

An example of an environmental restoration mapping project using Google My Maps.

GIS Mapping with Māori Groups and Community Projects

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GIS MAPPING TOOLS can help Māori groups visualise their connections to the land, communicate stories, and gather knowledge about a group's history, the landscape and its natural resources.

Land Information New Zealand (LINZ) is supporting Māori and community groups to increase their capability to access and use geospatial information. Over the coming months, the geospatial capability team at LINZ is partnering with members of the Māori GIS Association and others to facilitate a series of online step-by-step tutorials based on many of the shared key interests of Māori communities. Everyone is welcome to join us.

Working with Māori and local communities to grow their geospatial capability is a rewarding experience. We thought it would be useful to share with you some of the interests these groups have that can be represented in maps.



Mapping sites of significance and areas of interest

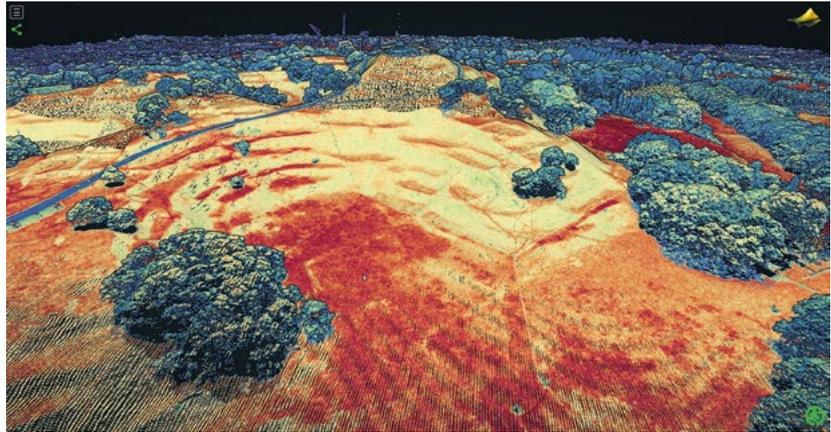
Sites of significance represent the special and long-term relationship that a community has with the landscape. These may be locations or areas that have historical or cultural value, or are associated with an event or individuals, and are defined and identified by those communities. Collectively, this information can be referred to as visualising a whaka-papa, origins or connections to the landscape.

Sites and areas of interest vary but may include mountains, rivers, gardens, fishing sites, place names, hunting grounds, burial sites, historical villages, caves, and wider areas where resources may have been collected, and many others. Often the name indicates the event or significance of a place.

The Ngāi Tahu Cultural Atlas provides access to more than 1000 traditional place names, travel routes and associated histories of the Ngāi Tahu tribal area. You can view their stories, journeys and maps at www.kahurumanu.co.nz.

Something we can do as GIS practitioners to support this work is to introduce the concept of connected 'graph' or 'topological' logic. For example, if a marae existed, there will likely have been historical gardens, fishing spots, tracks and associated resources. Each may have a specific name, and often historical 'Māori land sketch plans' or 'Initial block survey plans' can help to identify sites lost to living memory.

Before mapping sites of significance, you will also want to consider the different thematic types of symbology required, description, references and source fields. It is worth having a conversation about themes



Sample LiDAR from Auckland Council, 2013 via OpenTopography.org of Maungakiekie/One Tree Hill in Auckland, looking north.

and types or categories, which can also be used to help break down what might seem an overwhelming project into more tangible and achievable tasks by doing one category at a time. Involving groups at this stage to make their own data schema decisions will help grow their understanding as the project progresses.

Technologies

Technologies are advancing year on year to being 'online first' focused. Google Earth Desktop enabled the use of 3D visualisations of significant sites in Waitangi Tribunal hearings, providing the ability for touring from place to place following traditional stories, which could be thought of as a form of historical maps to aid navigation. These are now moving online.

There are many free desktop and online GIS options to consider such as QGIS, ArcGIS StoryMaps, an ArcGIS Online personal account, Google My Maps and Google Earth Web.

In non-profit or zero-budget group scenarios, some of the free online tools like Google My Maps, Google Earth Web (and unlisted YouTube for video) are a good starting point. Once a group's capability grows, other options can be considered as well, such as ArcGIS Online, QGIS and other apps as suits their needs.

Something to consider is data storage, safety, and longevity – where will the data sit in 5, 10 or 20 years' time? There is no simple answer and a strategy combining physical USB drives and cloud storage is required.

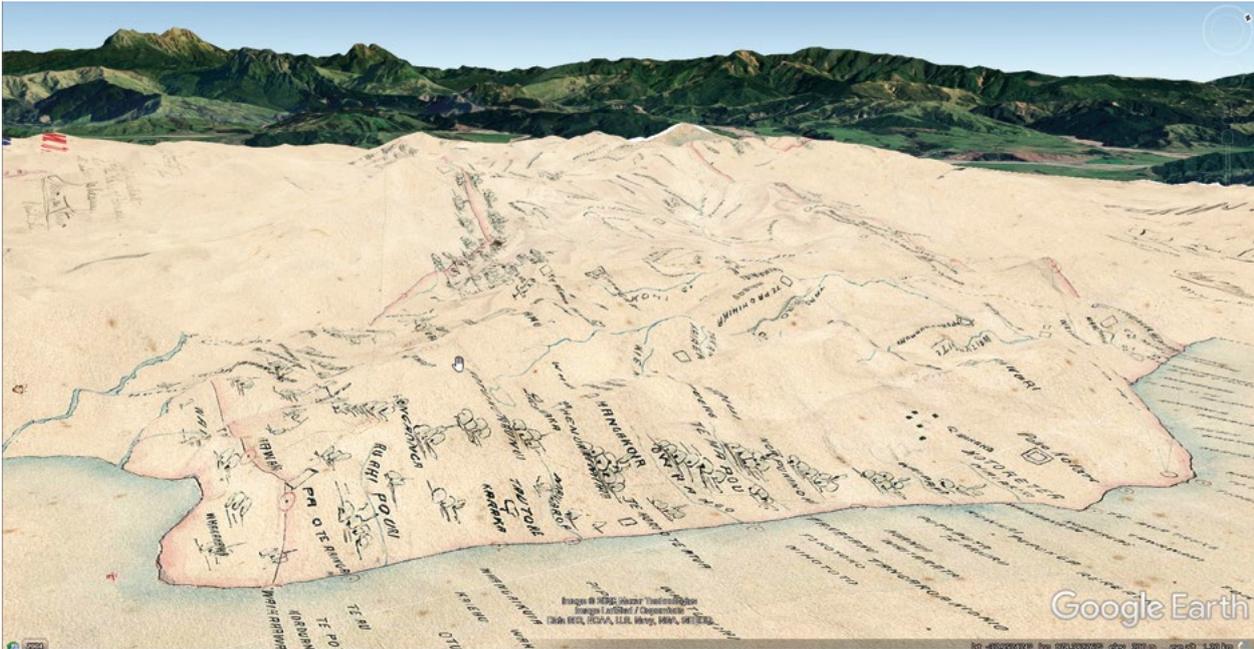
Frequently sites are represented as points, however with LiDAR and high-resolution imagery, it is now possible to digitise sites in vastly more detail with desktop tools. LiDAR data from OpenTopography.org can be used to explore 3D LiDAR in a web browser without the need for storage, servers or software installation.

However, start simple. Develop a set of point locations and then come back around to identifying areas and iteratively gathering more detail for each site including references, interview footage and documents.

Historical land blocks

Historical sketch and survey plans or 'ML plans' (Māori land) in the mid to late 1800s were a tool of colonisation and land alienation but can be used to provide a source of names and places lost to living memory.

There are generally two ways to access scanned ML plans. The better option is to seek support for what are called 'the first 300,000' plans on a DVD set from the Institute of Cadastral Surveying Incorporated or other suppliers for about \$800.



An example of the historical ML700 Survey Plan overlaid in Google Earth Pro desktop with historical places identified on the plan.

The second option is to order individual scanned plans from LINZ (at a cost of \$15) from [linz.govt.nz/land-records/order-copy-land-record](https://www.linz.govt.nz/land-records/order-copy-land-record).

Many research reports completed as part of Waitangi Tribunal hearing preparations were able to identify the original, initial or parent block. These were used to allocate ownership, and often a portion was carved off and sold to pay the surveyor. Subsequent divisions, partitions and conglomerations over the years make up the modern parcel fabric.

The sketch plans for each block often provide the most useful markers, however they are also some of the most difficult to georeference. Some parts can be matched to the landscape, but not without significant distortion of other areas, so judgment is needed when georeferencing.

To overlay an ML plan in GIS software, you can align them using a variety of features from the LINZ Data Service including parcels, named rivers and spot heights.

Overlaying and rubber sheeting an historical map accurately requires a reasonable level of capability and patience. Where accuracy is not

paramount, Google Earth Pro desktop can be used to provide a quick and effective 3D visualisation within seconds.

Representing change over time

Environmental monitoring and processing Resource Management Act consents are a key activity of many Māori trusts.

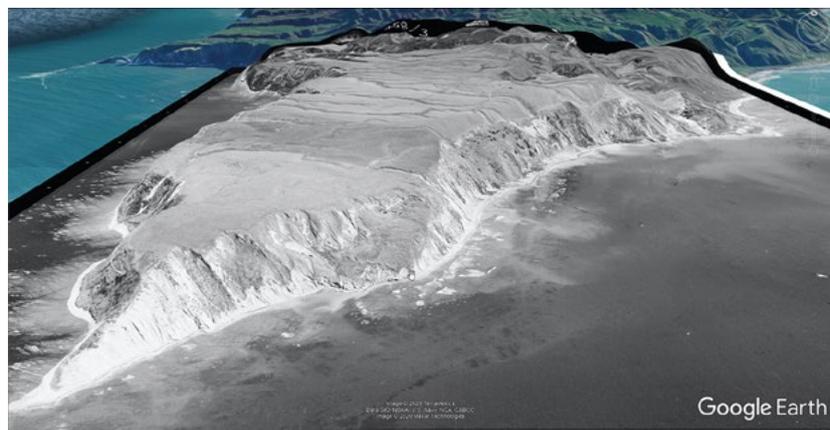
Historical imagery can be used to support monitoring change over time, and we are lucky to now have several great sources. Let's start with the most recent, and then travel back in history.

Using the Yellow 'Pegman' in

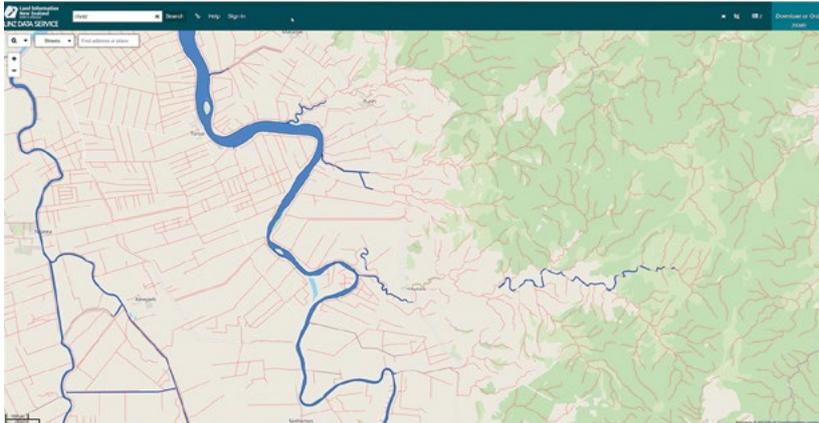
Google Maps, 360 Streetview imagery now contains at least one spherical image for every road and street in New Zealand. In many areas, at the top left of a sphere, you can view two to three earlier captures over the past few years.

The LINZ Data Service (data.linz.govt.nz) has a growing collection of aerial photography from the mid-2000s to the present.

For many parts of New Zealand, the LINZ Data Service also provides high-resolution orthophotos from the mid 1990s, and then one or more layers of aerial photography from the early 2000s.



A historical 1940s aerial photo from Retrolens.nz overlaid near the Rocket Lab spaceport at Mahia Peninsula.



Named river lines and polygons available from the LINZ Data Service: data.linz.govt.nz/x/aEvjGB.

Google Earth Pro desktop and the Esri ArcGIS Online Living Atlas 'Wayback' map service provide access to historical satellite imagery, in high resolution, back to the early 2000s as well as Landsat imagery back to around 1984. Another fun fact is Google Earth Pro historical imagery sometimes hides newer imagery favouring older, higher quality images.

And finally, [Retrolens.nz](https://retrolens.nz) provides access to historical aerial photos for all New Zealand, that generally cover decade on decade from the 1930s. Unfortunately, forest clearance in most areas had already occurred by the time these photographs were taken.

Monitoring the environment and restorations

In addition to monitoring change over time using imagery, many groups will want to develop their own systems to independently monitor environmental factors such as water quality, as well as perform cultural impact assessments of sites.

A free hosted tool that can be used to implement offline forms for data capture is called 'Kobotoolbox', which uses XLS data template standards and has basic mapping capability. Survey123 can also provide integrated data capture with an ArcGIS Online site but requires at least a non-profit

licence (about \$250 per user, per year).

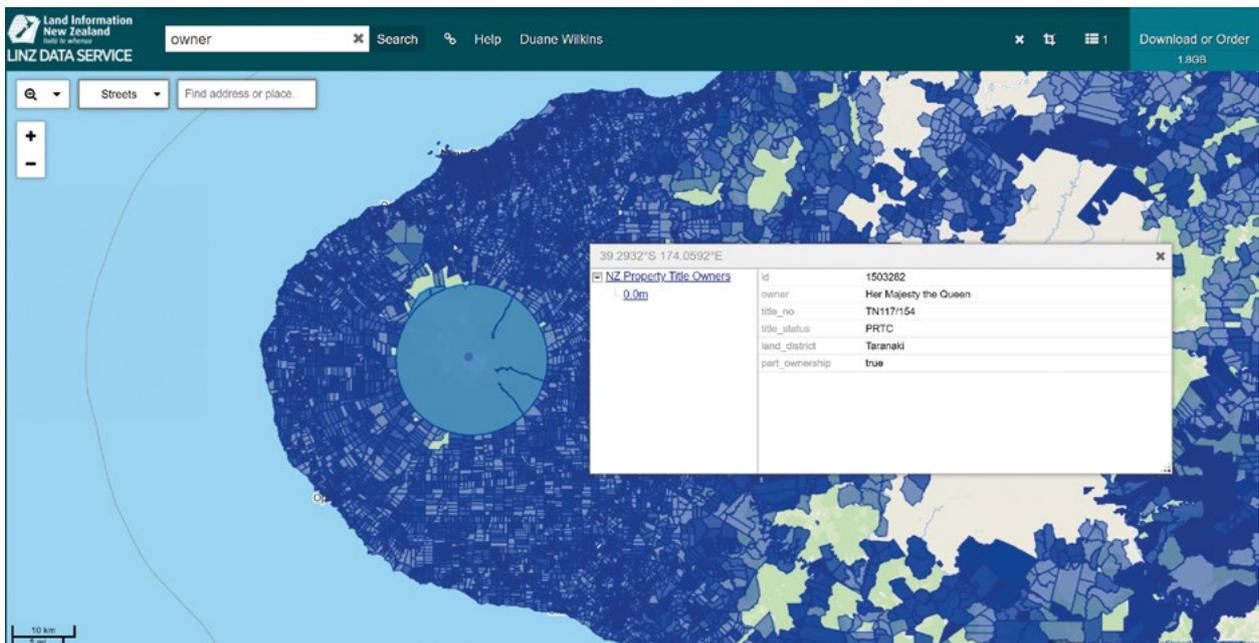
Tip: A simple technique is to assign unique site location IDs so that multiple records per site can be taken to show change over time by relating records to a unique ID. Most groups will be familiar with SHMAK test kits from NIWA, but if these are not available, simple observations or photographs could be captured to start with.

There are several related datasets that could be of interest, including the LINZ named rivers dataset; the River Environment Catchment layers are available from the MFE data service, although they do require some expertise to interpret and use.

Identifying properties

Many post-settlement groups will want to identify land parcels returned to them as part of their settlement, or areas where statutory acknowledgments apply.

Settlement legislation will often list the titles to these parcels, but it is laborious to identify parcels one title at a time (from settlement legislation) even for experienced GIS practitioners.



Property titles including owners, data example: data.linz.govt.nz/x/VPMpKu.

*To access the title and owner data, you'll need to request access to the Controlled Access Group on the LINZ Data Service: data.linz.govt.nz/x/DcjkwR.

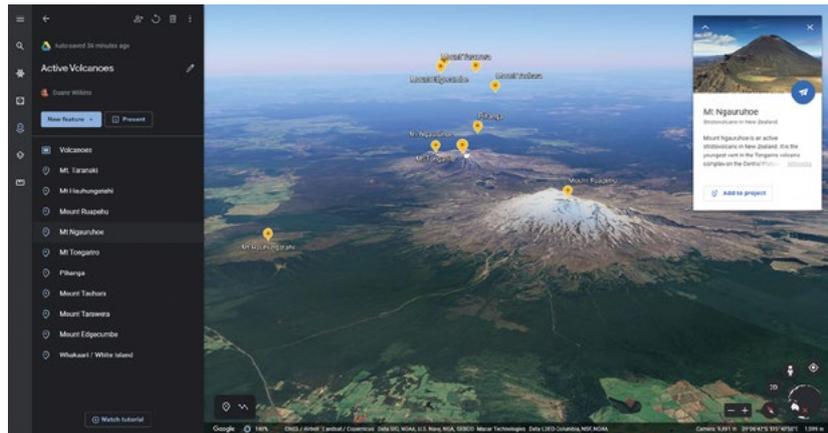
Tricks for those new to parcel data editing:

- Within the 'Titles and Named Owners' data downloaded from the LINZ Data Service, you can query for any matching terms within the title and owner names listings.

- Within the 'Primary Parcels' layer, you can query the non-blank records on the 'statutory actions' field.

Parcel editing tips:

- Rather than create new layers from a patchwork of single parcels or files, add a single 'Is_of_Interest' True/False field to the above data and calculate that field with a 'Y' based on various queries and manual selections.
- Then 'create a new layer' from a selection or query based on that 'Y' field, meaning you can go back later and remove or add additional parcels by adjusting those that have a 'Y' without needing to delete any parcels you may want to refer to later.
- You can also add a comments field to the source data layer and those comments will come through into the query layer.
- Download and curate the 'Māori Land' data for the area of interest



A very simple volcano tour using Google Earth Web. Access this story at tinyurl.com/volcmap.

from the Māori Land Court; there may be overlaps.

- You may also be able to source GIS data from the local council that describe settlement implementation arrangements.

3D storytelling

3D visualisations for many people are a 'nice-to-have', but then we fall back to standard 2D maps. Māori communities have a natural affinity for 3D visualisations and these help the viewer to better orientate and understand the map being shown and should be used wherever possible for place-to-place touring and storytelling.

Google Earth Pro calls bookmarks 'snapshot views'. Esri ArcGIS Online users call these 'slides' and desktop users call them "bookmarks".

A few tips for 3D flythrough optimisation:

- Manipulate the view to ensure most viewpoints have a slither of

the horizon which helps reduce dizziness for the viewer and improves scale and perspective.

- When storytelling a place-to-place journey, try to orientate each view to include the 'next location' in the background of the 'current view' – this creates a series of related and connected perspectives rather than discrete views that are difficult to connect.
- Use curved but gentle 3D movement 'swoops' and avoid straight point-to-point lines by adjusting the default perspective of each site, creating the experience of a series of gentle swings or curves to each location.

And finally, I almost always start my 3D stories with a view from orbit in space – because we can! Most 3D tools will animate a beautiful movie like zooming through the clouds to your site of interest.

Waiho i te toipoto, kau i te toiroa
Let us keep close together,
not wide apart

During these challenging times, it is important to remain connected; we invite you to join our upcoming online tutorial series building on some of the themes in this article. Keep an eye out on the LINZ social media pages and as always, we welcome your feedback. Just email capability@linz.govt.nz.

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