

Geological mapping

MinEx CRC fact sheet

January 2019

Overview

Geological mapping is the process of mapping the Earth's rocks, by examining rocks on the ground and interpreting those beneath the surface.

Current focus

The current focus of mapping in NSW is in the North Cobar, South Cobar, Mundi, Forbes and Dubbo areas. These areas are part of the MinEx Cooperative Research Centre's (MinEx CRC) National Drilling Initiative – a national collaboration to further our understanding of geology and metal deposits in areas where rocks aren't exposed at the Earth's surface. The mapping will also help identify groundwater resources in these areas.

About geological mapping

In NSW, the Geological Survey of New South Wales (GSNSW) is the state government agency who conducts mapping. Geoscience Australia (a federal government agency), universities, consultants and companies also undertake geological mapping.

GSNSW geologists have been mapping the geology of NSW since 1875, regularly updating the detail and accuracy of maps in priority areas as new analytical techniques and technology (such as GPS, airborne geophysics and satellite datasets) become available.

GSNSW geologists work with other geoscientists including geochemists (who study the chemistry of rocks), geophysicists (who study petrophysical properties of rocks such as magnetism, electrical conductivity and density), petrographers (who study rocks with microscopes), palaeontologists (who study fossils), and geochronologists (who determine the age of rocks).

Mapping process

Geologists use aerial photos, satellite imagery and geophysical datasets to locate and interpret rocks. They check their interpretations by examining rocks in the field. This includes mapping the extent and types of rocks, and observing different minerals and textures, taking measurements and collecting samples of the rocks.

This field work is low impact.



A geologist examining sedimentary rocks.

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When in the field, geologists drive on existing roads and tracks, and then walk to the areas they want to check. They are mindful of sensitive areas – such as areas of cropping or grazing, flora and fauna, and indigenous sites.

GSNSW geologists are highly trained and experienced in Work Health and Safety (WHS) procedures, first aid and four-wheel driving. They all carry Personal Locator Beacons and GPS trackers, and have a daily check in. They are covered by NSW Government insurance.

Most previous geological mapping in these areas was done in the 1980s and 1990s. The new maps, with improved resolution, will help inform land use planning, soil mapping and natural resource management.

A permit has been granted for geological mapping and sampling in these areas and the landholder's permission is always obtained before entering private land.

Making observations

A geologist will spend time looking at the rocks in detail – often with a hand lens. They will describe the form of the rocks, the mineral composition, and note things like textures, grain size, if fossils are present, or if the rocks have been folded.



A geologist recording the features of an outcrop of granite.

Taking measurements

Physical characteristics of the rocks can be measured in the field using hand-held devices such as:

- a compass to measure the orientation of the rocks
- a magnetometer to measure how magnetic the rocks are
- a gravimeter to measure the density of the Earth in the area
- a spectrometer to measure the visible, thermal and infra-red light spectra of a rock
- a gamma-ray spectrometer to measure natural background levels of radiation. (All rocks contain low (safe) levels of gamma radiation resulting from the natural decay of radioelements.)

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A geophysicist recording physical rock properties.

Collecting samples

Samples are collected by hand, sometimes using hand-held tools such as a hammer. Typical samples include:

- geochemical samples (<5 kg) which are crushed into a powder in a laboratory, then analysed for up to 50 different major and trace elements
- petrophysical samples (<2 kg) which are collected to measure density or magnetic properties
- petrographical samples (fist sized) which are trimmed and cut into a 30 µm thick slice (thinner than paper!) which is mounted onto a glass slide about 8 cm x 2 cm and examined with a microscope
- palaeontological samples (<5 kg) collected to examine fossils under a microscope, or may be partially dissolved in acid to find microfossils that help determine the age of the rocks

- geochronological samples (<10 kg) which are crushed in a laboratory, and then selected minerals (like zircon) are separated to help determine the age of the rocks.



Collecting a geochronology sample from a granite outcrop.

Mapping results

A wide range of people use this mapping information, including:

- **Agronomists:** to evaluate soils for cropping or grazing.
- **Biologists:** to look for plants and animals, and suitable habitats for preservation.
- **Forestry operators:** to plan and manage plantations.
- **Geotechnical engineers:** to plan construction projects and avoid natural hazards like faults.

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- **Landholders:** to identify areas of erosion, water ponding, soil quality etc.
- **Local governments:** for land use planning and to find local construction and road base materials.
- **Mineral, quarry and energy companies:** to find economic resources.
- **Mineral and fossil collectors:** to target collection sites.
- **Researchers:** to investigate how the Earth formed and its geological history.
- **Tourists:** to understand the landscape.
- **Water resource scientists:** to look at drainage, catchments and aquifers.

These results will also be available to the general public.

Other maps and reports are available at our offices and online.

<http://www.resourcesandenergy.nsw.gov.au/miners-and-explorers/geoscience-information/products-and-data>

Using our free MinView web portal, you can view and download our NSW-wide geological mapping overlain with other geoscience data and aerial photos.

<https://minview.geoscience.nsw.gov.au/>

You can also download free geological maps for your mobile device (phone or tablet).

<https://www.geoscience.nsw.gov.au/phonemaps/>

More information

To learn more about MinEx CRC and how we will use the results, please visit:

Email:

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Website:

www.resourcesandgeoscience.nsw.gov.au/minexcrc