

February 2023

Fact sheet

Seismic surveys

Overview

Seismic surveying is a geophysical technique that uses man-made vibrations to image buried rocks on land and in marine environments. Such surveys allow geoscientists to interpret geological features and structures deep below the surface. Large underground areas can be accurately mapped or imaged, with minimal disturbance to the environment.

About seismic surveys

Data from seismic surveys is used to produce images of the rocks underground.

Seismic surveys involve generating vibrations (seismic waves) that penetrate Earth's surface.

On land, vibrations are generated using specialised trucks. Sensors on the surface measure the energy reflected or refracted by buried rocks, with little impact on the environment.

Marine surveys are quite different as they involve a vessel towing airguns that generate the seismic waves, along with a series of cables with sensors that record the vibrations.

Survey process

The Geological Survey of NSW (GSNSW) conducts seismic reflection surveys on land, using experienced and professional contractors who follow strict operational guidelines. These surveys are low impact and do not affect the environment or physical infrastructure.

A field crew lays out sensors (called geophones) on the surface along the survey line every few metres. Seismic lines generally follow existing tracks, road verges, fire trails or internal fence boundaries. Road traffic management is used where required.

Once the geophones are in place, 2 to 3 vibrator trucks position themselves in the centre of the geophone array. They drive slowly along the line, stopping every 20 to 40 m to generate a seismic signal. These specialised trucks use steel plates to vibrate the ground, through a range of frequencies, to send the seismic signal into the subsurface. The array of geophones measures the time and amplitude of the reflected seismic signal.

Figure 1 Vibrator truck convoy.



Figure 2 A geophone node that records ground vibrations.



The spread of geophones can extend 12 to 20 km, depending on how quickly the field crew can collect and reposition geophones. As the survey progresses, geophones are collected from the rear of the line and taken to a large truck, where the data is downloaded, and the geophones are recharged so they can be moved to the front of the seismic line. The data is checked for quality and at the end of the survey is processed to produce an image of the subsurface geology.

The survey is controlled and coordinated from a truck with long range communications. Several support vehicles are required for laying out and retrieving geophones, carrying equipment, repairing equipment and processing data.

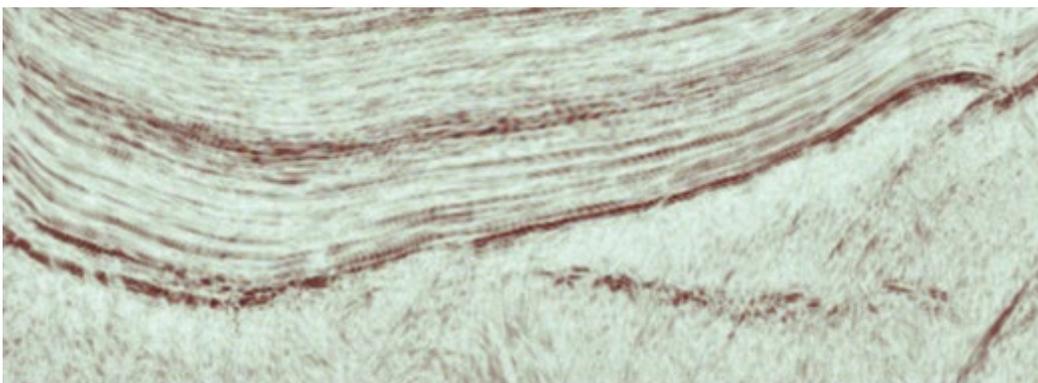
Survey results

The large volumes of data that are produced from this surveying method are analysed and processed to produce images. Geophysicists use such images to interpret the geology up to 60 km deep in Earth's crust and help to define areas of faults and rocks, and areas with mineral, groundwater or energy resource potential. When incorporated with other geological information, a 3D model of the subsurface can be produced.

The survey results are used by a wide range of people including:

- geoscientists, to interpret rock types, geometry and structures up to 60 km deep
- landholders, to identify areas with potential groundwater
- local government, for land use planning and to help identify potential water resources and fault locations
- state government, for infrastructure projects
- water resource scientists, to investigate potential groundwater reserves and aquifers in 3D.

Figure 2 Processed seismic image spanning 55 km across ground to around 6 km in depth.



The GSNSW is the custodian of the state's seismic data. Seismic data acquired by GSNSW is publicly available. Exploration companies must also submit seismic data they acquire to GSNSW. After 1.5 to 5 years of exploration, seismic data is publicly released. All publicly available seismic data can be accessed through [MinView](#).

A report summarising the outcomes of each seismic survey may be prepared once initial interpretation is completed. If a report is produced, it is likely it will be at least 12 months following

release of the data. You will also be able to access models and interpretation of the data if they are undertaken.

Figure 3 Communications truck.



A survey is proposed on my property. What does this mean for me?

If you are a landholder and a survey crosses your property, we will contact you to arrange a land access agreement. Depending on how big the survey is, the crew may need to access your property over several weeks. We will leave tracks in as good or better condition than when we started the survey. Gates will be left as instructed.

The vibrations generated by the vibrator truck last for 16 to 26 seconds and are comparable to a road-train passing by.

Livestock and infrastructure will not be adversely affected by the survey. Such surveys don't cause earthquakes or generate radiation.

Figure 4 Banks for downloading and recharging geophone nodes.



Figure 6 Vibrator truck with traffic control in background.

Figure 7 Geophone in position

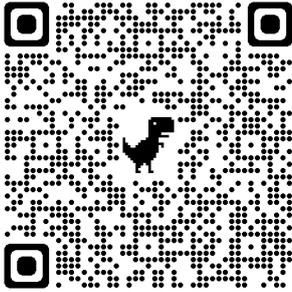


More information

Landholders and local communities will be notified in advance of seismic surveys. Information including survey progress will be updated regularly on our website. To learn more about this survey and how we will use the results:

- Email: geophysics.products@regional.nsw.gov.au
- Geophysical survey enquiry hotline: 1800 960 522
- Website: www.regional.nsw.gov.au/groundwater

Scan the QR code below to watch a Geoscience Australia video on how seismic surveys are acquired.



© State of New South Wales through Regional NSW 2023. You may copy, distribute, display, download and otherwise freely deal with this publication for any purpose, provided that you attribute Regional NSW as the owner. However, you must obtain permission if you wish to charge others for access to the publication (other than at cost); include the publication in advertising or a product for sale; modify the publication; or republish the publication on a website. You may freely link to the publication on a departmental website.

Disclaimer: The information contained in this publication is based on knowledge and understanding at the time of writing (February 2023) and may not be accurate, current or complete. The State of New South Wales (including Regional NSW), the author and the publisher take no responsibility, and will accept no liability, for the accuracy, currency, reliability or correctness of any information included in the document (including material provided by third parties). Readers should make their own inquiries and rely on their own advice when making decisions related to material contained in this publication.