



The Canterbury Geotechnical Database: An authoritative source of geotechnical data

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What is the Canterbury Geotechnical Database?

The Canterbury Geotechnical Database (CGD) was established in May 2012 as an online 'one stop shop' and authoritative data warehouse to help rebuild greater Christchurch following the 2010 and 2011 Canterbury earthquake sequence.

The database contains records for;

- over **20,000** cone penetration tests¹
- **4,000** borehole tests²
- **1,000** piezometer tests³ with accompanying groundwater monitoring records, and
- **6,000** laboratory tests. It also included other data needed for obtaining building and resource consents.

The main objective of the CGD was to make the best use of information from geotechnical investigations. Good-quality information and analysis would then enhance the quality of building design and streamline the building and resource consent process.

The data needed to be securely stored, easily accessible by all partners and decision makers and available for ongoing future use.

Developing the CGD

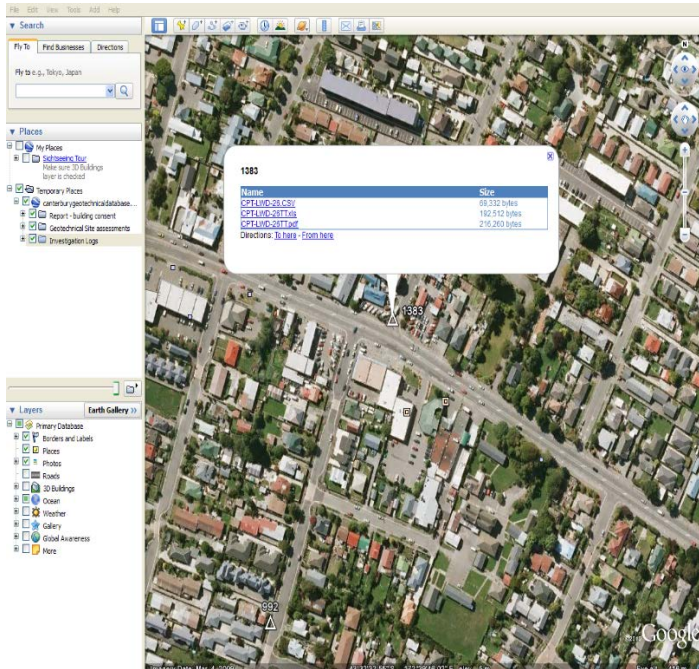
In November 2011, the Ministry of Business, Innovation and Employment (MBIE) (whose responsibilities include those of the former Department of Building and Housing) released guidelines on repairing and rebuilding houses affected by the Canterbury earthquakes.

The guidelines introduced the concept of a database as part of the residential land zoning and Technical Category TC1, TC2 and TC3 investigations (see below for a summary of the zoning and TC categories). The database was to be a way of sharing the available geotechnical data and making the rebuild as efficient as possible.

¹ https://en.wikipedia.org/wiki/Cone_penetration_test

² <https://en.wikipedia.org/wiki/Borehole>

³ <https://en.wikipedia.org/wiki/Piezometer>



Red zone

Areas in the flat land residential red zone had area-wide land and infrastructure damage. An engineering solution to repair the land would be uncertain and costly, and likely to be highly disruptive.

Green zone

Green zone areas were generally considered to be suitable for residential construction.

White zone

Where land was classified as white, complex geotechnical issues relating to land slip and rock roll required further assessment and observation before land decisions could be made.

Orange zone

Land classified as orange meant that engineers needed to investigate it further.

Technical Category 1 (TC1, grey) – future land damage from liquefaction is unlikely. You can use standard foundations for concrete slabs or timber floors.

Technical Category 2 (TC2, yellow) – minor to moderate land damage from liquefaction is possible in future significant earthquakes. You can use standard timber-piled foundations for houses with lightweight cladding and roofing, and suspended timber floors or enhanced concrete foundations.

Technical Category 3 (TC3, blue) – moderate to significant land damage from liquefaction is possible in future large earthquakes. Site-specific geotechnical investigation and specific engineering foundation design are required.

Creating a single source of information

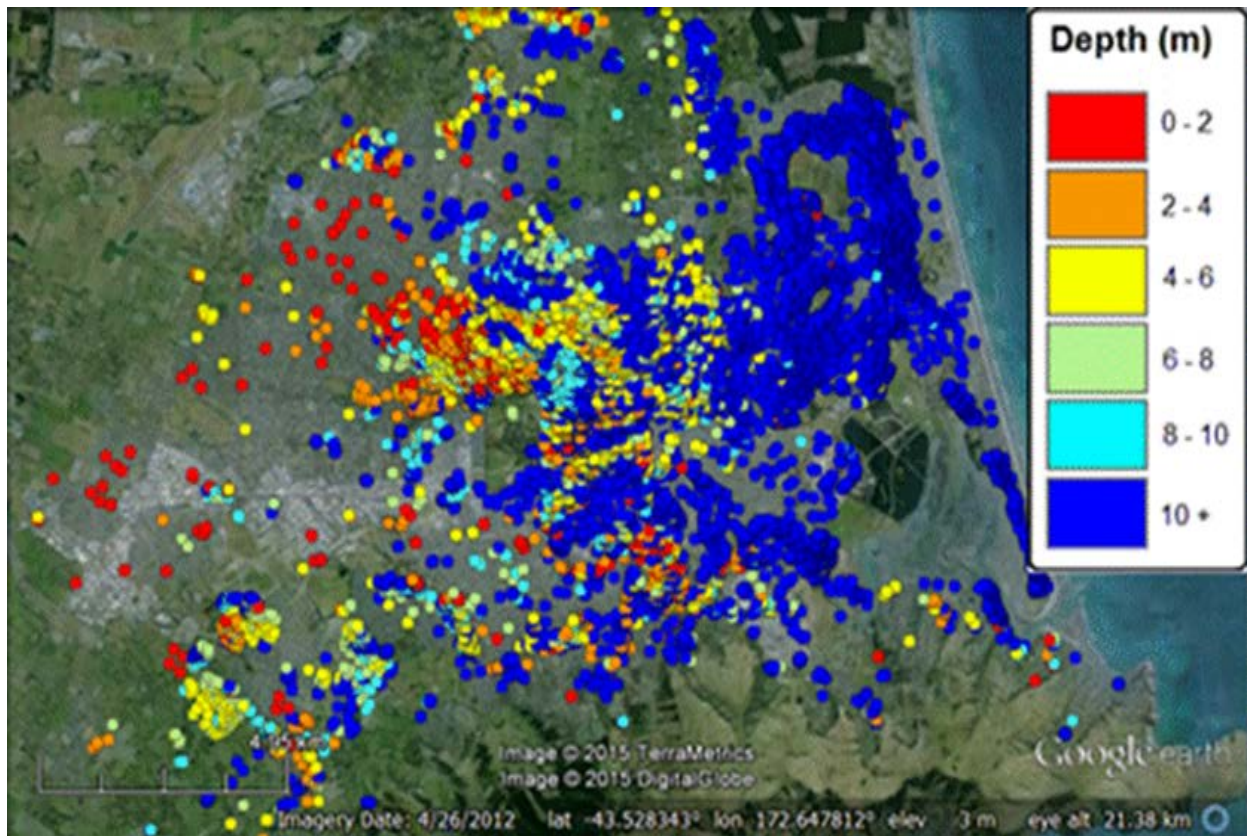
CERA recognised that the geotechnical data being gathered by a range of private (insurance and engineering companies), public and non-governmental organisations was a significant asset. It would be highly valuable if combined into a 'single source' and made available to those requiring information on the rebuild activities of Canterbury.

"If we share data, we can all crack on with the job and get stuff done and not just be in this void of not having enough information. High-value information in the right hands is unbelievably powerful." Stephen Ferriss, Data & GIS Manager, CERA

CERA worked closely with a wide range of entities to build the CGD. At first, the Earthquake Commission (EQC) provided it with the majority of the data. Private sector insurers and geotechnical companies also contributed to the database. Engineering company Tonkin and Taylor provided technical support.

Other stakeholders were:

- territorial local authorities
- universities and research institutes (national and international)
- the insurance industry
- the geotechnical engineering community.



lotting the depth of the ground to the top of the first hard soil layer detected by cone penetration tests.viewable using [Google Earth](#).

Key goals of the CGD

The key goals of the CGD project were to:

- avoid duplication in field investigations
- make the enormous amounts of information collected available to the geotechnical community
- set fairly broad conditions for using the CGD to encourage different groups to contribute and access the information
- secure buy-in and agreement that, if users were to access data, they must contribute their data too
- provide access at no cost.

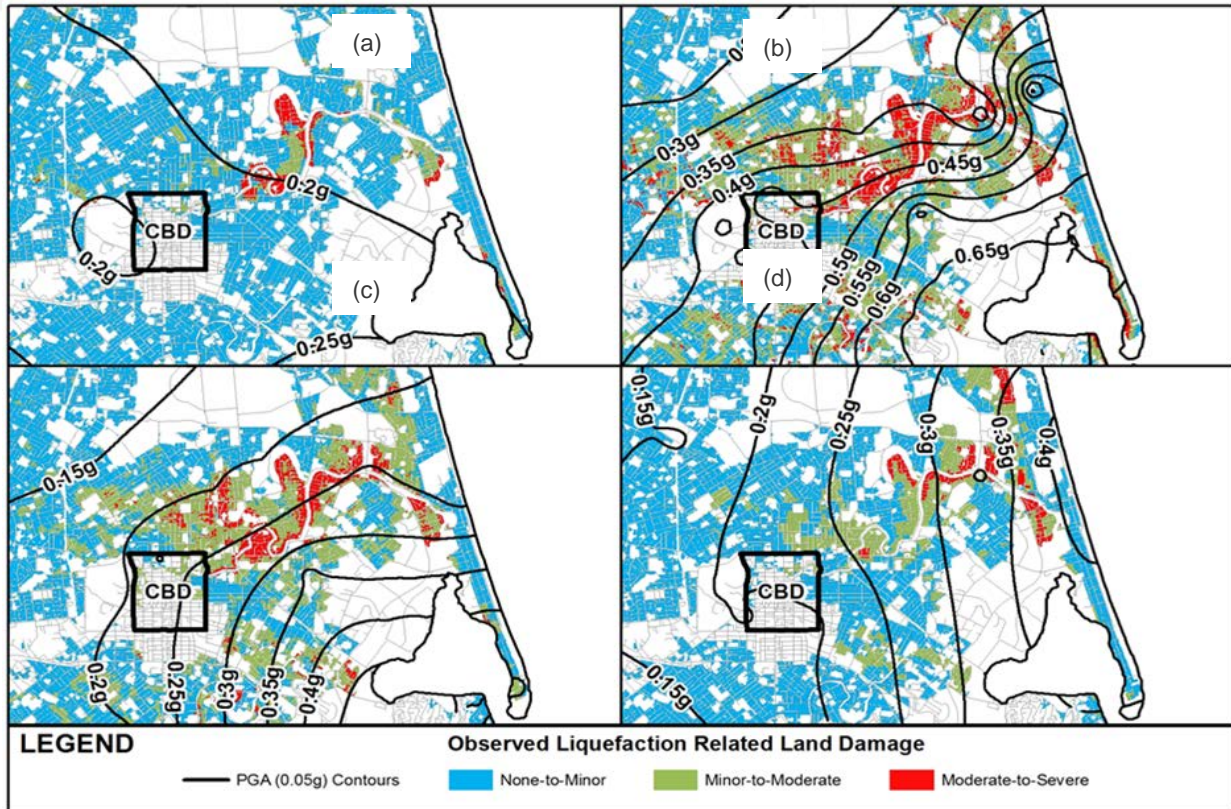


Figure 2: Examples of the varying land damage mapped and recorded in the CGD after the earthquakes of: (a) 4 September 2010, (b) 22 February 2011, (c) 13 June 2011 and (d) 23 December 2011.

IMPORTANT INFORMATION

Figures 1 and 2 were created from maps and/or data extracted from the Canterbury Geotechnical Database⁴, which were prepared and/or compiled for the Earthquake Commission (EQC) to assist in assessing insurance claims made under the Earthquake Commission Act 1993 and/or for the Canterbury Geotechnical Database on behalf of the Canterbury Earthquake Recovery Authority (CERA). The source maps and data were not intended for any other purpose. EQC, CERA, their data suppliers and their engineers, Tonkin & Taylor, have no liability to any user of this map and data or for the consequences of any person relying on them in any way.

The success of the CGD

There were a number of key factors which contributed to the success of the CGD.

- CERA had a clear mandate to develop and provide an integrated and collaborative approach.
- CERA had strong leadership, commitment and collaboration from all entities to agree to share information and make this approach work.
- The registration process made it easy to participate in the project.
- The cloud-based storage facility offered a cost-effective, secure and robust way of storing and accessing data at low risk.
- Users could access real-time data seamlessly and securely from any location using commodity computing or mobile devices.
- The user community had a strong data-sharing culture, so that users could instantly gain from investing their own data.

⁴ <https://canterburygeotechnicaldatabase.projectorbit.com>



A key lesson identified from the CGD project was that collaboration between the public and private sectors can achieve great outcomes. This project could not have succeeded without commitment from all parties.

The statistics speak for themselves

As at 7 March 2016, the GCD had:

- **2,738** users across hundreds of domains including universities, government agencies, territorial authorities, insurers and reinsurers, academics and over **200** engineering consultancies
- triggered numerous international research collaborations
- **43,773** geotechnical investigation uploads
- enabled **462,026** transactions
- cost **\$700,000** across its lifetime, with ongoing costs of less than **\$10,000** per month.

Interpretations of the data have improved the efficiency of geotechnical surveying, reduced the financial burden on land owners (fewer tests) and provided risk analysis to support bank lending and insurers; all of these benefits have helped the public in some way. The Stronger Christchurch Infrastructure Rebuild Team (SCIRT) estimates that access to the data has helped it save over **\$5 million**.

Some data is also registered and indexed on <http://www.data.govt.nz>, a directory of New Zealand government data sets that are available to the public.

After 1 December 2015, the CGD system transferred to MBIE. MBIE intends to extend the system's reach beyond Canterbury to make it a national database. It is projected to be available again in May 2016.

For more information, contact the Chief Engineer at MBIE: Mike.Stannard@mbie.govt.nz