Mineral Resources Tasmania

Laboratory Report

LJN2019-133

MINERALOGICAL ANALYSES, VARIOUS LOCATIONS

An unpublished Mineral Resources Tasmania Report for:

DPIPWE

By: R S Bottrill L Unwin and T Coyte

Date: 26 September 2022

Mineral Resources Tasmania
Department of State Growth

Tasmanian Government

SUMMARY

The Studland bay sample appears to be a medium grained Calcarenite, possibly Palaeogene(?). It contains some weathered basaltic fragments and has a marine origin, but was probably also transported as wind-blown (aeolian) material in coastal dunes. The Sandy Bay sample is an opal-montmorillonite mixture and may be a very weathered zeolite vein or fracture fill. The Dunning Rivulet sample, described as a cave formation, is a white, fine grained, soft and porous material containing mostly calcite, and could be called travertine.

INTRODUCTION

Three geological samples were received from DPIPWE, for mineralogical and petrographic analysis, to determine their nature and origin. Details are shown in Table 1.

Table 1: Sample details.

Reg. No	Location	Tests	Description
G410138	Studland bay	Microscopy	Calcarenite
G410139	Long Pt, Sandy Bay	XRD	Calcrete
G410140	Dunning Rivulet	XRD	White cave formation

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.

SAMPLE DESCRIPTIONS

G410138 Studland bay

This sample is a medium grained, poorly consolidated, pale brown calcarenite (Fig. 1). It appears to contain some brown, weathered basaltic fragments.

Under the microscope it is composed of about lime sand: 60-70% shell and coralline fragments (Figs. 2-3). There is about 10-15% rock fragments, and 20-30% quartz sand. The sand grains are mostly subrounded to subangular, indicating the sediment is relatively immature. The basaltic material varies from black to reddish brown and varies from hard to quite clayey.

G410139 Long Pt, Sandy Bay

This sample appears to be a Calcrete. It is white, fine grained, soft and porous (Fig. 4).

G410140 Dunning Rivulet

This sample, described as a cave formation, is a white, fine grained, soft and porous material (Fig. 5).

Figure 1: Sample G410138, showing a sandstone composed largely of shell fragments. FOV: about 50 mm.

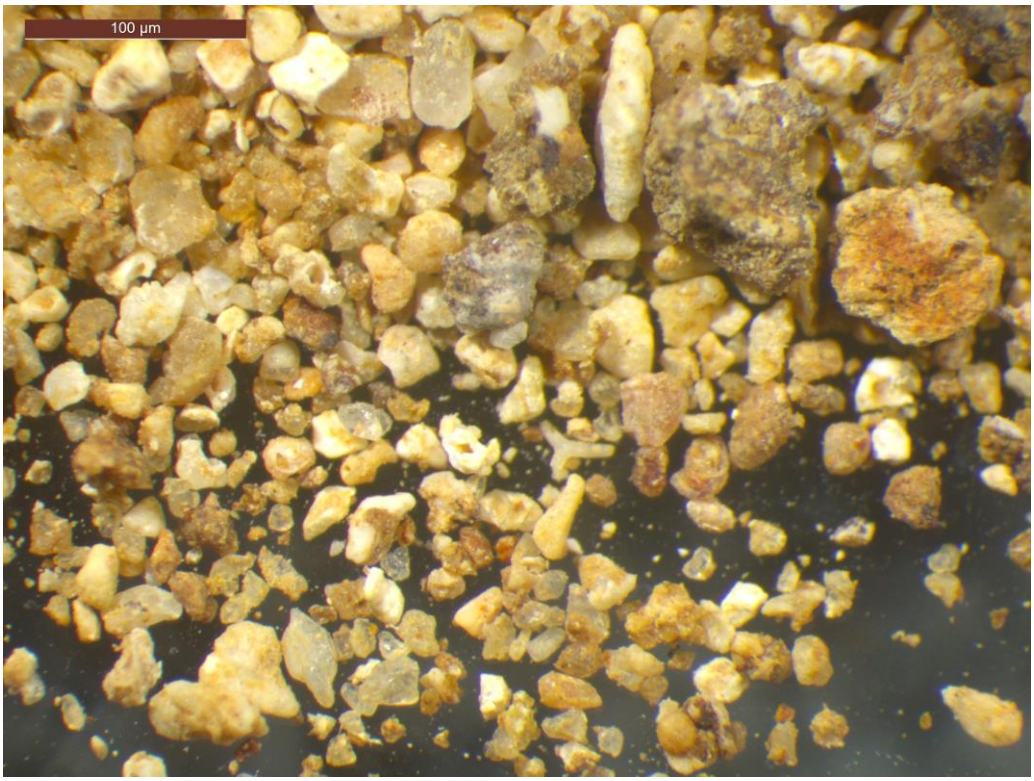


Figure 2: Sample G410138, showing a disaggregated sandstone composed largely of shell fragments and subangular/subrounded quartz, plus coarser, weathered basaltic fragments in the upper right. FOV: about 0.6 mm.

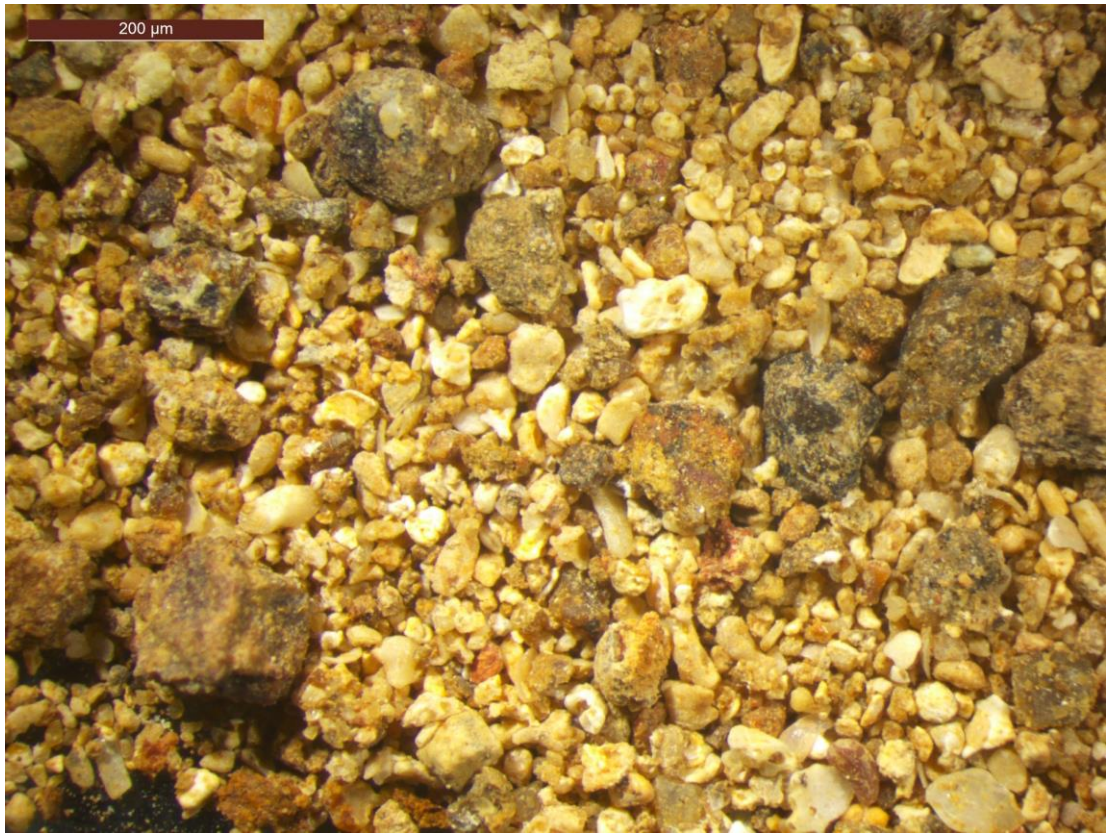


Figure 3: Sample G410138, showing a disaggregated sandstone composed largely of shell fragments and subangular/subrounded quartz, plus coarser, weathered basaltic fragments (grey). FOV: about 1 mm.

Figure 4: Sample G410139, showing highly porous clayey/siliceous material. FOV: about 40 mm.

Figure 5: Sample G410140, showing porous calcareous material. FOV: about 40 mm.

XRD ANALYSES

The samples were prepared, examined and analysed in the MRT laboratories, Rosny Park, Tasmania. They were run on a Rigaku Miniflex 600 X-Ray Diffractometer system: a 600W generator 150mm goniometer with a Cu tube; 40kV/15mA, sample spinner and a Scintillation counter (SC) with Be window, -3° to 145° 2Ø scanning range and 2° - 145° 2Ø measuring range, with a scanning speed of 0.01 to 100°/min, a graphite counter monochromator and a Kß Ni- filter. The analysis software used is the PDXL2 using the ICCD database.

The results are shown in Appendix 1. G410139 (Sandy Bay) is mostly opal (silica) and montmorillonite (clay). G410140 (Dunnings Rivulet) is mostly calcite, with very minor quartz and kaolinite.

PXRF

The samples G410139 and G410140 were analysed for major and trace elements by X-ray Fluorescence using a portable Olympus Vanta M Series pXRF. This 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 Detector. For data processing the instrument uses the built-in Olympus Vanta analysis software version 3.12.34.

The main results are shown in Appendix 2 and summarised in Tables 3 & 4 (mostly converted to wt.%). The sample G410139 is rich in Si, with minor Ca, Fe, Mg and Al. The sample G410140 is rich in Ca, with minor Mg, S, Fe, Si and Al. These are consistent with the XRD analyses.

Table 3: Summary of Main pXRF Results (approx. wt%).

Sample	G410139	G410139	G410139
Location	Long Pt, Sandy Bay	Long Pt, Sandy Bay	Long Pt, Sandy Bay
Mg %	0.0	0.8	0.4
Al%	2.0	5.8	3.8
Si%	3.9	19.2	24.8
P%	0.1	0.0	0.0
S%	0.2	0.1	0.0
K%	0.0	0.0	0.0
Ca%	35.6	2.2	0.0
Ti%	0.1	0.2	0.1
Cr%	0.0	0.0	0.0
Mn%	0.0	0.0	0.0
Fe%	0.2	2.0	1.8
Ni%	0.0	0.0	0.0
Cu%	0.0	0.0	0.0

Table 4: Summary of Main pXRF Results, G410140 (approx. wt%).

Sample	G410140	G410140	G410140
Location	Dunning Rt	Dunning Rt	Dunning Rt
MgO	<0.2	1.22	0.99
Al2O3	4.45	5.17	4.95
SiO2	9.15	17.70	16.53
P2O5	0.14	0.29	0.41
K2O	<0.01	0.32	0.71
CaO	47.71	37.12	33.02
TiO2	0.08	0.13	0.14
MnO	0.02	0.02	0.03
Fe2O3	0.37	0.71	0.76

SUMMARY AND DISCUSSION

G410138 Studland Bay

This sample appears to be a medium grained, poorly consolidated, pale brown Calcarenite. It may contain some weathered basaltic fragments and is moderately sorted but immature in its degree of rounding. The shell content implies a marine origin, but it's very possible that it was also transported as wind-blown (aeolian) material in coastal dunes. It looks like Palaeogene or Tertiary sediment, but it is not possible to be definitive about the age, without some palaeontology of the foraminifera and other microfossils.

G410139 Long Pt, Sandy Bay

This sample resembles a Calcrete but is actually an opal-montmorillonite mixture. It contains trace zeolite (laumontite?) and may be a very weathered zeolite vein or fracture fill.

G410140 Dunning Rivulet

This sample, described as a cave formation, is a white, fine grained, soft and porous material containing calcite, plus very minor quartz and kaolinite. It could be termed travertine.

R.S. Bottrill
MINERALOGIST/PETROLOGIST

L Unwin & T Coyte
LABORATORY ASSISTANTS

Appendix 1: XRD Analyses

Client: DPIPWE
Sample Source: various
MRT Job Number: LJN2019-133
Analysis: Approximate Mineralogy
Method: X-Ray Diffraction

Analysis Results – G410139

General information

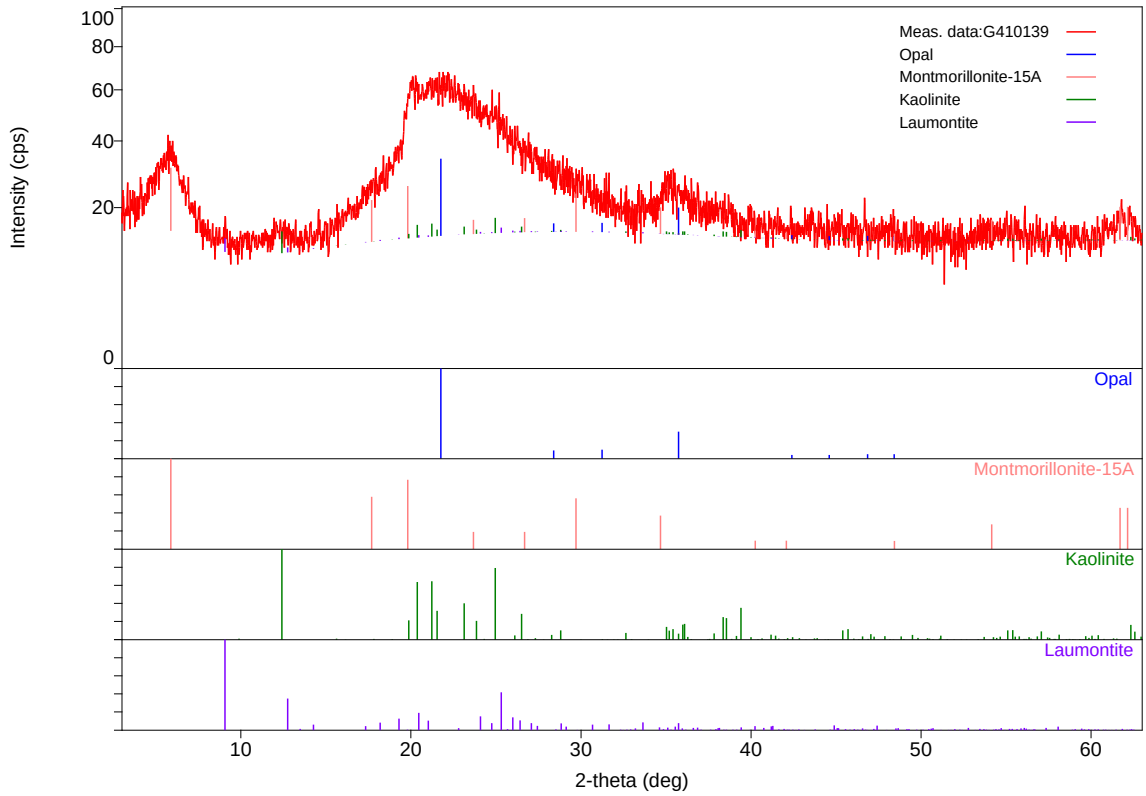
Analysis date	2020/01/9	XRD	Rigaku Miniflex 600
Job Number	LJN2019-133		
Sample ID	G410139	Operator:	T.Coyte
Comment:	Original RIR Method, Checked against pXRF results		

Analysis results

Phase name	Content (%)	Formula
Opal	73(±10)	SiO_2xH_2O
Montmorillonite-15A	23(±8)	$Ca_{0.2}(Al,Mg)_2Si_4O_{10}(OH)_24H_2O$
Kaolinite	3(±2)	$Al_2Si_2O_5(OH)4$
Laumontite	<1	$CaAl_2Si_4O_{12}(H_2O)_2$

Peak overlap may interfere with identifications and quantitative calculations.
Amorphous minerals and minerals present in trace amounts may not be detected.

Phase data pattern



Analysis Results – G410140

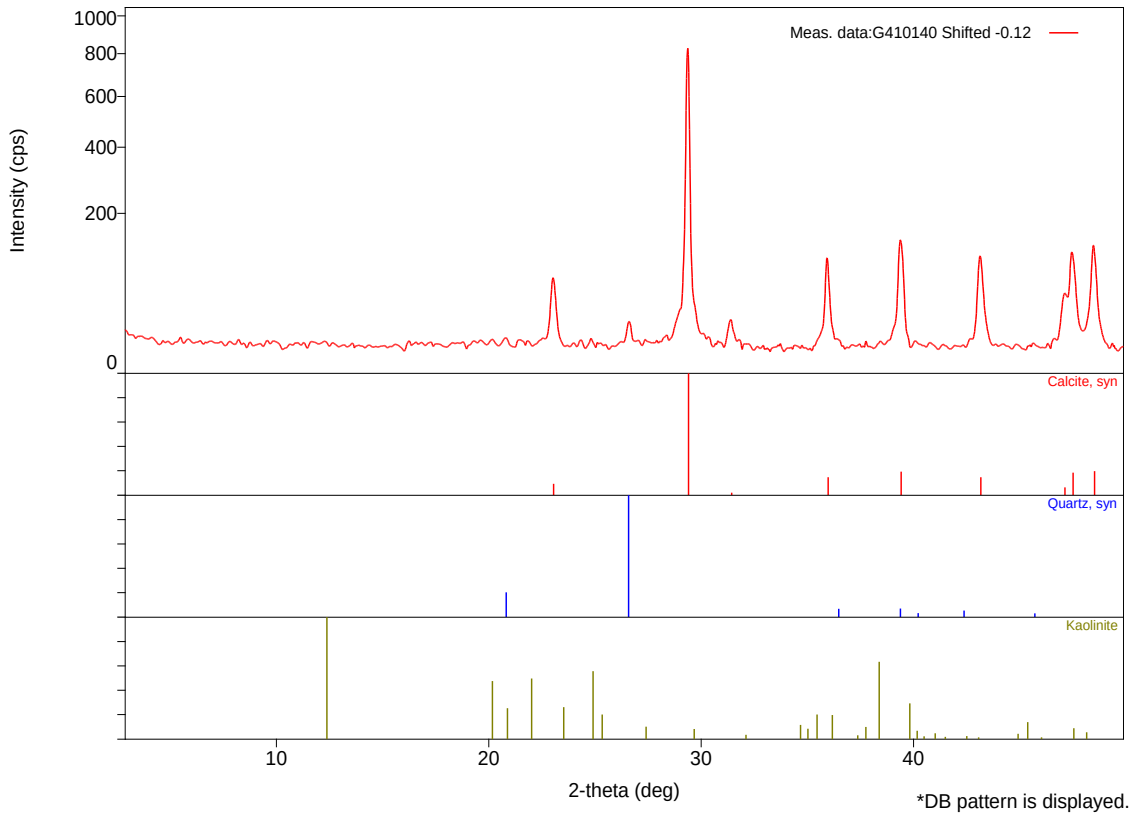
General Information

Analysis date	2019/12/19		
Job Number:	LJN2019-133	Measurement date	2019/12/19
Sample ID	G410140	Operator/Analyst	lunwin
Comment	Shifted -0.12		

Quantitative analysis results (RIR)

Phase name	Content (%)
Calcite	95(±3)
Quartz	2(±3)
Kaolinite	2(±3)

Phase data pattern



*DB pattern is displayed.

Mineral Resources Tasmania

Appendix 2: Laboratory Report: pXRF analyses

Client: DPIPWE
Sample Source: various
MRT Job Number: LJN2019-133
Analysis: Geochemistry
Method: Portable XRF

Sample ID	G410140	G410139	G410139	G410139
Date	7/1/20	7/1/20	7/1/20	7/1/20
Lab Job Number	LJN2019-133	LJN2019-133	LJN2019-133	LJN2019-133
Location	Dunning Rt	Long Pt, sandy Bay	Long Pt, sandy Bay	Long Pt, sandy Bay
Units	PPM	PPM	PPM	PPM
Mg Concentration	7733	0	7929	3828
Mg Error1s	2258	1440	1578	1082
Al Concentration	29892	20436	57655	38170
Al Error1s	483	404	522	354
Si Concentration	71245	38733	191605	247978
Si Error1s	443	257	804	785
P Concentration	1504	641	0	0
P Error1s	55	50	86	55
S Concentration	14701	2366	590	278
S Error1s	92	30	23	16
K Concentration	3943	0	0	0
K Error1s	42	74	149	103
Ca Concentration	224861	355927	22389	0
Ca Error1s	1114	1481	97	114
Ti Concentration	1126	630	1823	1158
Ti Error1s	111	104	87	63
V Concentration	0	0	0	0
V Error1s	20	20	13	10
Cr Concentration	79	0	0	0
Cr Error1s	24	35	22	17
Mn Concentration	265	148	73	0
Mn Error1s	23	20	12	299
Fe Concentration	5882	2437	20088	18114
Fe Error1s	69	44	110	81
Co Concentration	0	0	0	0
Co Error1s	20	15	26	20
Ni Concentration	15	0	29	29
Ni Error1s	5	9	4	3
Cu Concentration	0	0	15	8
Cu Error1s	7	7	3	2
Zn Concentration	25	18	81	52
Zn Error1s	3	3	3	2
As Concentration	0	0	0	0

Mineral Resources Tasmania

Sample ID	G410140	G410139	G410139	G410139
Date	7/1/20	7/1/20	7/1/20	7/1/20
Lab Job Number	LJN2019-133	LJN2019-133	LJN2019-133	LJN2019-133
Location	Dunning Rt	Long Pt, sandy Bay	Long Pt, sandy Bay	Long Pt, sandy Bay
Units	PPM	PPM	PPM	PPM
As Error1s	3	3	1	1
Se Concentration	0	0	0	0
Se Error1s	2	2	1	1
Rb Concentration	13	8	5	2
Rb Error1s	1	1	1	0
Sr Concentration	137	161	56	34
Sr Error1s	2	2	1	1
Y Concentration	4	5	16	8
Y Error1s	1	1	1	1
Zr Concentration	13	8	171	82
Zr Error1s	2	2	2	1
Nb Concentration	0	5	44	21
Nb Error1s	3	2	1	1
Mo Concentration	0	0	0	0
Mo Error1s	4	5	3	2
Ag Concentration	0	0	0	27
Ag Error1s	17	18	11	4
Cd Concentration	0	0	0	0
Cd Error1s	19	21	12	9
Sn Concentration	0	0	0	0
Sn Error1s	28	30	17	12
Sb Concentration	0	0	0	0
Sb Error1s	35	38	21	15
W Concentration	0	0	0	0
W Error1s	11	12	7	5
Hg Concentration	0	0	0	0
Hg Error1s	9	10	5	3
Pb Concentration	0	0	0	0
Pb Error1s	4	4	2	2
Bi Concentration	0	0	0	0
Bi Error1s	11	12	8	6
Th Concentration	18	0	25	15
Th Error1s	5	10	4	3
U Concentration	0	0	0	0
U Error1s	6	6	4	3
LE Concentration	638544	578476	697407	690196
LE Error1s	2169	1760	1584	1181

Mineral Resources Tasmania

Sample ID	G410140	G410140	G410140	G410140	G410140	G410140
Date	22/01/20	22/01/20	22/01/20	22/01/20	22/01/20	22/01/20
Units	PPM	PPM	PPM	PPM	PPM	PPM
Mg Compound	MgO	MgO	MgO	MgO	MgO	MgO
Mg Compound Level	0	12211.7	9914.17	109247	155501	92443.7
Mg Compound Error	2476.51	2879.6	2841.67	4275.06	3626.63	5315.05
Mg Concentration	0	7364	5978	65875	93766	55743
Mg Error1s	1493	1736	1713	2578	2187	3205
Al Compound	Al2O3	Al2O3	Al2O3	Al2O3	Al2O3	Al2O3
Al Compound Level	44486	51660	49468	49234	31830	62757
Al Compound Error	819.713	765.566	745.917	900.207	659.282	1149.81
Al Concentration	23544	27340	26180	26056	16846	33214
Al Error1s	434	405	395	476	349	609
Si Compound	SiO2	SiO2	SiO2	SiO2	SiO2	SiO2
Si Compound Level	91469.2	176973	165253	203482	128899	168600
Si Compound Error	619.658	919.618	863.93	1255.88	732.796	1311.42
Si Concentration	42759	82729	77250	95121	60256	78814
Si Error1s	290	430	404	587	343	613
P Compound	P2O5	P2O5	P2O5	P2O5	P2O5	P2O5
P Compound Level	1350.9	2921.44	4076.8	0	0	0
P Compound Error	120.297	113.559	112.912	208.813	169.208	276.151
P Concentration	590	1275	1779	0	0	0
P Error1s	52	50	49	91	74	121
S Concentration	1897	8643	16330	9274	23037	30391
S Error1s	31	55	86	71	115	218
K Compound	K2O5	K2O5	K2O5	K2O5	K2O5	K2O5
K Compound Level	0	3210.54	7135.42	0	0	0
K Compound Error	168.454	58.4059	69.8762	213.499	148.426	323.843
K Concentration	0	1587	3527	0	0	0
K Error1s	83	29	35	106	73	160
Ca Compound	CaO	CaO	CaO	CaO	CaO	CaO
Ca Compound Level	477069	371169	330215	255080	271366	173697
Ca Compound Error	2139.07	1562.5	1385.69	1332.31	1165.75	1131.31
Ca Concentration	340959	265272	236003	182304	193944	124140
Ca Error1s	1529	1117	990	952	833	809
Ti Compound	TiO2	TiO2	TiO2	TiO2	TiO2	TiO2
Ti Compound Level	759.836	1307.04	1409.05	1891.12	520.609	1559.84
Ti Compound Error	179.132	159.112	153.97	202.356	138.758	222.955
Ti Concentration	455	783	845	1134	312	935
Ti Error1s	107	95	92	121	83	134
V Concentration	0	0	0	189	60	226
V Error1s	21	18	16	17	11	18
Cr Concentration	0	0	0	0	0	0

Mineral Resources Tasmania

Sample ID	G410140	G410140	G410140	G410140	G410140	G410140
Date	22/01/20	22/01/20	22/01/20	22/01/20	22/01/20	22/01/20
Units	PPM	PPM	PPM	PPM	PPM	PPM
Cr Error1s	37	28	28	39	30	44
Mn Compound	MnO	MnO	MnO	MnO	MnO	MnO
Mn Compound Level	165.694	210.332	320.432	3962.96	8419.65	5687.26
Mn Compound Error	27.6805	23.4114	25.0769	78.0186	95.0616	102.184
Mn Concentration	128	163	248	3069	6521	4405
Mn Error1s	21	18	19	60	74	79
Fe Compound	Fe2O3	Fe2O3	Fe2O3	Fe2O3	Fe2O3	Fe2O3
Fe Compound Level	3679.84	7060	7572.38	96921.1	66604.1	200124
Fe Compound Error	68.6176	81.9284	82.1658	574.131	346.083	1345.64
Fe Concentration	2574	4938	5296	67791	46586	139976
Fe Error1s	48	57	57	402	242	941
Co Concentration	0	0	0	0	0	0
Co Error1s	16	17	17	62	45	86
Ni Concentration	0	23	0	312	248	425
Ni Error1s	10	5	7	13	9	18
Cu Concentration	0	16	19	1522	4125	6547
Cu Error1s	8	4	4	24	34	70
Zn Concentration	13	29	20	116	155	133
Zn Error1s	3	3	3	6	6	11
As Concentration	0	0	0	0	16	0
As Error1s	3	2	2	2	2	2
Se Concentration	0	0	0	0	0	0
Se Error1s	2	2	1	2	1	1
Rb Concentration	10	11	13	0	0	0
Rb Error1s	1	1	1	1	1	1
Sr Concentration	138	138	146	54	80	71
Sr Error1s	2	2	2	2	2	2
Y Concentration	5	0	0	20	11	17
Y Error1s	1	2	2	1	1	2
Zr Concentration	13	23	38	0	0	12
Zr Error1s	2	2	2	3	2	2
Nb Concentration	6	0	0	6	0	13
Nb Error1s	2	3	3	2	2	3
Mo Concentration	11	0	0	12	0	26
Mo Error1s	2	4	4	3	3	3
Ag Concentration	0	0	0	0	0	0
Ag Error1s	20	16	15	14	12	12
Cd Concentration	0	0	0	0	0	0
Cd Error1s	22	18	17	16	14	13
Sn Concentration	0	0	0	0	0	0
Sn Error1s	33	26	24	24	20	19

Mineral Resources Tasmania

Sample ID	G410140	G410140	G410140	G410140	G410140	G410140
Date	22/01/20	22/01/20	22/01/20	22/01/20	22/01/20	22/01/20
Units	PPM	PPM	PPM	PPM	PPM	PPM
Sb Concentration	0	0	0	0	0	0
Sb Error1s	41	33	30	30	25	24
W Concentration	0	0	0	0	0	0
W Error1s	13	11	10	11	9	9
Hg Concentration	0	0	0	14	0	0
Hg Error1s	10	8	8	5	7	8
Pb Concentration	0	7	6	0	0	0
Pb Error1s	5	2	2	4	3	4
Bi Concentration	0	0	0	0	0	0
Bi Error1s	13	10	10	9	8	8
Th Concentration	17	0	0	17	0	23
Th Error1s	5	8	8	6	6	7
U Concentration	0	0	0	0	0	0
U Error1s	7	5	5	5	4	4
LE Concentration	586882	599658	626320	547115	554039	524889
LE Error1s	1861	1865	1801	2501	2062	3155