurch.

Trimble R8 GNSS receivers were used to reestablish control and then transfer this to the local sites, where detailed surveying was undertaken with the SX10 Scanning Total Station. The benefit of using the SX10 was the dual purpose ability to operate as a traditional high accuracy total station for

control work, coupled with true scanning capabilities for faster data acquisition - a real asset on a job with such limited space for equipment and the need to have complete confidence in the data acquired while still in the field.

The SX10 scanning functionality was used to measure at low tide to the exposed rocks that proved valuable for a number of reasons. First, it saved a significant amount of time in data collection, replacing the need to manually measure points. Second, it provided much richer data than collecting single topo points on each rock outcrop. The third benefit was that comparisons could be done with the SBES data, which had been measured over the same positions at high tide, providing an extra redundancy on the data.



Drone data was also captured, and then combined with all sensor data to provide a real world picture of the state of the marina and surrounding area. This was then used to plan the remedial work required to get the marina up and running again. Over a year later, the South Island of New Zealand continues to rebuild. With the help of Eliot Sinclair's rapid response, comprehensive survey data and follow up monitoring work, the Marina was able to reopen quickly, resuming the crucial fishing and tourism business.

To find out more about the Trimble SX10 or other products used in capturing data, visit our complete portfolio page:

<https://geospatial.trimble.com/products-and-solutions/total-stations>