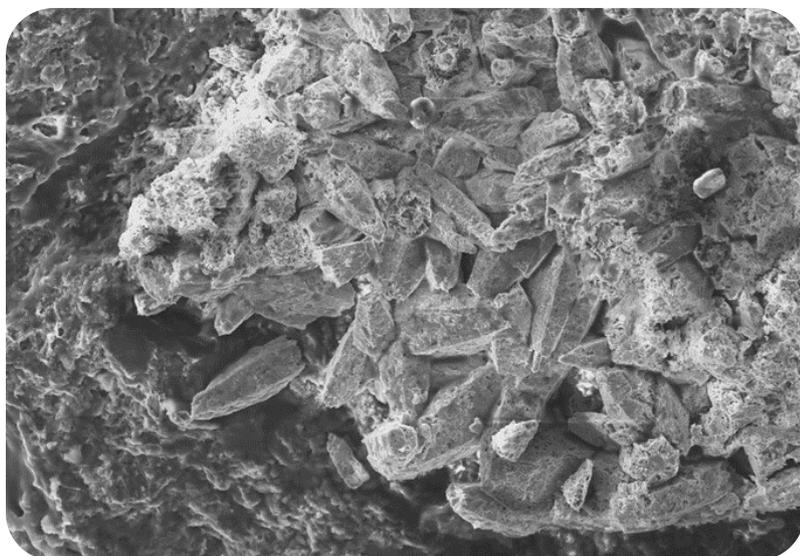


Mineral Resources Tasmania

Laboratory Report

LJN2019-117

# MINERALOGICAL ANALYSES, VARIOUS LOCATIONS



An unpublished Mineral Resources Tasmania Report for:

**M Latham**

**By:** R S Bottrill & T Coyte

**Date:** 26 September 2022

# Mineral Resources Tasmania

## SUMMARY

*The samples submitted were identified as;*

*Rosebery: Meneghinite*

*Carson de Beers: Molybdenite + Wolframite*

*Natone/Housetop: Jarosite (Pb and As bearing)*

*Natone/Housetop: Ilmenite (Niobium rich)*

*Whyte R: Vanadinite*

*Calder R: Au-Hg grains*

*Mt Housetop: Ilmenite*

## INTRODUCTION

A varied selection of mineral specimens were submitted for identification. The sample details are given in Table 1.

*Table 1. Sample details*

<b>MRT Reg. No.</b>	<b>Tests</b>	<b>Location</b>	<b>Sample Description</b>
G408728	SEM	Rosebery	Meneghinite
G408729	Visual	Carson de Beers	Molybdenite + Wolframite
G408730	SEM	Natone/Housetop	Jarosite?
G408731	SEM	Natone/Housetop	Ilmenite
G410125	SEM	Whyte R	Vanadinite
G410135	SEM	Calder R	Au-Hg grains
G410136	PXRF	Mt Housetop	Ilmenite?

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## PROCESS

To determine the mineral composition, some representative parts of the material were examined microscopically and crushed and analysed by X-ray Diffraction (XRD) in the Mineral Resources Tasmania (MRT) Laboratories, Rosny Park and Mornington. Some were tested chemically by pXRF in the same laboratories.

## DESCRIPTION

G408728 contains broken pieces of metallic grey sulphosalt (meneghinite by XRD) with a lineated texture (Fig. 1).



*Figure 1: Sample G408728, as received. Broken pieces of metallic grey meneghinite with a lineated texture. Normal light, FOV (field of view) ~30mm.*

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G408729 contains Black bladed wolframite and silvery molybdenite in white quartz (Fig. 2, 3).



*Figure 2: Sample G408729, as received. Black bladed wolframite in white quartz. Normal light, FOV (field of view) ~80mm.*



*Figure 3: Sample G408729, as received. Black bladed wolframite and silvery molybdenite in white quartz. Normal light, FOV (field of view) ~60mm.*

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In G408730, *powdery yellow-brown jarosite occurs on pink K-feldspar (Fig. 4).*



*Figure 4: Sample G408730, as received. Yellow-brown jarosite and pink K-feldspar. Normal light, FOV (field of view) ~50mm.*

In sample G408731, black ilmenite occurs on mottled graphic quartz and Kspar (Fig. 5).



*Figure 5: Sample G408731, as received. Black ilmenite (bottom) and mottled graphic quartz and Kspar. Normal light, FOV (field of view) ~50mm.*

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Sample G410125 contains very small (about 50 micron long) crystals of tapered prismatic orange Vanadinite (EDS confirmed) on a dark green chloritic groundmass (Fig. 6,7).

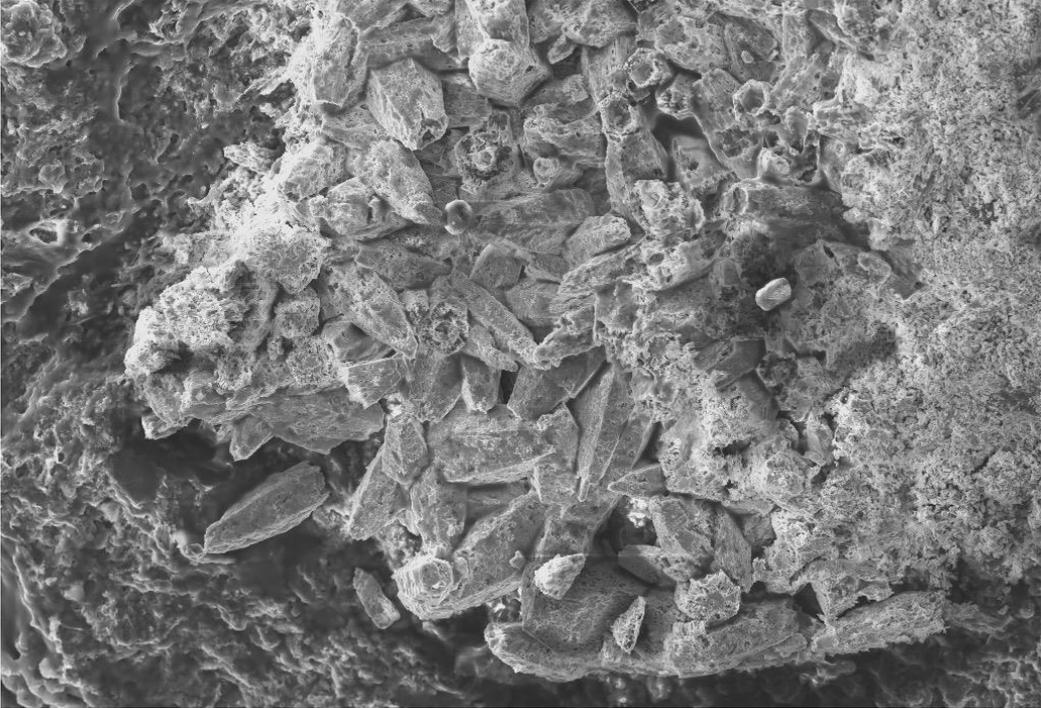


Fig. 6. Sample G410125, showing very small (<0.5mm) crystals of prismatic vanadinite on a chloritic groundmass. FOV ~0.5mm.

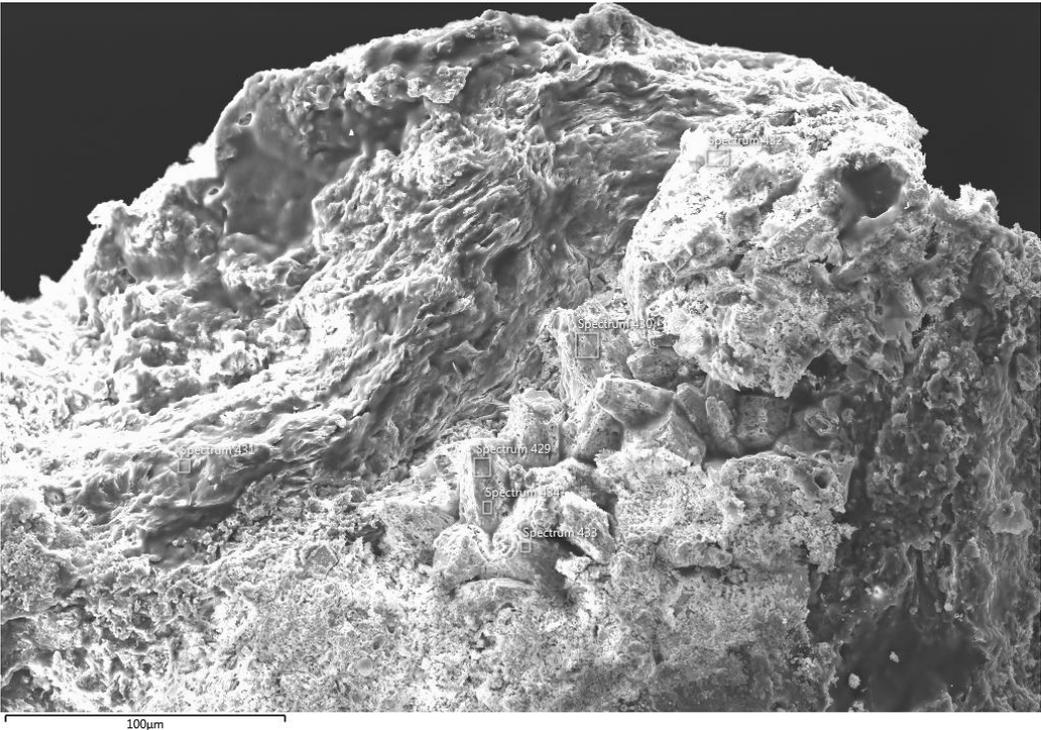
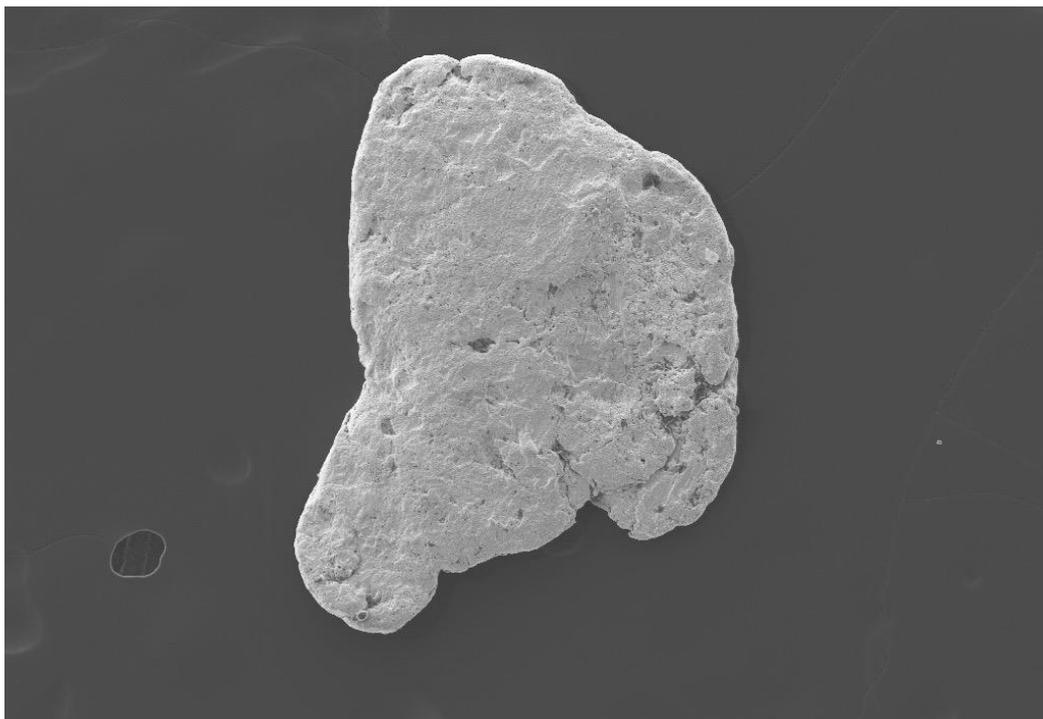


Fig. 7. Sample G410125, showing very small (<0.5mm) crystals of prismatic vanadinite on a chloritic groundmass. FOV ~0.5mm.

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Sample G410135 contains several irregular, rounded grains of gold with a silvery coating, to about 1.5mm (Fig. 8).



*Fig. 7. Sample G410135, irregular, rounded grain of gold. FOV ~1.6mm.*

Sample G410136 contains black ilmenite grains on mottled graphic quartz and Kspar, similar to G408731.

## PXRF

The sample G410136 was analysed for major and trace elements using an Olympus Vanta M Series pXRF. The instrument uses a 4-Watt X-ray tube with application optimized anode material (rhodium Rh and tungsten W): 8-50 kV with a large area Silicon Drift analysis software version 3.12.34.

The results are shown in Appendix 2. The sample is rich in K, Al, Si, Ti, Fe, and anomalous in Mn, Rb and Nb. This is consistent with a mixture of K feldspar and ilmenite.

Detector. The instrument uses the built in Olympus Vanta

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## SEM/EDAX ANALYSES

The samples were subsampled, with selected grains mounted on carbon tape on Al stubs and analysed by SEM-EDS, CSL, University of Tasmania, with analytical conditions shown in Appendix 2. The results are given in Appendix 3 and summarised below.

### **G408728     Rosebery**

The sample is Meneghinite, with the empirical formula:  $\text{Cu}_{1.1} \text{Pb}_{12.8} \text{Sb}_{6.9} \text{S}_{23.1}$ ; the ideal IMA formula is  $\text{CuPb}_{13}\text{Sb}_7\text{S}_{24}$ .

### **G408730     Natone**

The sample contains Pb and As-bearing jarosite,  $\text{K}_{0.8}\text{Fe}_{3.0}(\text{S}_{1.8} \text{As}_{0.3}\text{O}_4)_2(\text{OH})_6$ .

### **G408731     Natone**

The sample contains Mn-bearing ilmenite,  $\text{Fe}_{0.95}\text{Mn}_{0.05}\text{Ti}_{0.93}\text{O}_3$  with minor V (<0.5%) and very anomalous Nb (< 0.7%).

There is also K-feldspar (microcline?  $\text{K}_{0.9}\text{Na}_{0.1}\text{AlSi}_3\text{O}_8$ ).

### **G410125     Whyte R**

The sample contains a Cr-, As and Fe bearing Vanadinite:  
 $\text{Pb}_{5.0}(\text{V}_{2.7}\text{Cr}_{0.1}\text{Fe}_{0.1}\text{As}_{0.1}\text{O}_{12}) \text{Cl}_{0.8}$

There is also a Zn-bearing, Mg-rich chlorite (Clinochlore:  $(\text{Mg}_{2.9} \text{Al}_{2.1} \text{Fe}_{0.8} \text{Zn}_{0.1}) (\text{Si}_{3.8} \text{Al}_{0.2}) \text{O}_{10}(\text{OH})_8$ )

### **G410135     Calder R**

The sample contains Au-Hg grains, with some pure gold but mostly gold-mercury alloys, some with >45wt.% Hg. Silver contents are not detectable.

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## SUMMARY AND DISCUSSION

### **G408728     Rosebery**

The sample is Meneghinite, a Cu-Pb-Sb sulphosalt.

### **G408729     Carson de Beers**

The sample contains Molybdenite + Wolframite.

### **G408730     Natone**

The sample contains Pb and As-bearing jarosite.

### **G408731     Natone**

The sample contains Mn-bearing ilmenite, with very anomalous Nb (< 0.7%). There is also K-feldspar (microcline?).

### **G410125     Whyte R**

The sample contains a Cr-, As and Fe bearing Vanadinite.

There is also a Zn-bearing, Mg-rich chlorite.

### **G410135     Calder R**

The sample contains Au-Hg grains, with some pure gold but mostly gold-mercury alloys.

### **G410136     Mt Husetop**

PXRF analyses indicate a mixture of ilmenite and K-feldspar.

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## Appendix 1: Laboratory Report: pXRF analyses

**Client:** R Bottrill

**Sample Location:** various

**Job Number:** LJN2019-117

**Analyses:** Mineral chemistry

**Methods:** pXRF

**Analyst:** R Bottrill

**Date:** 10/12/2019

Sample ID	G410136	G410136
Date	10/12/2019	10/12/2019
Method Name	Geochem(2)	Geochem(2)
Units	PPM	PPM
Mg Concentration	0	6195
Mg Error1s	7547	2024
Al Concentration	52753	62860
Al Error1s	733	663
Si Concentration	130923	82454
Si Error1s	760	484
P Concentration	0	344
P Error1s	179	29
S Concentration	385	570
S Error1s	36	23
K Concentration	21296	6456
K Error1s	129	49
Ca Concentration	1534	0
Ca Error1s	35	156
Ti Concentration	344	52986
Ti Error1s	92	345
V Concentration	0	0
V Error1s	16	25
Cr Concentration	0	0
Cr Error1s	27	23
Mn Concentration	96	4325
Mn Error1s	17	59
Fe Concentration	3149	415225
Fe Error1s	45	1898
Co Concentration	0	0
Co Error1s	14	52
Ni Concentration	0	0
Ni Error1s	6	3
Cu Concentration	0	0
Cu Error1s	6	2
Zn Concentration	20	173

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Sample ID	G410136	G410136
Date	10/12/2019	10/12/2019
Method Name	Geochem(2)	Geochem(2)
Units	PPM	PPM
Zn Error1s	3	10
As Concentration	6	0
As Error1s	1	2
Se Concentration	0	8
Se Error1s	1	3
Rb Concentration	364	355
Rb Error1s	4	6
Sr Concentration	25	12
Sr Error1s	1	2
Y Concentration	6	0
Y Error1s	2	1
Zr Concentration	0	15
Zr Error1s	3	3
Nb Concentration	8	246
Nb Error1s	1	5
Mo Concentration	14	62
Mo Error1s	2	4
Ag Concentration	0	0
Ag Error1s	16	3
Cd Concentration	0	0
Cd Error1s	17	4
Sn Concentration	0	0
Sn Error1s	26	5
Sb Concentration	0	0
Sb Error1s	33	7
W Concentration	0	0
W Error1s	10	3
Hg Concentration	0	0
Hg Error1s	7	2
Pb Concentration	12	123
Pb Error1s	2	14
Bi Concentration	0	135
Bi Error1s	10	13
Th Concentration	15	0
Th Error1s	4	2
U Concentration	0	68
U Error1s	6	6
LE Concentration	789051	367388
LE Error1s	1218	2644

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## Appendix 2: Laboratory Report –SEM analytical conditions

### Hitachi SU-70 analytical field emission SEM

- Installed February 2011
- Schottky thermal field emission source
- ultra-high resolution (1.0 nm @ 15kV, 1.6 nm @ 1kV for SE imaging)
- high vacuum operation only (i.e. no variable pressure in chamber)
- Hitachi in-chamber and in-lens scintillation detectors, Super ExB filter, beam deceleration
- Hitachi in-chamber 5-segment solid state BSE detector, retractable
- in-column Faraday cup with picoammeter for beam current measurement
- anticontamination cold plate, liquid nitrogen cooled
- 5 axis motorised fully eucentric stage, XYZ range 110x110x40mm
- Oxford AZtec EDS/EBSD system with
  - X-Max 80 SDD EDS, MnKa 125 eV resolution, elements B-U, large area hyperspectral mapping, standardless and standards-based quantification, feature analysis
  - HKL NordlysNano EBSD camera & forescatter detector system, HKL & Channel 5 software packages, Synergy EDS/EBSD integration, HKL, ICSD & American Mineralogist phase databases
- NEW June 2017: Gatan ChromaCL2 colour cathodoluminescence imaging system with integrated BSE detector, Digital Micrograph 3 software, automated mosaic acquisition, simultaneous acquisition of SE, iBSE and colour CL images.

Label:	am 179
Element List Type:	Current Spectrum
Processing Option:	All Elements
Specimen Coating:	On
Beam Calibration Element Coating:	Off
Coating Element:	Carbon
Coating Thickness:	20 nm
Coating Density:	2.25 g/cm <sup>3</sup>
Automatic Line Selection:	Disabled
Normalization:	Enabled
Thresholding:	Sigma level = 1
Detector Window Correction:	Enabled
Deconvolution Elements:	None
Selected Standards:	Minerals_15kV_2017-10-20 [ User ]
Pulse Pile Up Correction:	Succeeded
Detector file:	X-Max 3
Efficiency:	File based

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## Appendix 3: Laboratory Report –SEM Analyses

**Client:** R Bottrill

**Sample Location:** var.

**Job Number:** LJN2019-117

**Analyses:** Mineral chemistry

**Methods:** SEM-EDS

**Analyst:** R Bottrill

**Lab Manager:** R Bottrill

**Date:** 18/12/2019

Table 1: G408728 Meneghenite (Atomic proportions, to 21 cations) 2019-12-18/G408728/Site 2

Label	O	Al	Si	S	Cu	Sb	Pb	Bi
Spectrum 444	0.0	0.0	0.0	23.2	1.2	7.1	12.7	0.0
Spectrum 445	2.5	0.5	0.0	23.4	1.2	6.5	13.3	0.0
Spectrum 446	3.7	0.0	0.4	23.3	0.9	7.0	13.0	0.0
Spectrum 447	2.3	0.0	0.0	23.2	1.2	7.1	12.7	0.0
Spectrum 448	0.0	0.0	0.0	23.0	1.1	7.0	12.8	0.0
Spectrum 449	0.0	0.0	0.0	22.9	0.8	6.8	12.9	0.5
Spectrum 450	0.0	0.0	0.0	22.8	1.4	7.0	12.6	0.0
Spectrum 451	0.0	0.0	0.0	23.2	0.8	6.9	12.8	0.5
Spectrum 452	0.0	0.0	0.0	22.7	1.4	7.0	12.6	0.0
Average				23.1	1.1	6.9	12.8	0.0

Table 2: G408731 Kspar (Atomic proportions, to 2 cations) 2019-12-18/G408731/Site 1

Spectrum Label	O	Na	Al	Si	K	Mn	Fe	Ba
Spectrum 394	11.24	0.11	1.09	3.00	0.80	0.00	0.00	0.00
Spectrum 395	10.49	0.06	1.07	3.00	0.88	0.00	0.00	0.00

Table 3: G408731 Ilmenite (Atomic proportions, to 2 cations) 2019-12-18/G408731/Site 2

Label	O	Na	Al	Si	K	Ti	V	Mn	Fe	Nb	Ba
Spectrum 396	3.26	0.00	0.00	0.01	0.00	0.96	0.00	0.06	0.97	0.01	0.00
Spectrum 398	2.61	0.00	0.02	0.02	0.00	0.93	0.01	0.05	0.95	0.01	0.01
Spectrum 399	2.17	0.00	0.02	0.01	0.00	0.94	0.00	0.05	0.97	0.01	0.00
Spectrum 400	2.63	0.00	0.00	0.00	0.00	0.95	0.01	0.05	0.97	0.01	0.01
Average	2.67	0.00	0.01	0.01	0.00	0.94	0.01	0.05	0.97	0.01	0.01

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Table 3a: G408731 Ilmenite (wt.%) 2019-12-18/G408731/Site 2

Label	O	Al	Si	Ti	V	Mn	Fe	Nb	Ba	Total
Spectrum 396	33.58		0.11	29.51		1.99	34.9	0.67		100.75
Spectrum 398	28.84	0.44	0.39	30.91	0.37	1.91	36.54	0.61		100
Spectrum 399	21.62	0.29	0.18	27.93		1.73	33.89	0.59		86.24
Spectrum 400	28.48	0.1	0.09	30.73	0.52	1.78	36.68	0.45	1.16	100

Table 4: G401135 Gold (Wt% and atomic proportions) 2019-12-18/G401135/Site 2, 3

Spectrum Label	Au wt%	Hg wt%	Total	Au at%	Hg at%
Spectrum 435	54.02	35.59	92.74	0.60	0.40
Spectrum 436	41.13	31.81	73.74	0.56	0.44
Spectrum 437	53.55	40.44	101.84	0.57	0.43
Spectrum 438	57.98	45.36	106.13	0.56	0.44
Spectrum 439	55.3	42.93	100	0.56	0.44
Spectrum 440	53.79	25.04	80.56	0.68	0.32
Spectrum 441	96.48		100.35	0.99	0.00
Spectrum 442	90.92		94.42	0.99	0.00
Spectrum 443	97.27		99.83	1.00	0.00

Table 5: G410125 Vanadinite (Atomic proportions, 8 cations) 2019-12-18/G410125/Site 2

Spectrum Label	O	Cl	Mg	Al	Si	Ca	V	Cr	Mn	Fe	Zn	As	Pb
Spectrum 429	9.49	0.76	0.00	0.00	0.00	0.00	2.69	0.11	0.00	0.20	0.00	0.00	5.00
Spectrum 430	10.54	0.82	0.00	0.00	0.00	0.00	2.65	0.13	0.00	0.15	0.00	0.09	4.99
Spectrum 432	21.94	0.99	0.00	0.00	0.00	0.00	2.55	0.11	0.00	0.11	0.00	0.12	5.11
Spectrum 433	8.50	0.84	0.00	0.00	0.00	0.00	2.65	0.10	0.00	0.09	0.00	0.07	5.09
Spectrum 434	7.07	0.62	0.00	0.00	0.00	0.00	2.78	0.17	0.00	0.00	0.00	0.06	4.99
Average	11.51	0.80	0.00	0.00	0.00	0.00	2.66	0.12	0.00	0.11	0.00	0.07	5.04

Table 6: G410125 Chlorite (Atomic proportions, to 8 cations) 2019-12-18/G410125/Site 2

Label	O	Cl	Mg	Al	Si	Ca	V	Cr	Mn	Fe	Zn
Spectrum 431	19.21	0.00	2.94	2.28	3.81	0.02	0.00	0.00	0.02	0.81	0.13

Table 7: G408730 Jarosite (Atomic proportions, to 6 cations, excluding Al, Si) 2019-12-18/G408730/Site 3

Label	K	Ca	Pb	Fe	S	As
Spectrum 392	0.88	0.00	0.06	2.83	1.93	0.29
Spectrum 393	0.84	0.00	0.06	2.87	1.96	0.28
Average	0.78	0.01	0.04	3.05	1.80	0.30

Table 7a: G408730 Jarosite (at.%) 2019-12-18/G408730/Site 3

Spectrum Label	O	Al	Si	S	K	Ca	Ti	Fe	As	Pb	Total
Spectrum 391	77.46	1.28	1.94	4.84	2.00	0.13	0.14	11.12	1.10		100
Spectrum 392	77.87	1.63	2.52	5.79	2.65			8.49	0.86	0.19	100
Spectrum 393	78.83	0.78	1.19	6.26	2.68			9.18	0.89	0.18	100