National Argon Map: an AuScope Initiative
$^{40}Ar/^{39}Ar$ Geochronology Laboratory Sample Submission Form

This form must be completed and returned to Marnie Forster (Marnie.Forster@anu.edu.au) before any work can be commenced in the Argon Laboratories.

Person submitting samples: Joel Fitzherbert
Affiliation: GSNSW
Project Title: Cobar Basin geochronology
Sample Number(s) (including IGSN if one exists): NSWSJAF0207.01D
Mineral separation required? Yes or No: Yes
Date submitted:

GEOGRAPHIC AREA/ PROVINCE/ BASIN : Central Lachlan Orogen, Cobar Basin	
1:250k SHEET NAME:	**NUMBER:**
1:100k SHEET NAME: Cobar	**NUMBER:** 8035
LOCATION METHOD: (GPS: WGS84 / AGD66 / AGD84 / GDA94)	
ZONE: 55	
EASTING: 371928.727	**NORTHING:** 6551716.849
LATITUDE: -31.161442118527	**LONGITUDE:** 145.65625607624

STRATIGRAPHIC UNIT FORMAL NAME *: CSA Siltstone
STRATIGRAPHIC UNIT INFORMAL NAME:
LITHOLOGY: Thinly-bedded sequence of siltstone and sandstone

DRILLHOLE ID (if applicable): NP139
PROSPECT (if applicable): Elura mine
DEPTH FROM (metres): 232.10
DEPTH TO (metres):232.30

* Stratigraphic Unit names can be searched and checked within the Australian Stratigraphic Units Database via the following link: https://asud.ga.gov.au/

Dating Objective

What is the geological question $^{40}Ar/^{39}Ar$ analysis will address?

Pervasive adularia rich alteration is associated with eh early stages of mineralisation and Elura mine. Dating this adularia will hopefully give a maximum age constraint on mineralisation in the region.

What type of age(s) are expected? (e.g. magmatic crystallisation, metamorphism, fluid alteration/mineralisation, cooling, shearing etc):

Alteration/mineralisation

Mineral target(s) for dating:

Adularia

Estimated $^{40}Ar/^{39}Ar$ age (e.g. Cenozoic, Mesozoic, Paleozoic, Proterozoic, Archean – provide estimated numerical age range if possible):

Paleozoic 420-380 Ma

Sample Information

Location description (e.g. a sample of x was collected from y, z km from abc town):

Drill core from Elura mine west of Cobar township.

Lithological characteristics (rock description):

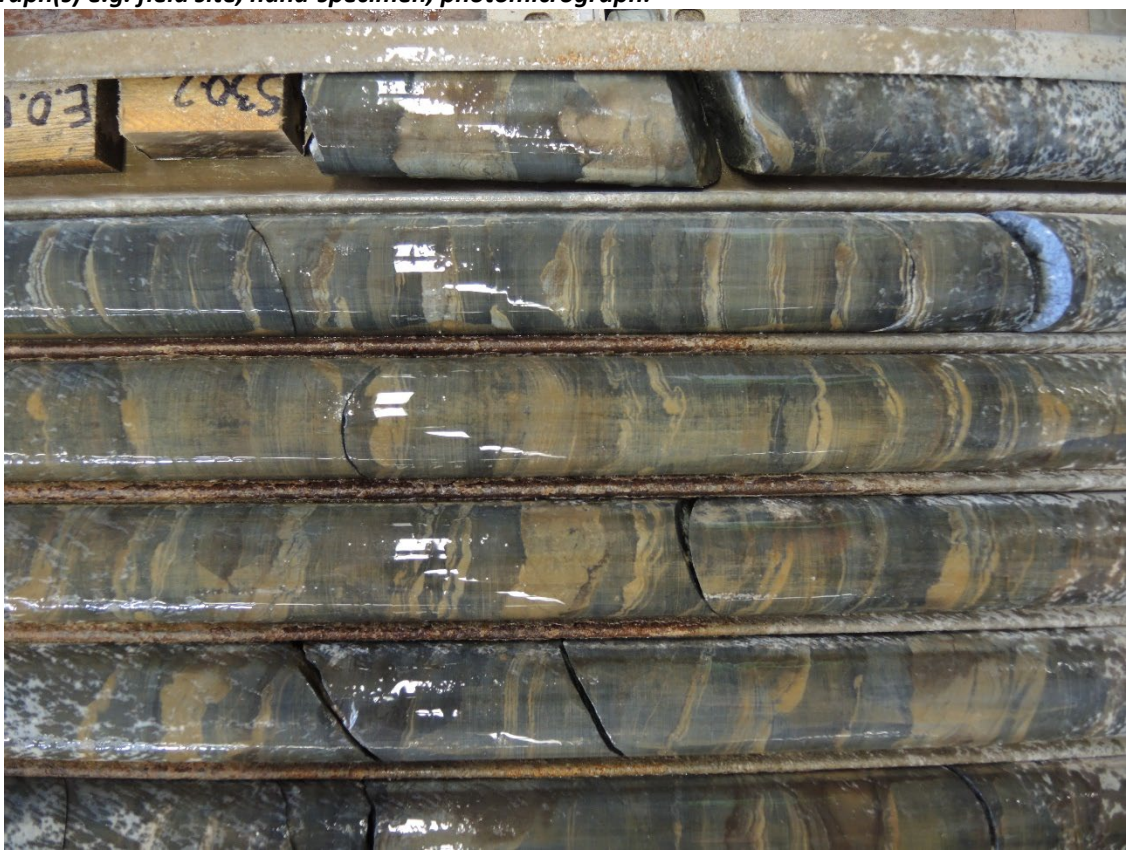
Strongly foliated siltstone sample with thin dismembered carbonate-rich sandstone horizons. The siltstone itself contains well preserved very pale green chlorite but is white mica dominant. Framboidal pyrite is also present.

Adularia-rich veins and zones of intense adularia alteration crosscut the sample and have been deformed in a micaceous slaty cleavage.

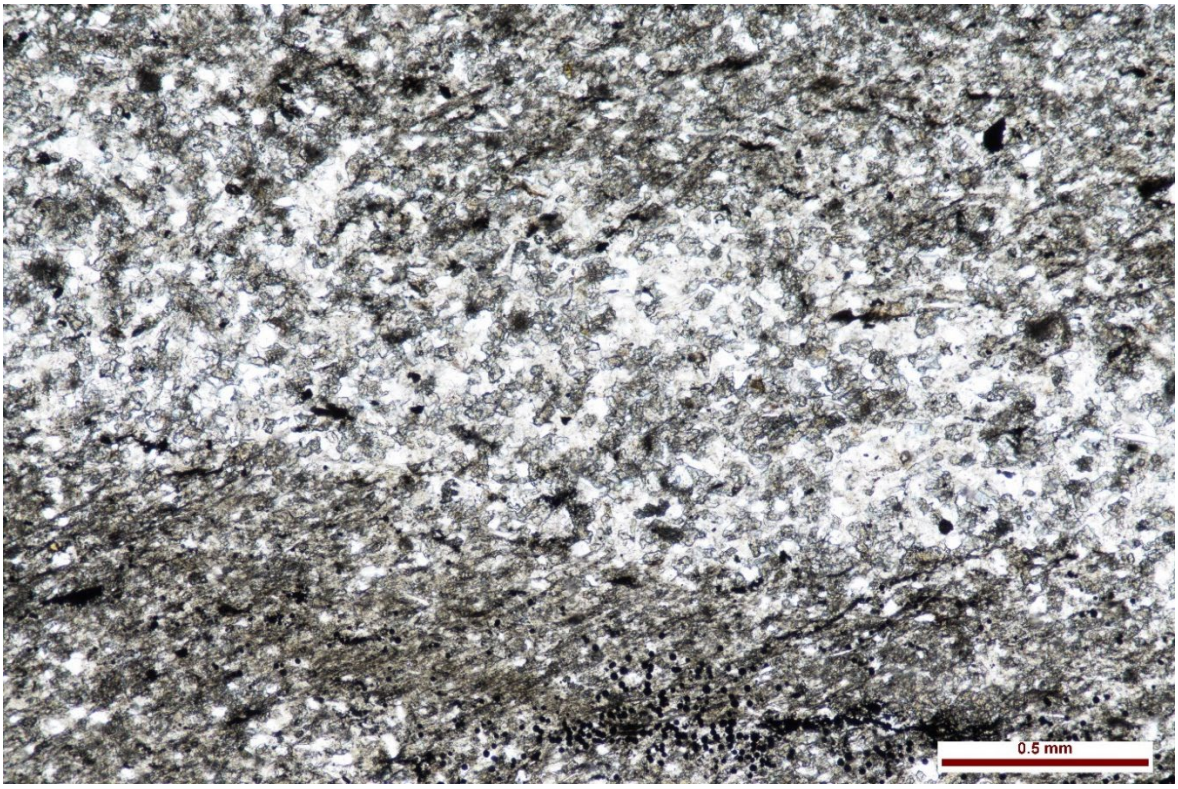
Relative age constraints (pertinent geological relationships with surrounding rock units and any previous geochronology):
Adularia-rich veins and alteration appears to be the earliest expression of alteration/mineralisation. Foliation development (likely Tabberabberan ~380Ma) postdates the alteration. Previous Ar-Ar dating of white mica from alteration from Elura gave an ~380 Ma age (Sun et al 2000). Pb model ages for galena from the orebody also suggest an ~380 Ma age for mineralisation (e.g. Fitzherbert and Downes 2020)

Thin section description (if available):
Typical host to alteration/mineralisation is a thinly-bedded siltstone and sandstone. The siltstones have a very well-developed detrital/diagenetic foliation that is defined by trails of fine-grained oxides and slender detrital muscovite. Carbonate is present, but in low abundance in the silty layers. There is also a well-developed spaced cleavage defined by sericitic white mica. The sandstone horizons are often a mosaic of fine-grained quartz and carbonate. Carbonate appears to Fe-poor and potentially dolomitic. Both detrital chlorite and biotite were noted. In this sample chlorite is pale green with up to 5–10% in some sandy horizons. Tourmaline and zircon are accessory minerals. Other layers contain abundant detrital muscovite. Framboidal pyrite (up to 10%) is often abundant. The framboidal pyrite is always parallel to S_0 and are a detrital or diagenetic feature, occurring as disseminated singular framboids or as clusters. In some silt layers the carbonate-rich alteration is quite pervasive. A weak to moderate sericite foliation is always present.

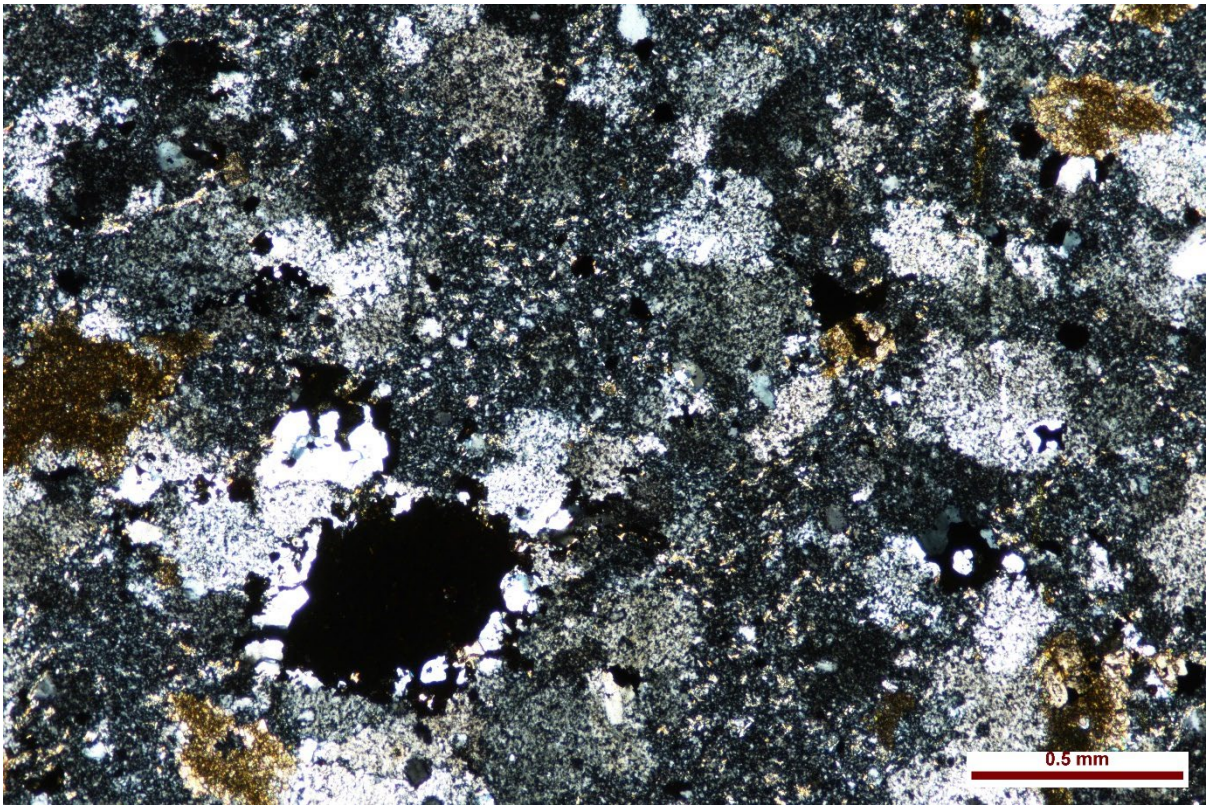
Photograph(s) e.g. field site, hand-specimen, photomicrograph:



Photograph of typical thin-bedded to laminated siltstone and sandstone in drill hole NP139



Plane polarised light image of laminated siltstone and sandstone. The light horizon in the centre of the image is a pervasively carbonate replaced sandstone horizon.



Cross polarised light image of hydrothermal micropoikilitic mosaic of quartz and feldspar (adularia) within an altered/mineralised zone.

Relevant bibliographic references:

Sun Y., Jiang Z., Seccombe P.K. & Feng Y. 2000. New dating and a review of previous data for the development, inversion and mineralization in the Cobar Basin. In McQueen K.G. & Stegman C.L. (eds.) 2000. Central West Symposium Cobar 2000, Extended Abstracts, 113–16.

Fitzherbert, J.A. and Downes, P.N. 2020. A mineral system model for Cu–Au–Pb–Zn–Ag systems of the Cobar Basin, central Lachlan Orogen, New South Wales. Geological Survey of NSW report, GS2021/0042.