

OUTCROP SAMPLE PROCEDURES

Outcrop samples collected are used to create regional background signatures for lithological, spectral and geochemical parameters at each location. Geomorphological, geological and radiometric parameters are recorded, and a digital photograph at each site is taken. The samples are systematically processed in the field camp. Lithological textures, alteration colours (Munsell), grain-size variations, petrophysical parameters (magnetic susceptibility) are routinely recorded.

All samples are taken using a hammer, and sometimes a chisel, in order to collect only the targeted vein or fracture. Fracture samples consist of small broken pieces of rock, which are placed into a 100ml vial. The fracture sample physical shape and size characteristics are not favourable for PIMA spectral measurements. Sampling from breccia and veins provides a medium, which can be subjected to low level detection geochemical techniques, and may display geochemical anomalies indicative of alteration, and leakage of uranium or indicator element from an otherwise blind uranium deposit at the unconformity. This type of sampling is referred to as fracture sampling and the samples are subjected to the G950 geochemical method, which provides ultra-low detection limits.

Sampling Technique

Samples are routinely halved using a core saw. One half is described (grain-size, Munsell colour, and magnetic susceptibility). The same sample is measured for spectral parameters using the PIMA II spectrometer. These samples are retained within the Cameco storage facility in Darwin. The other half of the sample is used for litho-geochemical analysis. A segment of each sample is also sent for petrographic thin section processing.

[Codes for Competency Friability & Grain Size](#)
[Codes for Munsell Colours](#)

Geochemical Processing

All samples were sent to NTEL in Darwin and Pine Creek, Northern Territory, for multi-element analysis. In total, four separate methods were used to analyse up to 65 elements and four isotopes. The geochemical methods used are detailed in the following tables.

[G400 Analytical Procedures](#)

Reflectance Spectroscopy (PIMA)

Reflectance spectroscopy (PIMA) analysis was completed using the PIMA II short-wave infrared spectrometer on all samples collected. This instrument measures the reflected energy from a sample in the short wave infrared (SWIR) region of the energy spectrum. The sampling area on the rock specimen that is measured is permanently marked. Multiple measurements are occasionally taken, particularly if variations in spectral features are noted. The spectra are converted to an ASCII format and processed using “The Spectral Geologist” (TSG) developed by [AusSpec International](#). The SWIR spectra, once processed, provide a mineral identification utilising internal software pattern matching algorithms called “The Spectral Assistant” (TSA).

The experienced user can collect information on the degree of mineral crystallinity, and chemical composition variations within mineral groups from the spectra. The program also allows the user to create scalars based on spectral features and parameters. This allows for quantifying crystallinity parameters; classifying chlorite species based on Mg and Fe absorption features and a multitude of other features.

Sample Naming Convention

The Sample Number is related to the Station ID that identifies a locality. The Station ID allows a number of metadata to be included in the unique ID. This ID is made up of three parts.

- Project Code – two character code
- Year Sampled – two numbers making the last two numbers of the year
- Sample ID – four numbers, usually sequential

Eg, GG030258

- GG – Gunbatgarri project
- 03 - sampled in 2003
- 0258 – station ID, usually sequential, number sequences may be assigned to geologists

Each station is unique across the project for the life of the project.

Cameco sample numbers allow for a number of metadata to be included in the sample ID. This ID is made up of five parts, and uses the Station ID to form the main portion of the ID.

- Project Code – two character code
- Year Sampled – two numbers making the last two numbers of the year
- Sample Type – one character code
- Sample Number at station – one number indicating number of samples from one locality or station
- Sample ID – four numbers, usually sequential

Eg, GG03C20258

- GG – Gunbatgarri project
- 03 - sampled in 2003
- C - C type sample
- 2 - second sample collected from Station (locality) allows up to 9 samples per Station
- 0258 – station ID, usually sequential, number sequences may be assigned to geologists

Each sample is unique across the project for the life of the project. Each sample can be quickly referenced to a project, year, reason for sampling or type, and sometimes who collected the sample.

Type of Sample