

National Argon Map: an AuScope Initiative

$^{40}\text{Ar}/^{39}\text{Ar}$ 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: Nick Roberts
Affiliation: Mineral Resources Tasmania
Project Title: Mid-Cenozoic chronostratigraphy of central and northern Tasmania
Sample Number(s) (including IGSN if one exists): A500731 (MRT Reg. No.)
Mineral separation required? Yes or No: No
Date submitted: 20/07/2021

GEOGRAPHIC AREA/ PROVINCE/ BASIN : NW Tasmania	
1:250k SHEET NAME: Geology of NW Tasmania (2020)	NUMBER: SK55-3 Burnie (old series)
1:25k SHEET NAME: Guildford	NUMBER: 3841
LOCATION METHOD: Drillhole collar survey (1987) converted to GDA94 coordinates	
ZONE: 55	
EASTING: 388120	NORTHING: 5414075
LATITUDE: 41°25'2"S	LONGITUDE: 145°39'40"E

STRATIGRAPHIC UNIT FORMAL NAME *:
STRATIGRAPHIC UNIT INFORMAL NAME: Tertiary basalts
LITHOLOGY: Basalt

DRILLHOLE ID (if applicable): SBDP5 (MRT ID 13590)
PROSPECT (if applicable):
DEPTH FROM (metres): 221.8
DEPTH TO (metres): 221.8

* 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 $^{40}\text{Ar}/^{39}\text{Ar}$ analysis will address?

Provide age constraint on the base of a thick, mid-Cenozoic, basalt stack with several thin zones of continental sediments that form the >750-km² basalt plateau near Waratah in northwestern Tasmania. The stratigraphy is penetrated by ten holes drilled in the mid-1980s during MRT's Sub-Basalt Drill Project (SBDP). The age of this sample (from near the base of 250-m basalt sequence) will improve upon existing palynostratigraphy for the SBDP holes and magnetostratigraphy from hole SBDP5 specifically. This includes constraining the onset of mid-Cenozoic effusive volcanism in the Waratah area.

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

Cooling/emplacement ages of an individual basalt flow at the base of the ~250-m-thick basalt stack.

Mineral target(s) for dating:

Groundmass

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

Cenozoic. Based on ^{40}K - ^{40}Ar and $^{40}\text{Ar}/^{39}\text{Ar}$ ages of other Tertiary basalt-flow sequences in this part of Tasmania, the age is likely to be between ca. 40 and 20 Ma. Palynostratigraphic constraints from thin sediment zones in this hole and in several nearby SBDP holes penetrating similar basalt stacks narrow the expected age range to latest Eocene to early-Oligocene age (Seymour, 1989). All pollen/spore assemblages in this hole are of early-Oligocene age.

Magnetostratigraphy from the basalts in this hole (Lucas, 1988) records a (top-down) N-R-N-R polarity sequence. Seymour (1989) interprets these magnetozones as recording Chron 13, which is currently dated to 34.999 Ma (base of C13.r) to 33.157 Ma (top C13.n) based on a spline fit of the geomagnetic polarity timescale (GPTS) (Ogg, 2020); this sample is from a reversely magnetized flow near the base of the sequence, suggesting a potential numerical age between 34.999 and 33.705 Ma. However, the previously proposed polarity correlation is uncertain as refinement of the GPTS over the last few decades has shifted several polarity reversals such that a different Chron may be recorded by the polarity sequence.

Sample Information

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

This drillhole is located 11 km east-northeast of Waratah, Tasmania. It is along Guildford Road ~2.3 km from the junction with Ridgley Highway. The sample is from 221.8 m depth, 27 m above the base of the basalt sequence, and 191 m above the end of the hole.

Lithological characteristics (rock description):

Vesicular basalt (olivine tholeiite).

Relative age constraints (pertinent geological relationships with surrounding rock units and any previous geochronology):

This sample is from one of the lowest basalt flows (Lucas' [1988] reversely magnetized flow 4) in a ~250-m-thick flow stack. The basalt-flow sequence is underlain by 49 m of undated hyaloclastite that in turn overlies Cambrian basement. Pollen/spore assemblages from five thin sediment zones between 28 and 245 m depth all indicate early-Oligocene ages. The submitted sample is bracketed by the lowest two palynological analyses (20 m lower and 97 m higher in the hole than the sample).

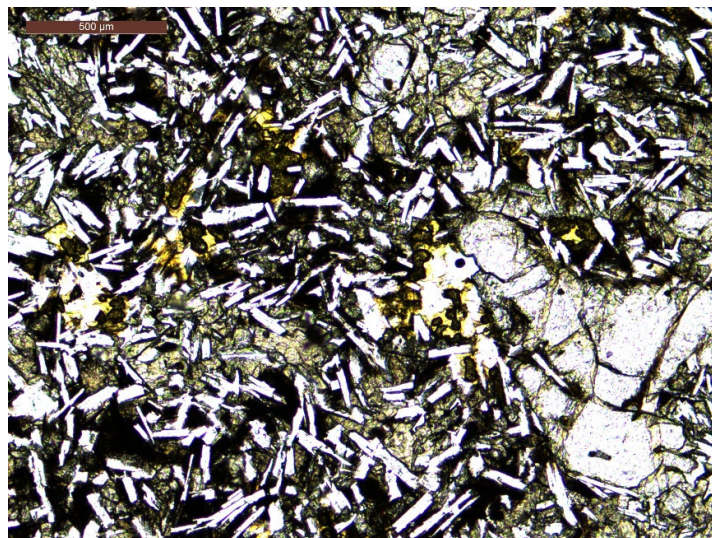
A surface sample of basalt is being submitted for dating in this batch (R000538) from 980 m due east (outcrop along Guildford Road). It will provide additional age constraint on the top of the basalt stack; that surface sample is approximately 30 m below the top of the sequence penetrated by SBDP5 and from roughly 192 m above the bore-core sample described here. Based on stratigraphic relationships, the present sample should be older than R000538 (surface sample from <1 km from SBDP5 and about 30 m below its top) and younger than A501207 (sample of the lowest basalt in SBDP4)

Thin section description (if available):

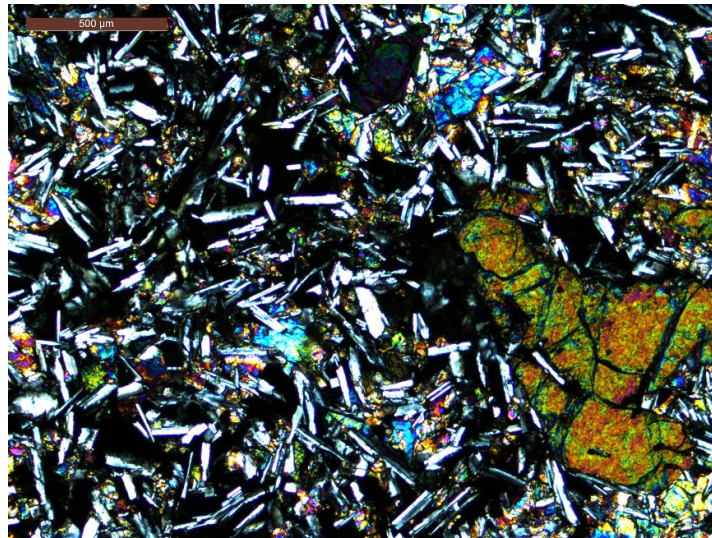
Numerous ± fresh euhedral to slightly embayed olivine phenocrysts (0.5 – 1 mm) lie in a fine-grained groundmass of plagioclase laths (≤ 250 μm) subophitically enclosed by platelets of clinopyroxene, together with much turbid opaque-rich mesostasis ("black glass"). There are numerous patches of pale amber yellow-brown isotropic alteration (?hisingerite) and many voids.

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

These and additional photomicrographs have been provided to laboratory staff at Curtin University.



A500731_SBDP5-222m_x5_PPL



A500731_SBDP5-222m_x5_XN

Relevant bibliographic references:

- Lucas, D.S. 1988. *Magnetics of the Tertiary basalts of north-western Tasmania*. B.Sc. thesis, Geology Department, University of Tasmania. 109 pp.
- Ogg, J.G. 2020. *Geomagnetic Polarity Time Scale*. In *The Geologic Time Scale 2020* (Gradstein, F.M., Ogg, J.G., Schmitz, M.D, Ogg, G.M. [Eds.]). Elsevier. p. 159-192.
- Seymour, D.B. 1989. *Geological atlas 1:50 000 series. Sheet 36 (8015N). St Valentines*. Geological Survey Explanatory Report, Tasmania Department of Mines. ER80155 147 pp.