Department of State Growth
MINERAL RESOURCES TASMANIA

Enquiries: Ralph Bottrill
Ph: 03 6165 4715 Fax: 03 6233 8338
Email: ralph.bottrill@stategrowth.tas.gov.au Web www.mrt.tas.gov.au
Our Ref: 15RSB039:NT

Tasmanian Government

23 July 2015

C Hughes
Corona Minerals Ltd
PO BOX183
WEST PERTH WA 6872

Dear Charles

XRD ANALYSES: AUSCOPE
MRT MINPET JOB LJN2015/045
GARFIELD PROSPECT

Ten pulp samples were submitted from the Garfield prospect, Western Tasmania, for mineralogical analysis by XRD in our laboratories, and Hylogging. The samples were analysed accordingly and the results are enclosed.

This work is valued at $2120.00 but will not be invoiced.

Item	No. units	unit cost	total
XRD	10	$100.00	$1,000.00
Hylogging	10	$100.00	$1,000.00
comp	1	$120	$120.00
Total			**$2,120.00**

Yours sincerely

R S Bottrill
MINERALOGIST-PETROLOGIST

Encl.

Mineral Resources Tasmania

Mineralogical/Petrology Report
LJN2015/045

XRD ANALYSES: GARFIELD AREA

An unpublished Mineral Resources Tasmania report for
Corona Minerals Pty Ltd

by R S Bottrill, D C Green and R N Woolley

23 July 2015

Mineral Resources Tasmania
Department of State Growth

Tasmanian Government

SUMMARY

The XRD results generally indicate quartz-muscovite dominant lithologies, possibly representing either pelitic sediments, low grade metasediments, or strongly silica-sericite altered felsic volcanics. The supplementary minerals are largely of likely hydrothermal origin, including pyrophyllite, paragonite, hematite, baryte, siderite, ferroan dolomite and ankerite. The Hylogger analyses generally support the XRD results, but misses a few, mostly minor, phases and shows a few probably spurious results.

INTRODUCTION & 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 mineralogy and probable original nature of various pulped rock samples and determine whether the HyLogger with give useful results on them also.

SAMPLES

The details of the samples submitted for XRD by Charlie Hughes, Corona Minerals, are given in Table 1 below.

The ten pulp samples were all from rocks collected in the Garfield area, near Queenstown, Tasmania.

Table 1: Sample details

Field No.	Other No.	Location	Sample Description
12007	62	Garfield	lab pulp
12008	63	Garfield	lab pulp
12009	64	Garfield	lab pulp
12010	65	Garfield	lab pulp
12011	66	Garfield	lab pulp
12012	67	Garfield	lab pulp
12013	68	Garfield	lab pulp
12014	69	Garfield	lab pulp
12015	70	Garfield	lab pulp
12016	71	Garfield	lab pulp

ANALYTICAL TECHNIQUES

The samples were all prepared, examined and analysed by XRD, chemical techniques and low power microscopy in the Mineral Resources Tasmania (MRT) laboratories, Rosny Park, Tasmania.

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, it 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.

RESULTS

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

HYLOGGER

Samplers of the pulps were pressed into plastic cups 25mm diameter, about 1cm tall, and Hylogged under standard conditions with TIR (Thermal Infra Red) and SWIR (Short wave Infra Red) spectrometers.

We interpreted the scans that were provided to us using the current spectral library of large crystals and spectral unmixing techniques for intact rocks on the understanding that it was just "to see what we could see".

The HyLogger results of the pulped samples are likely to be compromised by the lack of appropriate library spectra of similar material and poorly understood volume scattering effects, which are huge for fine powders. The system was never designed to analyse fine powders and a lot of effort has gone into adapting it at least for RAB chips, but even there, although the SWIR can give decent results, no one that we know of has scanned chips (let alone powders) with TIR. We suspected not much signal in the TIR spectra and that's how it's panned out, with many errors of both commission and omission.

Nevertheless, the results appear quite useful and are listed below, in Table 2.

Table 2: Results summary and comparison (differences highlighted)

Field No.	HyLogger mineralogy	Main XRD mineralogy	Comments
12007	Quartz, Muscovite	Quartz, Muscovite	Good match
12008	Quartz, Goethite, Calcite/dolomite	Goethite Quartz	Good match but no carbonate in XRD
12009	Quartz, Muscovite, Chlorite, Goethite	Quartz, Muscovite, Ankerite,' Chlorite	Good match but no carbonate in IR, no goethite in XRD
12010	Quartz, Gibbsite, Goethite, Kaolinite	Quartz, Gibbsite, Goethite, Kaolinite, Muscovite	Good match but no muscovite in IR
12011	Hematite,	Quartz, Hematite, Baryte	Poor match, no baryte or quartz in IR
12012	Quartz, Muscovite,	Quartz, Muscovite, Chlorite	Good match but no chlorite in IR
12013	Quartz, Muscovite,	Quartz, Muscovite, Chlorite	Good match but no chlorite in IR
12014	Quartz, Muscovite, Alunite, hedenbergite?	Quartz, Muscovite,	Good match but no Alunite or hedenbergite in XRD
12015	Quartz, Muscovite, Magnesite, Gibbsite/pyrophyllite?	Quartz, Muscovite,	Good match but no magnesite, gibbsite or pyrophyllite in XRD
12016	Quartz, Muscovite,	Quartz, Muscovite, Siderite	Good match but no siderite in XRD

INTERPRETATION

The XRD results indicate that most of these samples have quartz-muscovite dominant lithologies, possibly representing either pelitic sediments or low grade metasediments, or strongly silica-sericite altered felsic volcanics (no feldspar was detected). The chlorite-rich samples may have had a more intermediate to mafic volcanic source or composition? The muscovite may also represent illite in part, suggesting that the alteration may be due to weathering in part, especially where goethite and lepidocrocite are present (altered pyrite?), and in sample 12010 which contains some gibbsite and kaolinite.

There are numerous supplementary minerals of likely hydrothermal alteration, including pyrophyllite, paragonite, hematite, baryte, siderite, ferroan dolomite and ankerite.

The Hylogger results generally agree quite well with the XRD results, mostly detecting most major phases, except the baryte and quartz in 12011. Some minor to subordinate phases, e.g. chlorite and carbonates, were not detected by IR. IR analysis also recorded some phases, e.g. some carbonates, alunite and hedenbergite, which were not confirmed by XRD, and these appear to be misidentifications, although these generally appear subordinate.

R S Bottrill

MINERALOGIST/PETROLOGIST

D C Green

Geologist

R N Woolley

TECHNICAL OFFICER

Disclaimers

While every care has been taken in the preparation of this report, no warranty is given as to the correctness of the information and no liability is accepted for any statement or opinion or for any error or omission. No reader should act or fail to act on the basis of any material contained herein. Readers should consult professional advisers. As a result the Crown in Right of the State of Tasmania and its employees, contractors and agents expressly disclaim all and any liability (including all liability from or attributable to any negligent or wrongful act or omission) to any persons whatsoever in respect of anything done or omitted to be done by any such person in reliance whether in whole or in part upon any of the material in this report.

This and other data collected in MRT laboratories may enter the MRT databases but every attempt will be made to ensure it remains closed file and not be available externally, unless at your request.

Mineral Resources Tasmania

Appendix 1: Mineral Resources Tasmania Laboratory Report

Client: C. Hughes, Corona Minerals Ltd
Sample Source: Garfield
MRT Job Number: LJN2015/045
Analysis: Approximate Mineralogy
Method: X-Ray Diffraction

Results (approx wt %)

Sample	62	63	64	65	66	67
Reg. No.	12007	12008	12009	12010	12011	12012
>80%						
65%-80%		Goethite				
50%-65%			Quartz			
35%-50%	Quartz, Mica^{M}				Quartz	Quartz, Mica^{M}
25%-35%				Quartz	Hematite	
15%-25%		Quartz	Mica^{M}	Gibbsite	Barite	Chlorite
10%-15%			Ankerite	Goethite[1], Kaolinite		
5%-10%			Chlorite	Mica^{M}		
2%-5%	Pyrite	Mica		Mixed-layer[2]	Goethite	
<2%	Pyrophyllite, Lepido-crocite, ?		Lepido-crocite	?	Chlorite	Lepido-crocite

Sample	68	69	70	71
Reg. No.	12013	12014	12015	12016
>80%		Quartz		
65%-80%				
50%-65%			Quartz	
35%-50%	Mica^{M}, Quartz		Mica^{M}	Quartz
25%-35%				Mica^{M}
15%-25%	Chlorite			
10%-15%				
5%-10%		Mica^{M}		Mg-Siderite[3]
2%-5%	Pyrite		Pyrophyllite	Paragonite, Fe/Mn-Dolomite[4], Hematite
<2%	?	Lepido-crocite	Chlorite, ?	Chlorite, Lepidocrocite, ?

Notes overleaf

Analyst: R N Woolley
Date: 31 March 2015

XRD Notes:

Peak overlap may interfere with identifications (e.g. Kaolinite and Chlorite) and quantitative calculations.

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

[M] Muscovite type
[1] main peaks at 4.170Å and 2.675Å (Goethite = 4.183Å and 2.693Å; Diaspore = 3.99Å and 2.558Å); some replacement of Fe by Al?
[2] peaks at 14.1Å, (7.1Å, overlapped), 4.72Å, 3.55Å and 2.83Å; heating to 580°C produces a peak at 11.9Å (possible mixed-layer Chlorite-Vermiculite) rather than 13.8Å (Chlorite)
[3] main peak at 2.779Å (Siderite = 2.795Å; Magnesite = 2.742Å)
[4] main peak at 2.895Å (Ankerite = 2.906Å; Dolomite = 2.888Å)
? some very small unassigned peaks; trace amounts of minerals such as Chlorite, Rutile and Jarosite may be present in some samples

Sample 71 was treated with warm HCl; Mg-Siderite, Fe/Mn Dolomite, Hematite and Chlorite were removed; total weight loss was 15.7%

Analyst: R N Woolley
Date: 31 March 2015