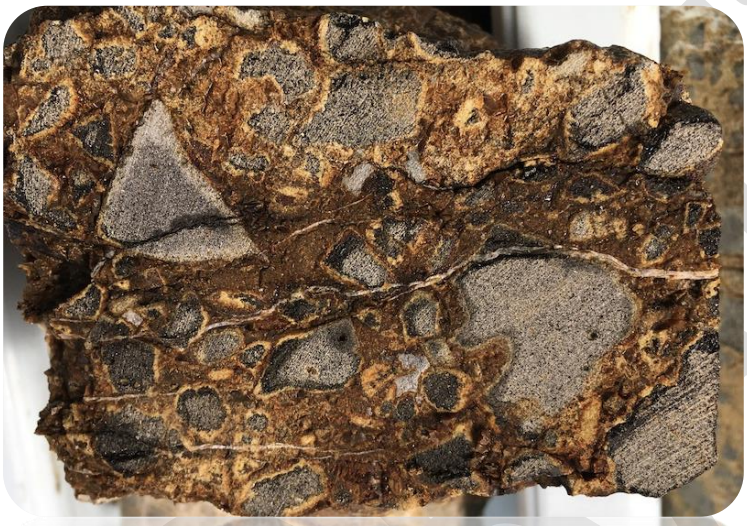
Mineral Resources Tasmania

Laboratory Report

LJN2020-018

MINERALOGICAL ANALYSES, BRIDGEWATER, TAS



An unpublished Mineral Resources Tasmania Report for:

R Bottrill

By: R.S. Bottrill, L Unwin and T Coyte

Date: 21 May 2020

Mineral Resources Tasmania
Department of State Growth

Tasmanian Government

SUMMARY

The samples studied all contain a rubbly, highly porous basalt, with cavities containing a range of secondary minerals, including hisingerite, magnesite, rhodochrosite, calcite, aragonite, quartz and smectite.

INTRODUCTION

Five samples of drill core were sampled and submitted for mineralogical analysis with details shown in Table 1. The aim is to determine the nature of secondary minerals in them.

Table 1: Sample details.

Reg. No	BH No., Depth	Location	Description	Process
G409320	BWBBH08/7.4	Bridgewater bridge, N	Basalt Breccia + agate, calcite	XRD
G409321	BWBBH08/19.1	Bridgewater bridge, N	Clay/bleached basalt	XRD, pXRF
G409322	BWBBH08/10.1	Bridgewater bridge, N	Basalt Breccia + brown cement - hisingerite?	XRD
G409323	BWBBH08/27.9	Bridgewater bridge, N	Basalt Breccia + black hisingerite	XRD
G409324	BWBBH08/46.8	Bridgewater bridge, N	Basalt Breccia + siderite?	XRD

SAMPLE PREPARATION

The samples were split into representative subsamples and examined by stereomicroscopy, and analysed for mineralogy. Analyses were done by XRD (X-

Ray diffraction) and Portable XRF, in the Mineral Resources Tasmania (MRT) laboratories, Rosny.

SAMPLE DESCRIPTION

G409320 BWBBH08/7.4 Basalt Breccia + calcite

This sample is a highly brecciated, fine grained, unfoliated and aphyric, dark grey basalt, with irregular, angular clasts to about 20cm diameter. Cavities contain brown material resembling hisingerite, and there are also veins and cavity fillings of white, banded chalcedonic quartz (agate) and minor calcite: Fig. 1.

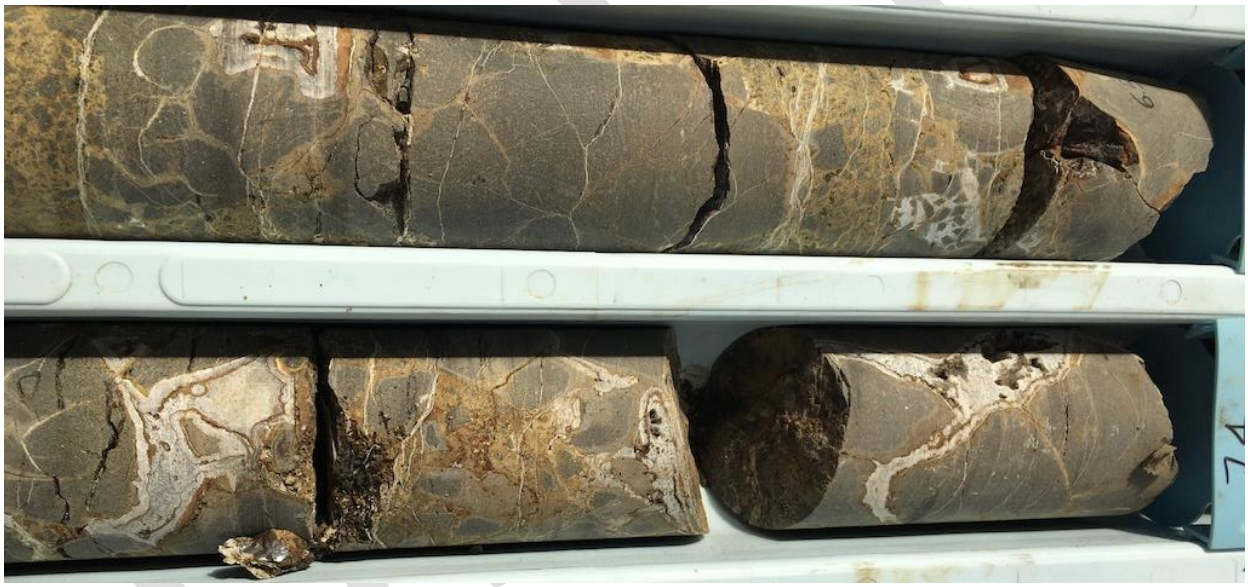


Fig. 1. G409320 BWBBH08/7.4 Basalt breccia with white calcite and brown hisingerite. FOV ~0.6m.

Mineral Resources Tasmania

G409321 BWBBH08/19.1 Clay/basalt

This sample is a highly brecciated, fine grained, unfoliated and aphric, dark grey basalt, with strong bleaching and irregular, angular clasts to about 20cm diameter (Fig. 2). Cavities contain off-white to pale brown clayey material: Fig. 3.

Fig. 2. G409321 BWBBH08/19.1 Clay patches in brecciated basalt. FOV ~ 1m.

Fig. 3. G409321 BWBBH08/19.1 Clay patches in brecciated basalt. FOV ~ 85mm.

G409322 BWBBH08/10.1 basalt breccia with brown hisingerite cement

This sample is a highly brecciated, fine grained, unfoliated and aphric, dark grey basalt, with irregular, angular clasts to about 2cm diameter (Fig. 2). There are some thin white calcite veins and cavities contain friable, glassy brown material resembling hisingerite: Fig. 4.

Fig. 4. G409322 BWBBH08/10.1 Basalt Breccia with brown hisingerite cement. FOV ~8cm.

G409323 BWBBH08/27.9 Basalt Breccia with black hisingerite

This sample is a highly brecciated, fine grained, unfoliated and aphric, dark grey basalt, with irregular, angular clasts to about 100cm diameter (Fig. 5). There are some thin white carbonate(?) veins and cavities contain friable, glassy brown material resembling hisingerite: Fig. 5.

Fig. 5. G409323 BWBBH08/27.9 Basalt Breccia with black hisingerite. FOV ~7cm.

G409324 BWBBH08/46.8 Basalt Breccia with brown carbonates

This sample is a highly brecciated, fine grained, unfoliated and aphric, dark grey basalt, with some minor bleaching around irregular, angular clasts to about 50cm diameter (Fig. 6). There are some red-brown (oxidised Fe-Mn rich carbonates) and white aragonite coatings in the cavities, plus green clay: Fig. 7.

Fig. 6. G409324 BWBBH08/46.8 Basalt Breccia with cavities containing carbonates. FOV ~30cm.

Fig. 7. G409324 BWBBH08/46.8 Basalt Breccia with carbonate coatings. FOV ~8cm.

PXRF

The samples were 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 Detector. The instrument uses the built in Olympus Vanta analysis software version 3.12.34.

The results are shown in Appendix 1 and Table 3; they indicate the material is dominated by Si, Ti, Al, Fe and Ca; Na could not be measured. The composition is very similar to fresh Tertiary basalt from close by (Table 3). In sample G409321 most of the mafics (olivine and pyroxene) have probably altered to clays and much of the Mg and Fe have been lost. The high Ca suggests that the plagioclase is not highly altered.

*Table 2: XRF Summary, wt% for **G409321**. G408839 is a fresh basalt from the nearby Bridgewater quarry, from the Tiger database.*

Analyte	Unit	G409321	G409321	G408839
		pXRF	pXRF	Tiger
SiO2	percent (%)	54	52	51.75
TiO2	percent (%)	2.1	2.3	1.51
Al2O3	percent (%)	18	18	14.41
Fe2O3	percent (%)	7.4	6.0	11.42
MnO	percent (%)	(0.1)	0.1	0.15
MgO	percent (%)	3.7	0	7.22
CaO	percent (%)	8.0	6.1	9.19
Na2O	percent (%)	na	na	2.8
K2O	percent (%)	(0)	0.2	0.31
P2O5	percent (%)	(0.2)	0.1	0.2
Loss Of Ignition	percent (%)	na	na	0.97
Sum of majors in wt %	percent (%)			100.06
Zr	ppm	98	88	97
Cr	ppm	265	244	178

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^{o} to 145^{o} 2Ø scanning range and 2^{o} - 145^{o} 2Ø measuring range, with a scanning speed of 0.01 to 100^{o}/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 and Table 2, and indicate mostly olivine (forsterite?), clinopyroxene (augite?), plagioclase (calcic?), smectite (montmorillonite?), hisingerite and carbonates (calcite, aragonite and minor siderite).

In G409324 two botryoidal, interbanded carbonates are present, close to Rhodochrosite (d=2.820) and Magnesite (d=2.760) but both indicate they are highly ferruginous phases using Rosenberg (1963). Assuming no other elements have been significantly substituted into the carbonates structure, the calculations suggest: Rhodochrosite: about ($Mn_{0.6}$ $Fe_{0.4}$) and Magnesite about ($Mg_{0.6}$ $Fe_{0.4}$). Assuming some minor Mg substitution in rhodochrosite and Mn substitution in magnesite the actual compositions may be slightly closer to rhodochrosite and magnesite respectively. Ca substitution is suspected to be low else it is likely that some dolomite and/or calcite should be present in the assemblage, but if so would push the magnesite composition closer to magnesite and the rhodochrosite composition a little further away from that end member.

Table 3: XRD Summary, wt%

Phase name	G409320	G409321	G409322	G409323	G409324	G409324 - Vein
Smectite	11(±4)	65(±10)	84(±10)	53(±10)		Sub Major
Plagioclase	38(±10)	34(±10)	14(±5)	23(±5)	44(±10)	
Olivine				<1	19(±5)	
Clinopyroxene	37(±10)	<1	<1	21(±5)	42(±10)	
Calcite	13(±4)					
Aragonite				<1		
Siderite - Magnesite		<1		2(±2)		Sub Dominant
Ferroan Rhodochrosite						Accessory

SUMMARY AND DISCUSSION

The samples studied all contain a rubbly, highly porous, aphyric, weakly weathered and weakly vesicular olivine basalt. It has abundant cavities to tens of cm wide, and these cavities contain a range of fine grained to well crystallised secondary minerals, including quartz (chalcedony), hisingerite, calcite, aragonite, ferroan magnesite, ferroan rhodochrosite and smectite. Off-white zones are partly clay-altered, bleached basalt.

Hisingerite is a black, near-amorphous, glassy, hydrous iron silicate. It has an XRD pattern similar to smectites and composition similar to nontronite, but does not react with water like smectites and other clays.

References

Rosenberg, P.E. (1963). Synthetic Solid Solutions in the systems MgCO3-FeCO3 and MnCO3-FeCO3, American Mineralogist

Mineral Resources Tasmania

R.S. Bottrill — **MINERALOGIST/PETROLOGIST**

T Coyte, L Unwin — **TECHNICAL OFFICERS**

Disclaimers

Mineral Resources Tasmania

Appendix 1: Laboratory Report: XRD Analyses

Client: R Bottrill
Sample Source: Bridgewater bridge
MRT Job Number: LJN2020-018
Analysis: Approximate Mineralogy
Method: X-Ray Diffraction
Analyst: L Unwin
Lab Manager: R Bottrill
Date: 20/5/20

Analysis Results – G409320

General information

Measurement date:	23/4/2020	**Analysis date:**	23/4/2020
Job Number:	LJN2020-018	**XRD**	Rigaku Miniflex 600
Registration Number:	G409320	**Analyst:**	L.Unwin
Quantitative Method:	XPlot	**Process Medium:**	Whole rock
Comment:	Shifted -0.03 with added Quartz		

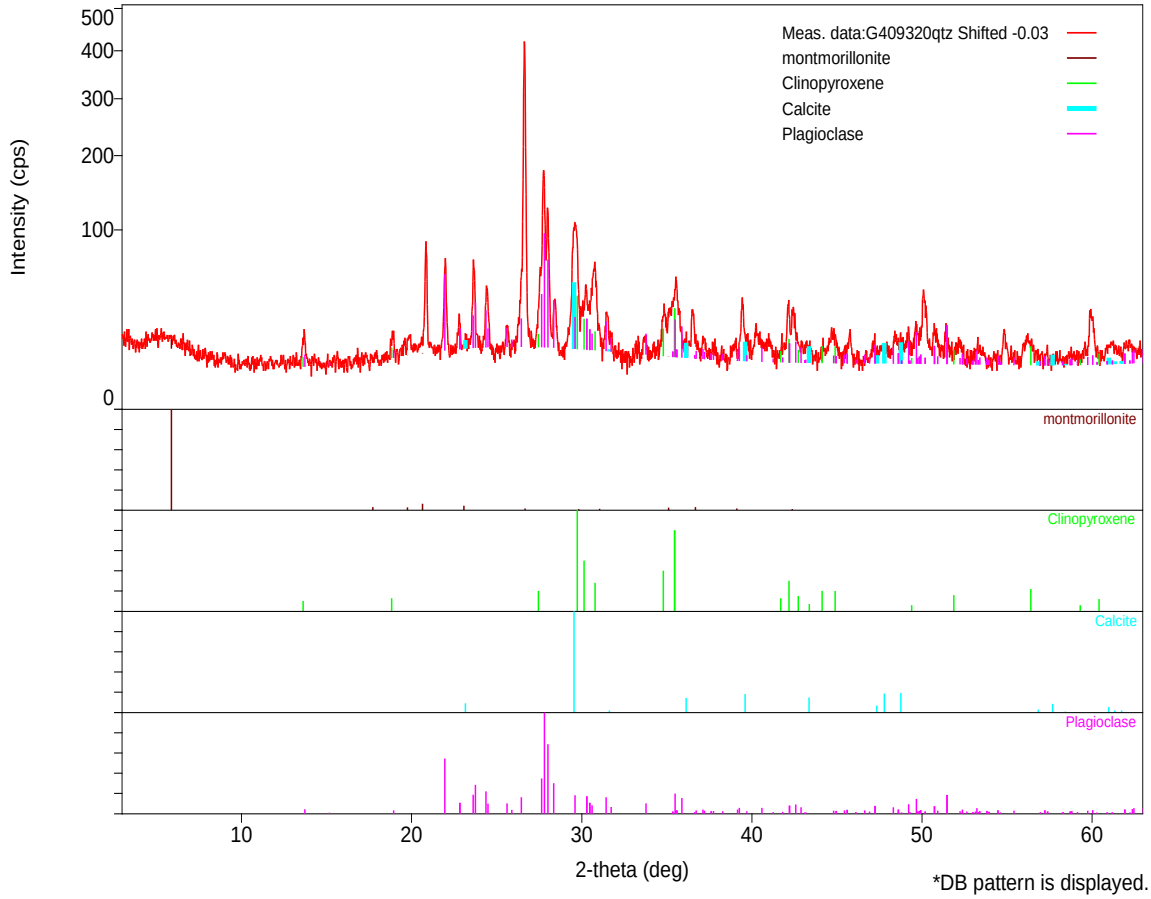
Analysis results

Phase name	Content wt% (± error)	Formula
Plagioclase	38(10)	$(Ca,Na)Al(Al,Si)Si_2O_8$
Clinopyroxene	37(10)	$Ca_xMg_yFe_z)(Mg_{y1}Fe_{z1})Si_2O_6$
Calcite	13(4)	$CaCO_3$
Montmorillonite	11(4)	

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

Mineral Resources Tasmania

Phase data pattern



*DB pattern is displayed.

Mineral Resources Tasmania

*DB pattern is displayed.

XRD Report–G409321-QA2-18/6/2020

General information

Measurement date:	23/4/2020	**Analysis date:**	23/4/2020
Job Number:	LJN2020-018-Basalts	**XRD**	Rigaku Miniflex 600
Registration Number:	G409321	**Analyst:**	L.Unwin
Quantitative Method:	XPlot	**Process Medium:**	Whole rock
Sample Holder:	Standard	**Speed (deg/min):**	0.5
Comment:	Shifted -0.09 with added Quartz		

Analysis results

Phase name	Content wt% (± error)	Formula
Smectite	65(10)	
Plagioclase	34(10)	$(Ca,Na)Al(Al,Si)Si_2O_8$
Mg-Siderite	<1(1)	$FeCO_3$
Clinopyroxene	<1(1)	$Ca_xMg_yFe_z)(Mg_{y1}Fe_{z1})Si_2O_6$

Notes

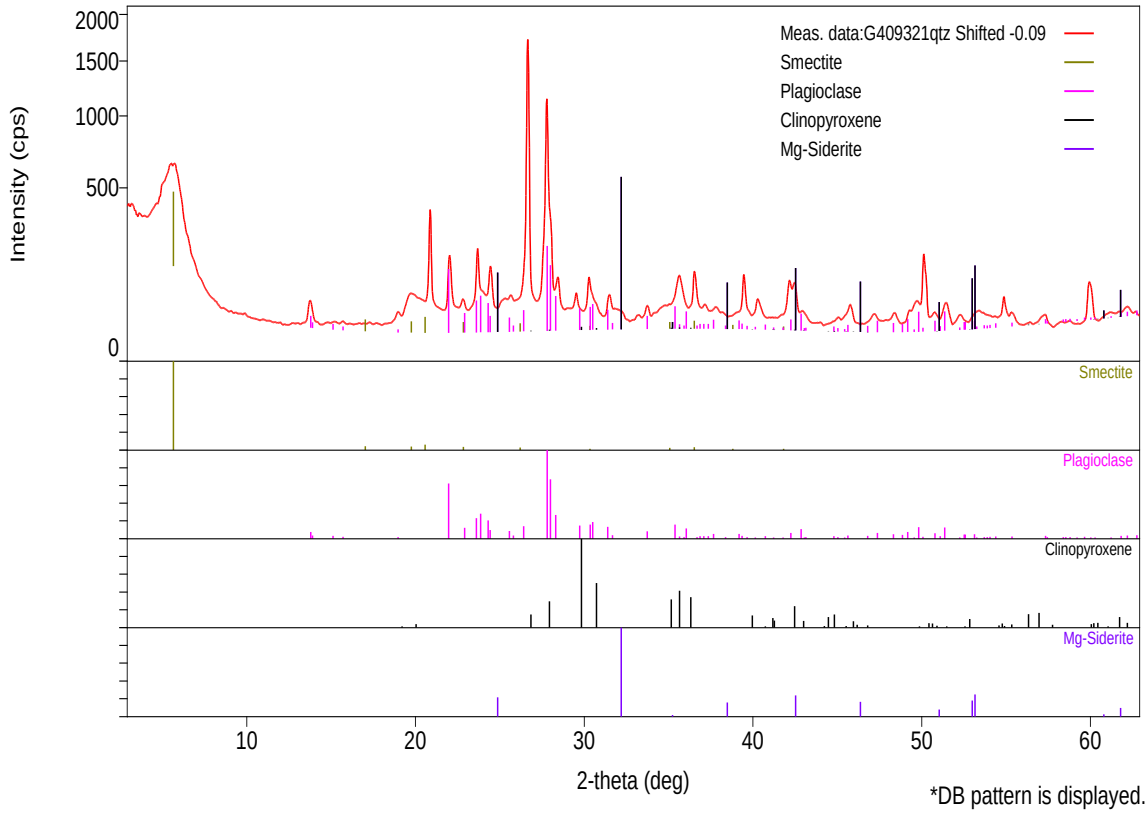
Peak overlap may interfere with identifications and quantitative calculations.
Amorphous minerals and minerals present in trace amounts may not be detected.

Peak List

No.	2-theta(deg)	d(ang.)	Phase name	Rel. int
1	5.628(16)	15.69(4)	Smectite(0,0,1),Plagioclase(0,1,0)	100.00
2	13.721(5)	6.448(2)	Plagioclase(1,0,-1),Clinopyroxene(1,1,0)	1.36
3	18.94(8)	4.682(19)	Plagioclase(0,2,-1)	0.14
4	20.7(3)	4.29(5)	Smectite(0,2,0),Plagioclase(1,-2,-1),Clinopyroxene(2,0,0)	11.72
5	22.021(19)	4.033(3)	Plagioclase(2,0,-1)	3.53
6	24.46(3)	3.636(4)	Plagioclase(0,3,-1)	4.11
7	25.90(19)	3.44(2)	Smectite(1,0,3),Plagioclase(2,-1,-1),Clinopyroxene(1,1,1), Mg-Siderite(0,1,2)	15.60
8	27.797(7)	3.2068(8)	Plagioclase(2,0,-2)	17.58
9	27.980(15)	3.1863(16)	Plagioclase(1,2,-2),Clinopyroxene(2,2,0)	15.54
10	28.46(3)	3.133(3)	Plagioclase(0,1,-2),Unknown	2.03
11	29.546(11)	3.0209(11)	Plagioclase(1,-2,-2)	1.38
12	30.264(12)	2.9509(12)	Plagioclase(1,-4,0)	1.31
13	30.45(6)	2.933(5)	Smectite(0,3,0),Plagioclase(0,2,-2),Clinopyroxene(3,1,0)	1.59
14	31.49(4)	2.839(3)	Plagioclase(1,3,1)	0.98
15	31.794(19)	2.8122(17)	Plagioclase(1,-4,-1),Unknown	0.14
16	32.1359	2.78309	Plagioclase(0,2,2),Mg-Siderite(1,0,4),Unknown	0.55
17	34.73(9)	2.581(6)	Smectite(1,0,5),Plagioclase(2,-1,1),Clinopyroxene(2,0,-2), Mg-Siderite(0,0,6)	3.39
18	35.6205	2.51842	Plagioclase(3,1,-2),Clinopyroxene(1,1,-2)	3.72
19	36.5431	2.45692	Smectite(2,0,2),Plagioclase(1,4,-2),Clinopyroxene(2,2,1)	3.37
20	40.39(3)	2.2314(15)	Smectite(1,1,6),Plagioclase(2,2,-3),Clinopyroxene(3,1,1)	3.96
21	42.152(6)	2.1421(3)	Smectite(2,-1,-4),Plagioclase(2,-5,-1)	3.21
22	42.460(6)	2.1272(3)	Plagioclase(3,1,-3),Mg-Siderite(1,1,3)	2.26
23	45.791(13)	1.9799(5)	Plagioclase(0,2,3),Clinopyroxene(2,4,0)	1.29
24	47.17(7)	1.925(3)	Smectite(1,4,-3),Plagioclase(3,-2,1),Clinopyroxene(2,4,-1)	0.50
25	48.44(3)	1.8777(10)	Plagioclase(2,2,2),Clinopyroxene(5,1,-1)	0.61
26	50.156(14)	1.8174(5)	Smectite(1,-3,-6),Plagioclase(4,-3,-1),Clinopyroxene(3,3,1)	5.96
27	50.76(4)	1.7973(12)	Plagioclase(1,1,3),Clinopyroxene(5,1,0)	0.72
28	51.458(19)	1.7744(6)	Plagioclase(2,0,-4),Clinopyroxene(2,4,1)	1.65
29	52.28(2)	1.7486(7)	Smectite(0,0,9),Plagioclase(1,5,2)	0.51
30	53.50(4)	1.7113(11)	Smectite(0,4,-6),Plagioclase(1,2,3),Clinopyroxene(4,2,1), Mg-Siderite(0,1,8)	2.11
31	54.98(3)	1.6687(8)	Smectite(1,5,-1),Plagioclase(1,-1,-4),Clinopyroxene(3,1,2)	3.08
32	57.24(8)	1.608(2)	Smectite(0,3,8),Plagioclase(3,-5,1),Clinopyroxene(5,3,-1)	0.77
33	59.958(5)	1.54156(12)	Smectite(0,1,10),Plagioclase(4,-2,-4),Clinopyroxene(1,1,3)	2.53

34	61.25(4)	1.5121(8)	Plagioclase(5,-3,-2),Clinopyroxene(6,2,-1),Mg-Siderite	0.66
35	62.22(3)	1.4909(6)	Smectite(3,-3,0),Plagioclase(2,-6,2),Clinopyroxene(1,3,-3),Mg-Siderite(1,2,2)	1.20
30	52.28(2)	1.7486(7)	Smectite(0,0,9),Plagioclase(1,5,2),Olivine(2,4,0)	0.51
31	53.50(4)	1.7113(11)	Smectite(0,4,-6),Plagioclase(1,2,3),Olivine(2,2,2),Clinopyroxene(4,2,1)	2.11
32	54.98(3)	1.6687(8)	Smectite(1,5,-1),Plagioclase(1,-1,-4),Olivine(2,4,1),Clinopyroxene(3,1,2)	3.08
33	57.24(8)	1.608(2)	Smectite(0,3,8),Plagioclase(3,-5,1),Olivine(1,3,3),Clinopyroxene(5,3,-1)	0.77
34	59.958(5)	1.54156(12)	Smectite(0,1,10),Plagioclase(4,-2,-4),Clinopyroxene(1,1,3)	2.53
35	61.25(4)	1.5121(8)	Plagioclase(5,-3,-2),Olivine(3,0,1),Clinopyroxene(6,2,-1)	0.66
36	62.22(3)	1.4909(6)	Smectite(3,-3,0),Plagioclase(2,-6,2),Olivine(2,5,1),Clinopyroxene(1,3,-3)	1.20

Phase data pattern



Mineral Resources Tasmania

XRD Report–G409322-QA2-18/6/2020

General information

Measurement date:	2020/04/23	**Analysis date:**	2020/04/23
Job Number:	LJN2020-018-Basalts	**XRD**	Rigaku Miniflex 600
Registration Number:	G409322	**Analyst:**	L.Unwin
Quantitative Method:	XPlot	**Process Medium:**	Whole rock
Sample Holder:	Standard	**Speed (deg/min):**	**0.5**
Comment:	Shifted -0.05 with added Quartz speed 0.05 standard holder		

Analysis results

Phase name	Content wt% (± error)	Formula
Smectite	84(10)	
Plagioclase	14(5)	$(Ca,Na)Al(Al,Si)Si_2O_8$
Mg-Siderite	2(2)	$(Mg,Fe)(CO_3)$
Clinopyroxene	Trace	$(Ca_xMg_yFe_z)(Mg_{y1}Fe_{z1})Si_2O_6$

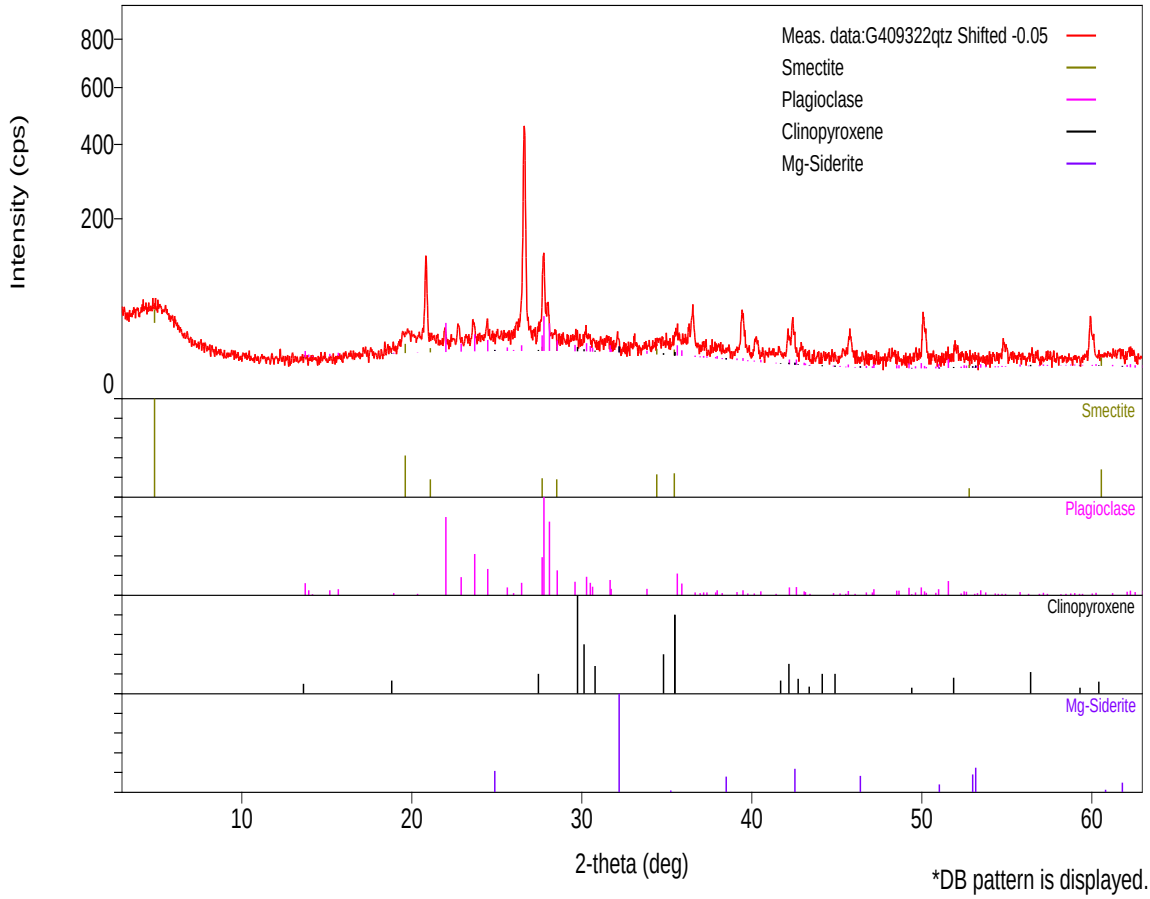
Notes
Peak overlap may interfere with identifications and quantitative calculations.
Amorphous minerals and minerals present in trace amounts may not be detected.

Peak List

No.	2-theta(deg)	d(ang.)	Phase name	Rel. int.
1	5.15(6)	17.14(19)	Smectite(0,0,1)	100.00
2	19.654	4.51327	Smectite(1,1,0),Plagioclase,Clinopyroxene(2,0,0)	42.09
3	21.9568	4.04485	Plagioclase(2,0,-1)	12.66
4	22.7375	3.9077	Plagioclase(1,-1,1)	12.25
5	23.6271	3.76254	Plagioclase(1,-3,0)	21.58
6	24.4387	3.63939	Plagioclase(1,3,0)	20.18
7	27.7607	3.21098	Plagioclase(0,4,0)	59.00
8	27.9934	3.18481	Smectite(0,2,4)	24.80
9	29.7097	3.00461	Plagioclase(1,-3,1),Clinopyroxene(2,2,-1)	19.11
10	30.2485	2.95231	Plagioclase(0,4,-1),Clinopyroxene(3,1,0)	12.22
11	31.5085	2.83707	Plagioclase(2,-2,-2)	16.51
12	32.1044	2.78575	Plagioclase(0,4,1),Mg-Siderite(1,0,4)	11.58
13	33.081	2.70571	Plagioclase(2,0,1)	14.55
14	34.4403	2.60197	Smectite(1,1,5),Clinopyroxene(1,3,-1)	15.70
15	35.5902	2.52049	Smectite(0,3,4),Plagioclase,Clinopyroxene(2,2,1),Mg-Siderite(0,0,6)	23.48
16	36.534(13)	2.4575(8)	Plagioclase(1,-5,0)	33.37
17	37.2167	2.41399	Plagioclase(1,5,-1)	8.43
18	39.4669	2.28138	Plagioclase(3,3,-1)	22.73
19	40.22(3)	2.2401(14)	Plagioclase(1,-5,1)	9.30
20	42.140(3)	2.14266(14)	Plagioclase(0,6,0),Clinopyroxene(3,3,-1)	8.32
21	42.417(3)	2.12927(13)	Plagioclase(2,-4,1),Mg-Siderite(1,1,3)	17.47
22	42.8994	2.10645	Plagioclase(3,-1,-3),Clinopyroxene(4,2,-1)	6.53
23	45.376	1.99707	Plagioclase(3,-1,1)	3.80
24	49.632	1.83533	Plagioclase(0,6,-2),Clinopyroxene(5,1,0)	2.75
25	50.079(10)	1.8200(3)	Plagioclase(2,6,0)	13.67
26	51.559	1.77117	Plagioclase(4,-2,0)	2.80
27	51.9836	1.7577	Plagioclase(2,-6,-2),Clinopyroxene(1,5,0)	5.95
28	59.922(7)	1.54241(17)	Plagioclase(1,-7,2)	9.73

Mineral Resources Tasmania

Phase data pattern



*DB pattern is displayed.

Mineral Resources Tasmania

Analysis Results – G409323

General information

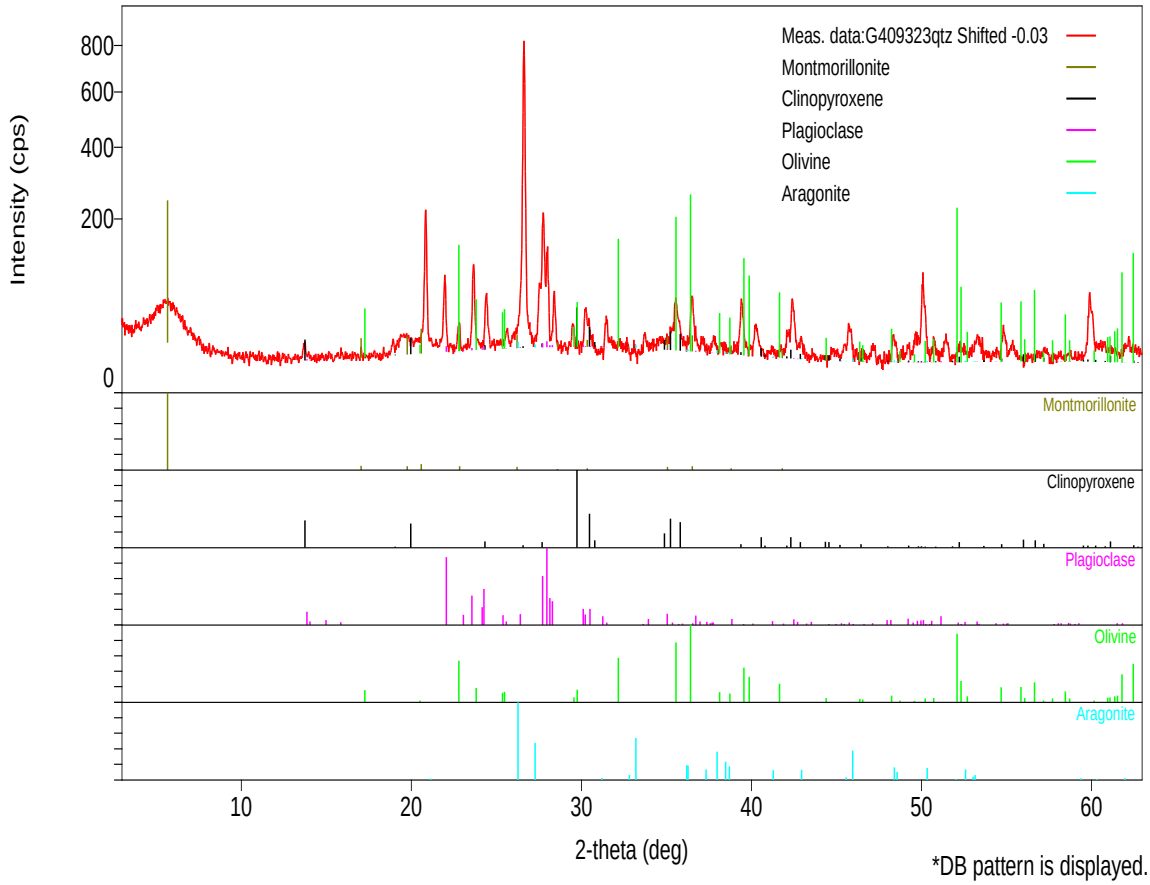
Measurement date:	5/3/2020	**Analysis date:**	7/5/2020
Job Number:	LJN2020-018-Bridgewater	**XRD**	Rigaku Miniflex 600
Registration Number:	G409323	**Analyst:**	L.Unwin
Quantitative Method:	XPlot	**Process Medium:**	Whole Rock
Comment:	Shifted -0.03 with added Quartz		

Analysis results

Phase name	Content wt%(± error)	Formula
Montmorillonite	53(10)	Various
Clinopyroxene	21(5)	$Ca_xMg_yFe_z)(Mg_{y1}Fe_{z1})Si_2O_6$
Plagioclase	23(5)	$(Ca,Na)Al(Al,Si)Si_2O_8$
Olivine	Trace	$Fe_2^{2+}SiO4$ to Mg2SiO4
Aragonite	Trace	$CaCO_3$

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

Phase data pattern



*DB pattern is displayed.

Mineral Resources Tasmania

Analysis Results – G409324

General information

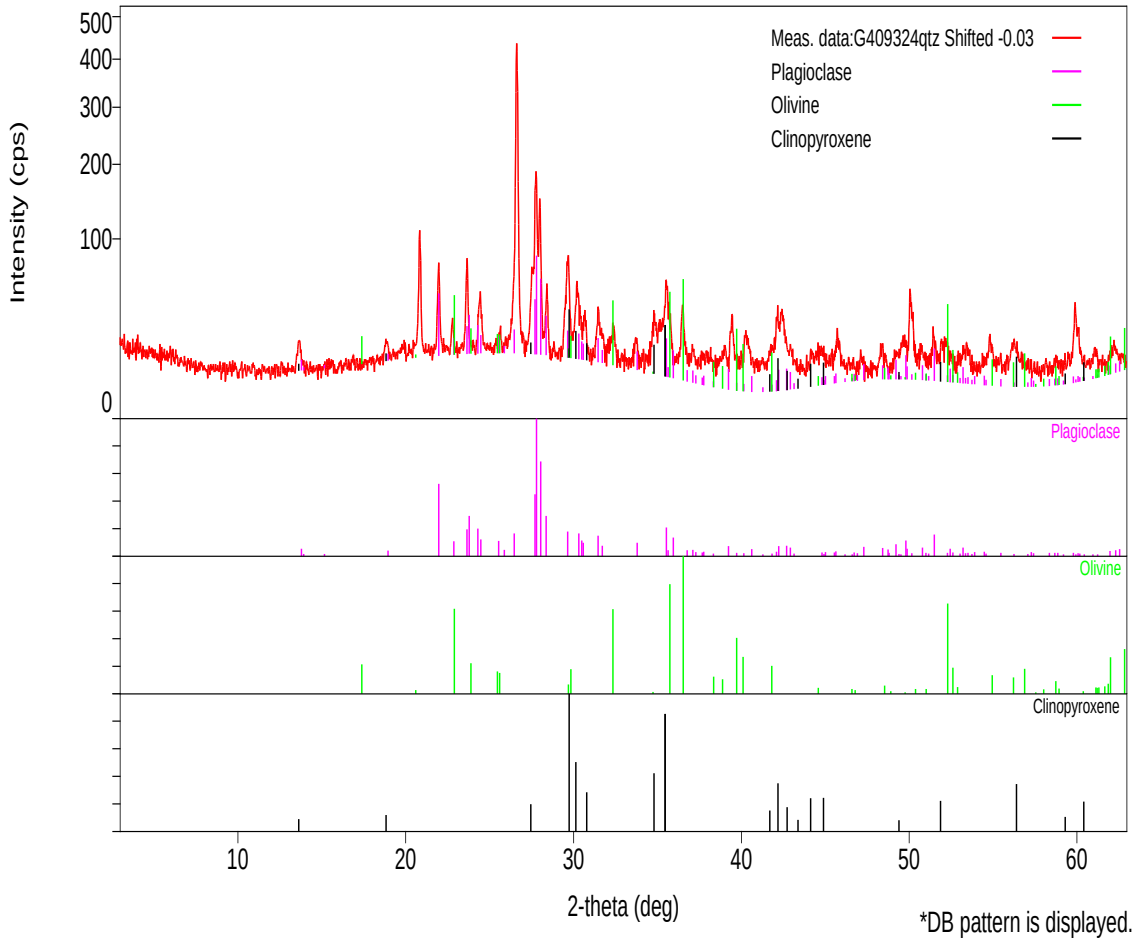
Measurement date:	5/3/2020	**Analysis date:**	23/4/2020
Job Number:	LJN2020-018	**XRD**	Rigaku Miniflex 600
Registration Number:	G409324	**Analyst:**	L.Unwin
Quantitative Method:	XPlot	**Process Medium:**	Whole rock
Comment:	Shifted -0.03 with added Quartz		

Analysis results

Phase name	Content wt%(± error)	Formula
Plagioclase	44(10)	$(Ca,Na)Al(Al,Si)Si_2O_8$
Clinopyroxene	42(10)	$Ca_xMg_yFe_z)(Mg_{y1}Fe_{z1})Si_2O_6$
Olivine	19(5)	$Fe_2^{2+}SiO4$ to Mg2SiO4

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

Phase data pattern



Mineral Resources Tasmania

Analysis Results – G409324 Selective

General information

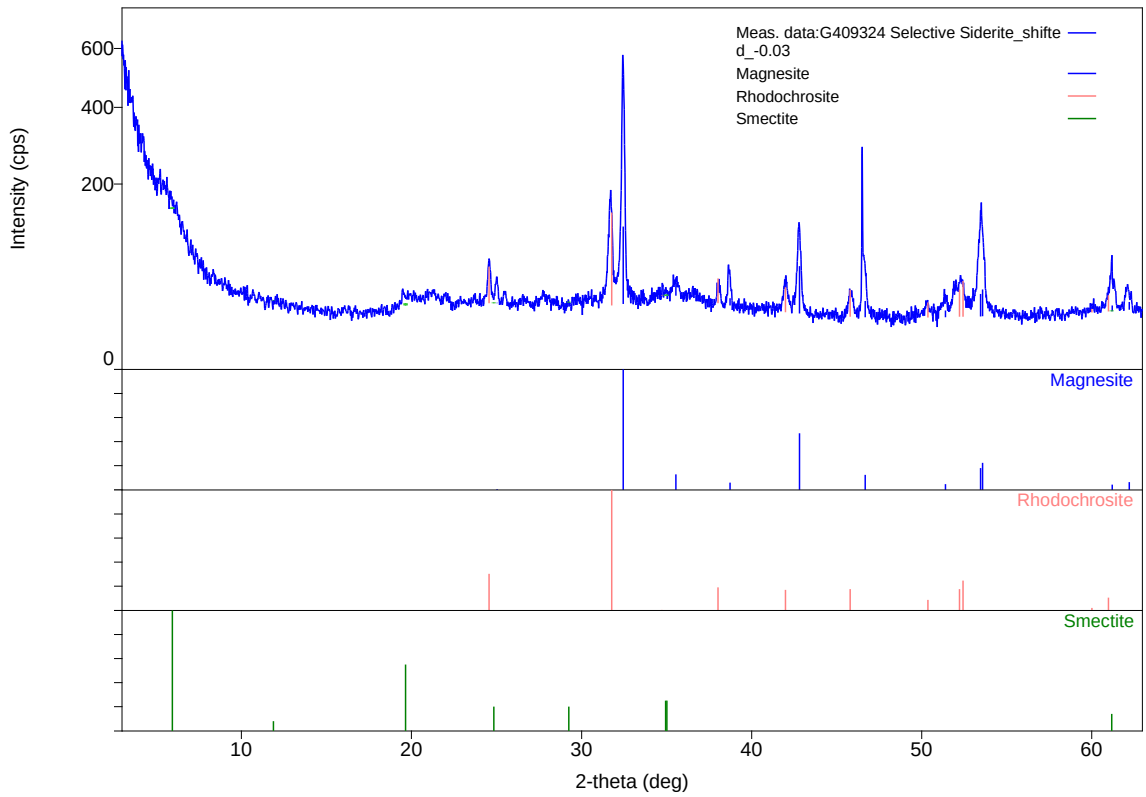
Measurement date:	19/5/2020	**Analysis date:**	19/05/2020
Job Number:	LJN2020-018 Bridgewater	**XRD**	Rigaku Miniflex 600
Registration Number:	G409324	**Analyst:**	T.Coyte
Quantitative Method:	XPlot	**Process Medium:**	Selective
Sample Holder	Glass Disk	**Speed:**	0.5 deg/min
Comment:	Sample was selectively collected aiming for a potential Siderite vein		

Analysis results

Phase name	Content - Estimate	Formula
Magnesite	Sub Dominant	$(Mg,Fe)CO_3$
Smectite-15A	Sub Major	Various
Rhodochrosite	Accessory	$(Mn,Fe)CO_3$

Notes:
Rhodochrosite (d=2.820) and Magnesite (d=2.760) both indicate they are ferruginous phases using Rosenberg, P.E. (1963). This has been calibrated against quartz and, assuming no other elements have been significantly substituted into the carbonates structure, the calculations suggest: Rhodochrosite: about (Mn 0.55 Fe0.45) and Magnesite about (Mg 0.63 Fe0.37).
Peak overlap may interfere with identifications and quantitative calculations.
Amorphous minerals and minerals present in trace amounts may not be detected.

Phase data pattern



Mineral Resources Tasmania

Appendix 2: Laboratory Report: pXRF Analyses

Client: R Bottrill
Sample Source: Bridgewater bridge
MRT Job Number: LJN2020-018
Analyses: Approximate Geochemistry

Methods: Portable XRF
Analyst: L Unwin
Lab Manager: R Bottrill
Date: 14/5/2020

Results:

Sample ID	DL	G409321	G409321
Date	-	14/5/20	14/5/20
Time	-	11:13:05	11:13:46
Method	-	Geochem(2)	Geochem(2)
SiO2 (%)	9	52	54
TiO2 (%)	0.2	2.3	2.1
Al2O3 (%)	5	18	18
Fe2O3 (%)	1.0	6.0	7.4
MnO (%)	0.1	(0.1)	(0.1)
CaO (%)	1.0	6.1	8.0
MgO (%)	1.5	(0)	3.7
K2O5 (%)	2.0	(0.2)	(0)
P2O5 (%)	0.5	(0.1)	(0.2)
S (%)	1.0	(0)	(0)
Cr (ppm)	50	265	244
Cu (ppm)	50	(38)	(31)
Nb (ppm)	30	(15)	(16)
Ni (ppm)	30	72	62
Pb (ppm)	10	(0)	(0)
Rb (ppm)	10	(6)	(4)
Sb (ppm)	100	(0)	(0)
Sr (ppm)	10	403	366
Th (ppm)	100	(0)	(0)
U (ppm)	50	(0)	(0)
V (ppm)	100	(77)	(95)
Y (ppm)	20	66	46
Zn (ppm)	20	315	320
Zr (ppm)	50	98	88
LE (%)	-	56.3	50.9

Disclaimer: pXRF results are unreliable and only provide an indication of the geochemistry. Accuracies and detection limits listed here are only for ideal analytical conditions. Sample preparation, grain size, porosity and composition will significant affect the validity of the results.
Results with the format '(30)', means those results are below the detection limits.