SCIRT Rebuilding Infrastructure

LEARNING LEGACY

Lessons learned from one of New Zealand's most challenging civil engineering projects: rebuilding the earthquake damaged pipes, roads, bridges and retaining walls in the city of Christchurch 2011 - 2016.

SCIRT Geographic Information System (GIS) Viewer – a window to central data

Story: SCIRT Geographic Information System (GIS) Viewer

Theme: Finance and Business Systems

A document which describes SCIRT's Geographic Information System (GIS) Viewer.

This document has been provided as an example of a tool that might be useful for other organisations undertaking complex disaster recovery or infrastructure rebuild programmes.

For more information about this document, visit www.scirtlearninglegacy.org.nz

Programme funded by
Christchurch City Council
New Zealand Government
city care
Downer
Fulton Hogan
McCONNELL DOWELL
Fletcher

Programme funded by
Christchurch City Council
New Zealand Government

SCIRT Geographic Information System (GIS) Viewer

From day one, data and information were vital to ensure informed decisions about what to, where and when. Ensuring visibility and availability was top priority. The SCIRT GIS Viewer was created for this purpose.

At the beginning, SCIRT's true scope of work was unknown. The extent of the damage was being assessed amid emergency repairs, design, construction and asset handover.

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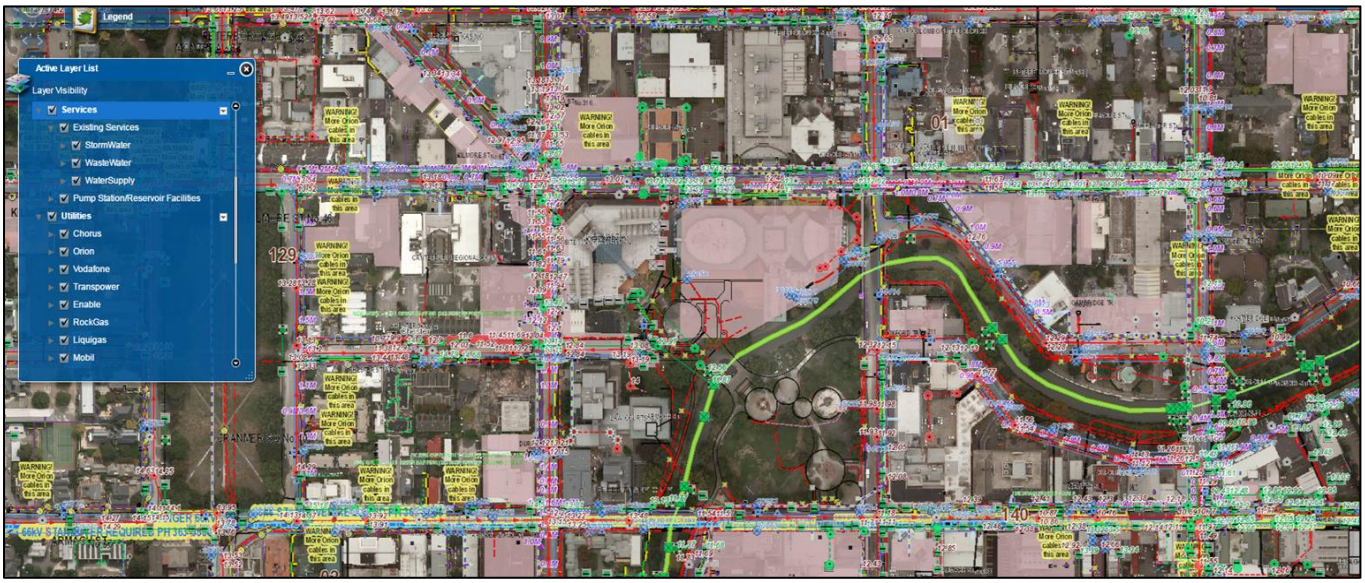
The SCIRT Geographic Information System (GIS) Viewer was a portal to the geographical information required by the organisation (e.g. underground pipe networks, utilities cables, protected trees, planning zones, asset condition data, street address, road names and property boundary locations). It allowed secure access to more than 600 data layers and gave more than 1500 users an up-to-date, easy to use city-wide view of all required information.

Users were given one of 32 view configurations, with restricted views of the data depending on need and security level.

System security

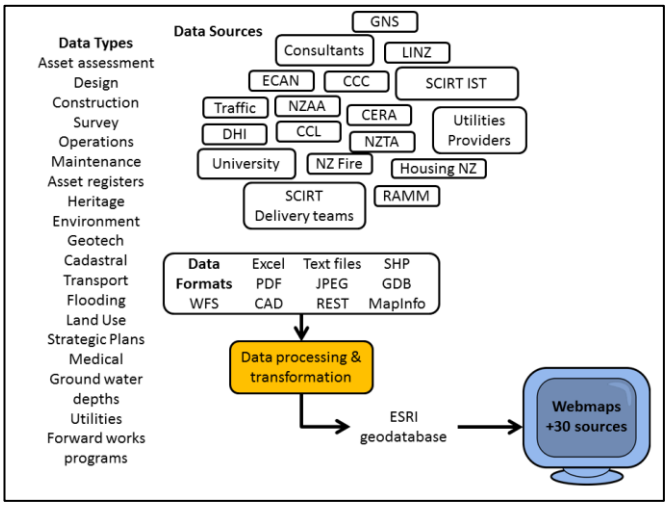
Providing confidence in the security of the viewer led to a high level of trust for providers and users. Restricted and confidential data was supplied, with agreements about usage. For example, Environment Canterbury allowed access to the Listed Land Use Register (LLUR); Canterbury Earthquake Recovery Authority (CERA) provided confidential geotechnical data with access limited to named individuals; and Orion made available data with display and usage requirements specified.

The viewer included data from more than 30 sources including the Christchurch City Council (CCC), utilities providers (Orion, Rockgas, Contact), the New Zealand Transport Agency (NZTA), the New Zealand Archaeological Association, GNS Science, Land Information New Zealand and Road Assessment and Maintenance Management (RAMM).



Spaghetti junction: Underground and overground services and utilities in the Christchurch central business district.

The viewer was updated more than 2700 times during the SCIRT programme with all of the data sources, types and formats illustrated in the figure below.



A myriad of information: Data types, sources and formats.

Key viewer requirements:

- **Fast:** Speed was of the essence. A server upgrade in 2013 made the system much faster, ensuring there were no joins between data layers and that attribute values symbolising a layer or used in a definition query were indexed.
- **Current:** Data was continually updated and expanded.
- **User friendly:** More features were added to cater to user needs.
- **Secure:** Different levels of security were created, including roles, tokens and https.

Move with the times

Viewer hosting changed during the programme. In 2010, it was hosted on a consultant's server when operating as a design support tool for the Burwood/Dallington/Avonside repair pod as part of the Infrastructure Rebuild Management Office (IRMO) emergency response to the September earthquake.

In 2011, when SCIRT was formed, the viewer was moved to Amazon cloud servers to ensure service reliability. In 2013, the viewer was moved to Fulton Hogan's servers to achieve cost savings.

At that time, the viewer was upgraded to utilise extra functionality, including pop-ups, improved latency and speed. The major upgrade incorporated feedback from users, who wanted a basic interface but advanced functionality.

A mobile map was also developed with basic functionality (pop-ups) and layers that displayed the three waters network, along with boundaries and address data. This was developed with JavaScript/Leaflet and Esri Leaflet plug-in.

Helping out

Following major flooding in 2013 and 2014, the Christchurch City Council established a task force. At Council's request, the SCIRT GIS Team provided the task force with access to the viewer to help better inform their decision-making.

In 2013, the GIS Team provided Red Cross with access to the viewer to help inform their community outreach programmes.

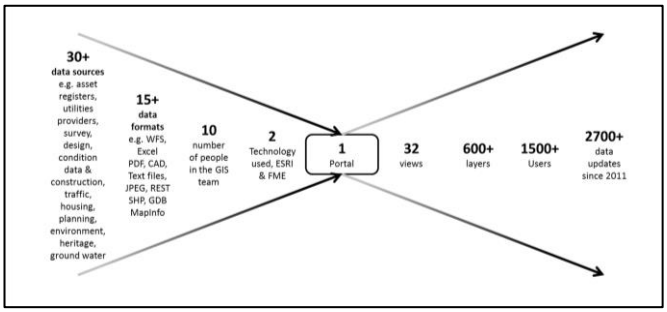
In 2013, the SCIRT viewer provided the basis for Land Information New Zealand's (LINZ) Forward Works Viewer (FWV). For further information about the FWV, please see Forward Works Viewer. In 2016, the Forward Works Viewer was made a national resource.

Must-have tool

Within the organisation, the GIS viewer was recognised as a key business system and its ongoing performance was a top priority.

Layers were continually added, existing layers were changed and updated and better data was made available. User requirements and background data management prompted ongoing adaption.

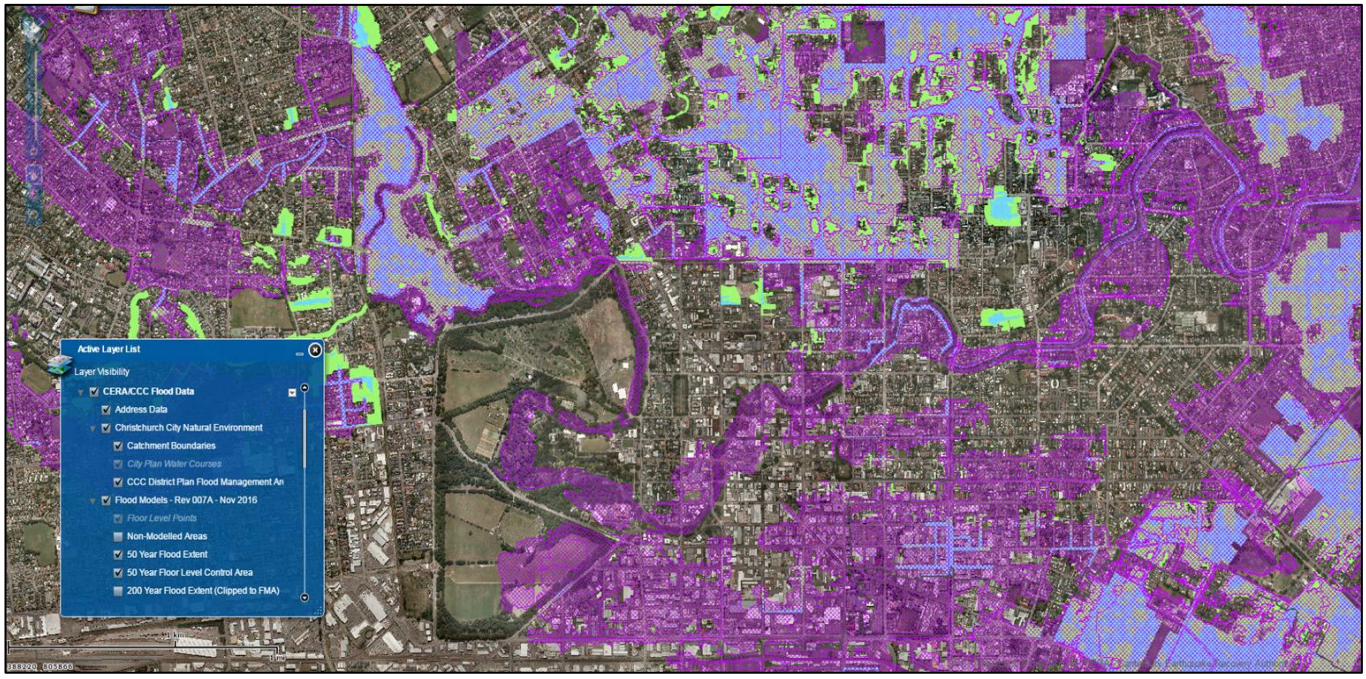
Multiple benefits meant the viewer became an integral tool for users. Speed, constantly updated data and ease of use were key elements in its success. Its functionality included querying, drawing, annotating and overlaying, printing, editing, time animations (see user manual, attached) and geotagged photos (for further information, please see story called Click, Click, Zoom).



By the numbers: Key SCIRT GIS Viewer statistics.

Lessons about the importance of visible information:

- User teams and background systems should be set up for ongoing adaption.
- The reasons for user requests should be well understood. The best solutions come from asking questions and understanding users' needs. The GIS team initially had a request log for functionality which expanded to a task log. This became a catalogue of all requests during the SCIRT programme (see attachment).
- The user experience was important. The top priority was a constantly operational system that provided the most up-to-date data.
- It was important to provide confidence in system security. Data agreements and restricted access were utilised as appropriate.
- A single sign-on system meant users could be easily added and deleted. An External Information Request form was introduced in 2012 to manage access requests (see attachment).
- The viewer utilised two tools for capturing live data: the abandoned/decommissioned tool and the traffic exclusion layer. The ability to update more live data would have been valuable; especially condition data being collected live in the field.
- An initial digital approach to data capture would be invaluable, aligned with recording data at an individual asset level. When using street addresses as identifiers, a standardised format was the best approach. It was easier to show the data by using existing unique identifiers.
- A save layer configuration file should be retained. The SCIRT one was lost with an upgrade in 2013. However, the advantages of the upgrade outweighed the usefulness of the file.



Flow of information: Christchurch City Council flood data.