

**Hyperspectral analysis at Angularli uranium deposit, Northern Territory.  
BR Smith and P Sinclair, 2025.  
Northern Territory Geological Survey, Record 2025-006.**

## **Appendix 2**

XRD analyses: drillcore, Northern Territory. Mineralogical/Petrology Report: LJN2017-037.  
RS Bottrill and RN Woolley, Mineral Resources Tasmania

**NTGS Technical Note 2018-004**

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Mineral Resources Tasmania  
Mineralogical/Petrology Report  
LJN2017-037

# **XRD ANALYSES: DRILLCORE, NORTHERN TERRITORY**

An unpublished Mineral Resources Tasmania report for  
**NT Geological Survey**

by R. S. Bottrill and R. N. Woolley

21 September 2018

# Mineral Resources Tasmania

## SUMMARY

*The XRD results generally confirm the presence of most of the minerals indicated by the Hylogger/IR methods. There are few significant misidentifications or misses in the Hylogger results, although the TIR misidentifies muscovite as paragonite in one sample, and misses minor muscovite in another.*

*In regards to specific queries: a pyrophyllite/dickite/kaolinite mix was confirmed, as was diascore, a dickite/kaolinite mix, and a dickite/pyrophyllite mix.*

## INTRODUCTION AND BACKGROUND

The Hylogger IR spectroscopic analyses of drillcore being conducted by various Geological Surveys in Australia routinely return analyses indicating various minerals that often cannot be readily confirmed in the hand specimens, and require XRD (X-ray diffraction) or other methods for confirmation.

The objective of this study is mostly to determine the presence or absence of various minerals, or their more specific identity, in samples from some drillholes in the Northern Territory.

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## SAMPLES

The details of the three samples, submitted for XRD by Belinda Smith, Northern Territory Geological Survey (NTGS), are given in Table 1 below. The drill core samples were all from the Katherine area, NT.

*Table 1: Sample details*

Client ID	Sample	Expected Mineralogy	Description
CP17BRS001	WRD0104, 165.05m	quartz, pyrophyllite, kaolinite, dickite	Mamawaderre Sandstone
CP17BRS002	WRD0104, 220.07m	quartz, diaspore, dickite, possible white mica, pyrophyllite	Mamawaderre Sandstone
CP17BRS003	WRD0104, 224.09m	quartz, dickite, paragonite, pyrophyllite	Mamawaderre Sandstone

## ANALYTICAL TECHNIQUES

The samples were all prepared, examined and analysed by XRD, and two by XRF and several by various chemical, physical and thermal techniques in the MRT laboratories, Rosny Park, Tasmania.

### XRF

Two samples were analysed for major elements on a fused disk, in a Bruker ASX58 XRF, with proprietary Bruker software and a series of commercial standards. The results are shown in Appendix 2.

The results were used to check the Na contents to see if paragonite was likely, but the low values suggest there would be <1% of this mineral at the very most. The low Mg contents suggest the biotite is also very unlikely. The trace of Fe could be substituting in muscovite mica or pyrophyllite.

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## XRD

The samples were prepared, examined and analysed in the MRT laboratories, Rosny Park, Tasmania. They were run on an automated Philips X-Ray diffractometer system: PW 1729 generator, PW 1050 goniometer and PW 1710 microprocessor with nickel-filtered copper radiation at 35kV/25mA, a graphite monochromator (PW1752), sample spinner and a proportional detector (sealed gas filled PW1711). Our typical step-size is 0.02 degrees, and the standard scanning speed is 0.02 degrees/second. The PW1710 system is presently driven by the CSIRO XRD software: "VisualXRD", "PW1710 for Windows" and "XPLOT for Windows". Interpretation and quantification is largely manual, using a series of prepared standards of the more common minerals to enable some semi-quantitative analysis. Quartz, if present, is used as an internal standard; and if not present, is often added to the sample for a supplementary scan. Our semi-quantitative results are calculated using single-peak calibration factors derived from scans of known mixtures of minerals.

The XRD results are attached in Appendix 1 and are summarised in Table 2, with comparison to the Hylogger and other results. The results are discussed further below.

**Table 2: Summary of Main Results, discrepancies highlighted.**

Client ID	Sample	Hylogger ID	Main XRD mineralogy	Comment
CP17BRS001	WRD0104, 165.05m	quartz, pyrophyllite, kaolinite, dickite	Quartz (65%-80%), Pyrophyllite (10%-15%), Muscovite (2%-5%), Kaolinite (2%-5%), Dickite (2%-5%),	Good.  Mica not detected in hylogger
CP17BRS002	WRD0104, 220.07m	quartz, diaspore, dickite, possible white mica, pyrophyllite	Quartz (65%-80%), Muscovite (5%-10%), Dickite (2%-5%), Diaspore (2%-5%), Pyrophyllite (2%-5%),	Very Good
CP17BRS003	WRD0104, 224.09m	quartz, dickite, paragonite, pyrophyllite	Quartz (>80%), Dickite (5%-10%), Muscovite (5%-10%), Pyrophyllite (2%-5%)	Good.  Paragonite not confirmed by XRD

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## SUMMARY AND DISCUSSION

The XRD results generally confirm the presence of nearly all of the minerals indicated by the Hylogger/IR methods. There are very few significant misidentifications or misses in the Hylogger results. The results shown in Table 2 are classified here as:

Very Good: All minerals identified correctly.

Good: All main minerals identified, most subordinates detected correctly.

Fair: One main mineral confirmed, and/or only one incorrectly identified; some subordinates detected correctly.

Poor: Main phases not detected, some subordinates detected correctly.

Very poor: No phases detected correctly.

The results are overall good to very good.

Notable XRD results and possible issues include that:

1. Muscovitic mica was reported by XRD but no mica reported by TIR in sample 001.
2. Paragonite was reported by TIR in sample 003 but XRD indicated muscovite instead. XRF shows very low Na so paragonite would be <1% at very most.

In regards to specific queries:

1. *Is this a pyrophyllite/dickite mix or is it pyrophyllite/kaolinite? Or both?* Yes, both.
2. *Is it diaspora? Is it dickite or is there a dickite/kaolinite mix?* Yes for diaspora and dickite; kaolinite possible but uncertain.
3. *Dickite > paragonite > pyrophyllite in SWIR. Is the SWIR correct?* Not exactly, dickite and pyrophyllite are correct but not paragonite. However, if muscovite is substituted for paragonite, the relative proportions look good.

# Mineral Resources Tasmania

R.S. Bottrill

**MINERALOGIST/PETROLOGIST**

R.N. Woolley

**TECHNICAL OFFICER**

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# Mineral Resources Tasmania

## Appendix 1: Mineral Resources Tasmania Laboratory Report

**Client:** B. Smith, NTGS

**Sample Source:** Mamawaderre Sandstone

**MRT Job Number:** LJN2017/037

**Analysis:** Approximate Mineralogy

**Methods:** X-Ray Diffraction

**Results** (approx wt %)

<i>ID</i>	<i>HyLogger No.</i>	<i>Depth (m)</i>	<i>Minerals Identified</i>
CP17BRS001	20933	165.05	Quartz (65%-80%), Pyrophyllite (10%-15%), Mica <sup>D</sup> (2%-5%), Kaolinite (2%-5%), Dickite (2%-5%), ? <sup>1</sup> (<2%)
CP17BRS002	29154	220.07	Quartz (65%-80%), Mica <sup>D</sup> (5%-10%), Dickite (2%-5%), Diaspore (2%-5%), Pyrophyllite (2%-5%), ? <sup>2</sup> (<2%)
CP17BRS003	29720	224.09	Quartz (>80%), Dickite (5%-10%), Mica <sup>D</sup> (5%-10%), Pyrophyllite (2%-5%)

Peak overlap (e.g. Dickite and Kaolinite) may interfere with identification and quantitative calculations

Amorphous material (e.g. some hydrous iron oxides, organic matter) and minerals present in trace amounts may not be detected

<sup>D</sup> Dioctahedral Mica (consistent with, and most likely, muscovite)

<sup>1</sup> XRF results and the colour of CP17BRS001 suggest that a trace amount of Hematite may be present (main XRD peaks overlap with other minerals)

<sup>2</sup> very small peak at 3.24Å; possible Rutile or K-Feldspar

Some Kaolinite may be present in both CP17BRS002 and CP17BRS003, but this cannot be confirmed

No Paragonite was detected in CP17BRS003, and the XRF results (see following table) confirm that it is unlikely to be present above a possible trace amount

**Analyst:** R.N. Woolley

**Date:** 17 May 2017

# Mineral Resources Tasmania

## Appendix 2: Mineral Resources Tasmania Laboratory Report

**Client:** B. Smith, NTGS

**Sample Source:** Mamawaderre Sandstone

**MRT Job Number:** LJN2017/037

**Analysis:** Whole rock chemistry

**Methods:** X-Ray Fluorescence

**Results** (approx wt %)

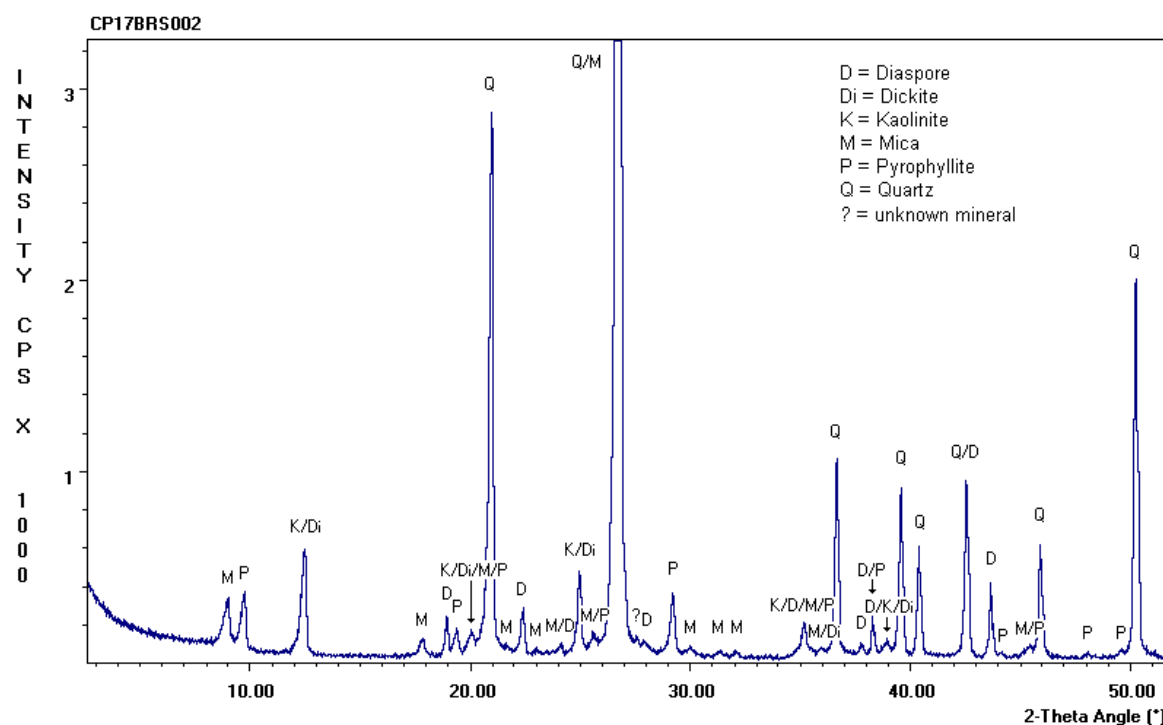
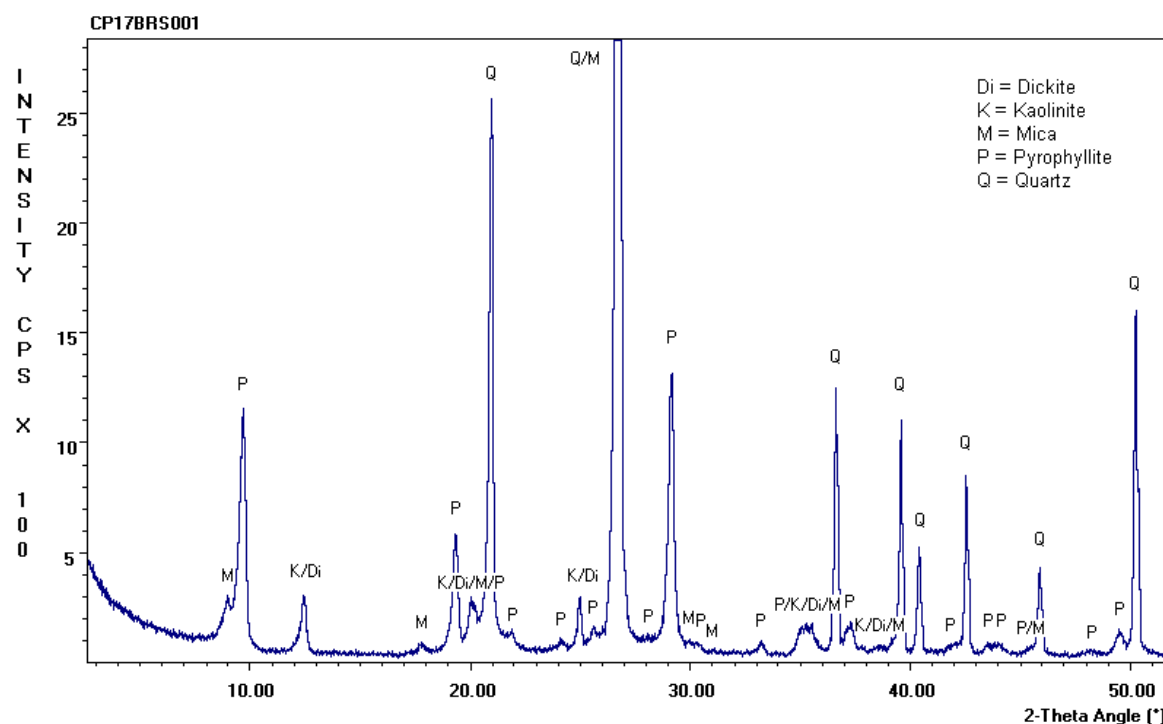
	CP17BRS001	CP17BRS003
SiO <sub>2</sub>	88.6%	92.4%
TiO <sub>2</sub>	0.15%	0.16%
Al <sub>2</sub> O <sub>3</sub>	8.35%	5.36%
Fe <sub>2</sub> O <sub>3</sub>	0.63%	0.08%
MnO	<0.01%	0.01%
MgO	0.01%	0.02%
CaO	0.03%	0.06%
Na <sub>2</sub> O	0.05%	0.02%
K <sub>2</sub> O	0.41%	0.64%
P <sub>2</sub> O <sub>5</sub>	0.05%	0.03%
LOI	1.67%	1.21%
Sum	99.95%	99.99%

**Analyst:** R.N. Woolley

**Date:** 17 May 2017

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## Appendix 3: XRD Traces



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