1985/62. Preliminary report on the Forest No. 1 diamond-drill hole and chemical analyses of associated tholeiitic basalts in the Smithton and Woolnorth Quadrangles

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Abstract

A stratigraphic diamond-drill hole, sited in the Eocambrian succession to the north of the township of Forest in the Smithton Quadrangle, confirms that the correlate of the Crimson Creek Formation in the Smithton Basin conformably and gradationally overlies a carbonate/mudstone succession which includes stromatolitic breccia units. The later succession is a correlate of the Success Creek Group and a lateral continuation of the Black River Dolomite. Analyses of basaltic units intercepted by the hole, as well as analyses of other basalt samples from surface outcrop locations within the Smithton and Welcome Quadrangles, are given.

INTRODUCTION

A stratigraphic diamond-drill hole was drilled into the Eocambrian succession to the north of the township of Forest on the north-west coast of Tasmania. The hole was drilled in two stages: 0-500.3 m between 30 October 1981 and 25 June 1982; and 500.3-1076 m between 11 July and 14 October 1983.

Hole Name:	Forest 1
DH Collar Co-ordinates:	352 738.00 mE, 5 480 111.00 mN (+- 5 m)
Elevation:	10.000 m (+- 0.1 m)
Depth of hole:	1076 m

Down hole survey (*) details:

Depth (m)	*Bearing (degrees M)*	*Inclination (degrees)*
0.00	0.00	0.00
407.70	316.50	2.50
605.70	316.50	10.00
803.70	316.50	11.50
1001.70	316.50	10.50

* Results of a down-the-hole survey using an Eastman single shot camera or equivalent. Inclination measured from vertical.

Space co-ordinates (*) for plotting of DDH Forest 1

Depth (m)	*Grid Co-ordinates*		*Elevation (m)*	
	metres E	*metres N*		
0.00	352738.000	5480111.000	10.000	Collar
203.85	352738.000	5480111.000	-193.850	
506.70	352731.295	5480122.382	-496.412	
704.70	352713.845	5480152.007	-691.404	
902.70	352693.810	5480186.019	-885.429	
1073.00	352678.058	5480212.760	-1052.877	EOH

* The calculated space co-ordinates listed above refer to the Australian Metric Grid (AMG).
The Mag N/Grid N angle = 13.00 degrees

The purpose of the hole was to see if a correlate of the Success Creek Group, the Black River Dolomite and Forest Conglomerate, underlay the correlate of the Crimson Creek Formation in the Smithton Basin, and if so what was the boundary relationship.

Before the first 500 m of the hole was drilled, the existence of deep gully infillings by volcaniclastic sedimentary rocks and associated basaltic rocks was unknown. The purpose of deepening the hole from 500 m was to obtain information on the nature of the basement for the Eocambrian successions in this area and to act as a seismic anchor point for the proposed ACORP seismic profile along north-western Tasmania. Due to the thickness of the successions, basement was not reached before the hole was abandoned due to drilling difficulties. These difficulties related to the presence of expanding clay (montmorillonite) and talc being present in the laminated mudstone units between 1020 m and 1030 m.

The lithological log of the hole is given in Appendix 1, and chemical analyses and locations of the samples are given in Tables 1 and 2 (Appendix 2).

[12 May 1986]

APPENDIX 1

Lithological log of drill core

Depth (m)		Description
0.0 -	2.0	Basalt boulders.
2.0 -	44.2	Dominantly massive, green/grey, sometimes amygdaloidal basalt with a zone of strong epidotisation from 26.3 - 26.8 m. Sample ABS44 from 12.3 m, basalt. ABS45 from 15.3 m, basalt.
44.2 -	52.2	Finely laminated, with the laminations often wispy, red-brown mudstone with interbedded greywacke with clasts of basic volcanic and subordinate quartz. Greywacke interbeds generally less than 100 mm. Laminae 1 - 2 mm. Sample ABS46 from 47.2 m, greywacke.
52.2 -	52.8	Pebble conglomerate, closed framework, clasts dominantly volcanic.
52.8 -	68.3	Dominantly greywacke, some rip-up clasts of mudstone present, in beds up to 2 m thick. Sample ABS47 from 65.6 m, greywacke.
68.3 -	68.7	Pebble conglomerate.
68.7 -	87.3	Brown pebbly mudstone containing rounded to subangular clasts of basic volcanic detritus. Clasts make up less than 10% of the rock and range in size from 2 - 80 mm. Crudely laminated thinly bedded coarse sand layers define bedding.
87.3 -	124.0	Massive greenish-grey, open-framework agglomerate; clasts dominantly of basalt, angular to subrounded; maximum size 180 mm. Minor sedimentary clasts. Sample ABS48 from 91.3 m, agglomerate.
124.0 -	165.7	Agglomerate, basalt clasts. Sample ABS95 from 141.7 m, basaltic clast. ABS96 from 151.7 m, basaltic clast. ABS97 from 165.8 m, basaltic clast.
165.7 -	166.4	Basalt.
166.4 -	200.0	Well-bedded green-grey and subordinate interbedded reddish-purple mudstone. Greywacke units, up to one metre thick, may be graded and often contain mudstone rip-up clasts. Zone of strong epidotisation with veins of quartz and calcite from 181.3 - 181.9 m. Sample ABS49 from 178.0 m, greywacke.
200.0 -	231.2	Laminated siltstone/mudstone and greywacke in about equal proportions. Greywacke beds may reach 500 mm in thickness, but usually are less than 150 mm. Mudstone beds are less than 50 mm. Sample ABS50 from 206.6 m, siltstone.
231.2 -	240.5	Green-grey greywacke (30 - 100 mm thick) and interbedded black mudstone (3 - 30 mm thick). Mudstone comprises about 25% of the sequence. Sample ABS51 from 235 m, siltstone.

240.5 -	242.0	Dominantly greywacke.
242.0 -	244.0	Interbedded greywacke and mudstone.
244.0 -	244.2	Volcanic breccia.
244.2 -	244.3	Greywacke.
244.3 -	275.8	Basalt flows, often chilled and brecciated; thin greywacke units present. Sample ABS52 from 270.5 m, basalt.
275.8 -	322.2	Laminated grey siltstone and black mudstone with minor thin greywacke units. Sample ABS53 from 281.3 m, laminated mudstone.
322.2 -	337.1	Dominantly grey-green greywacke with minor mudstone. Sample ABS54 from 323.3 m, laminated mudstone.
337.1 -	367.9	Massive green-grey greywacke with purple mudstone. Sample ABS55 from 339.9 m, laminated siltstone.
367.9 -	371.2	Laminated black mudstone interbedded with grey-green siltstone.
371.2 -	495.0	Well-bedded grey greywacke, often thickly bedded with interbedded purple mudstone.
495.0 -	496.2	Basaltic breccia containing abundant glass fragments. Sample ABS56 from 495.4 m, basaltic breccia.
496.2 -	500.2	Interbedded greywacke and mudstone. Sample ABS57 from 499.0 m, greywacke.
500.2 -	501.8	Interbedded greywacke and agglomerate.
501.8 -	505.1	Pebble conglomerate with angular basalt clasts.
505.1 -	506.9	Greywacke.
506.9 -	508.2	Pebble conglomerate.
508.2 -	509.5	Brecciated zone.
509.5 -	518.0	Basaltic agglomerate, pebble conglomerate and mudstone.
518.0 -	529.1	Fine-grained basalt. Zone of quartz and epidote with sulphide minerals. Sample ABS98 from 523.0 m.
529.1 -	543.0	Agglomerate and interbedded, basaltic clast. Zones of brecciation.
543.0 -	543.5	Amygdaloidal basalt.
543.5 -	550.2	Laminated green-grey siltstone and mudstone with greywacke units. Red mudstone rip-up clasts dominate some units up to 500 mm thick. Sample ABS58 from 550.0 m, carbonate unit.
550.2 -	551.1	Red siltstone with carbonate horizon.
551.1 -	558.5	Dominantly greywacke with laminated red mudstone units.
558.5 -	586.0	Dominantly green-grey greywacke with lenses of mudstone. Some units rich in carbonate.
586.0 -	615.5	Laminated black mudstone and green-grey siltstone with minor greywacke and zones of brecciation.
615.5 -	632.6	Dominantly greywacke with minor laminated mudstone and siltstone. Sample ABS59 from 632.5 m, greywacke. ABS60 from 632.6 m, greywacke.
632.6 -	658.0	Interbedded laminated mudstone/siltstone and greywacke. Sample ABS61 from 645.0 m, greywacke.
658.0 -	667.5	Dominantly greywacke with laminated mudstone/

		siltstone. Sample ABS62 from 666.9 m, greywacke.
667.5 -	681.0	Laminated black mudstone and siltstone with minor greywacke units.
681.0 -	739.5	Dominantly greywacke with lenses of black mudstone/siltstone. Good grading and scour bases of greywacke units. Sample ABS63 from 688.1 m, greywacke. ABS64 from 723.0 m, greywacke. ABS65 from 733.9 m, greywacke.
739.5 -	743.4	Laminated black mudstone and minor greywacke.
743.4 -	763.5	Dominantly greywacke with lenses of black mudstone. Mudstone 10 - 20 mm thick, but at times up to 50 mm thick. Sample ABS66 from 757.75 m, greywacke.
763.5 -	766.6	Zone of brecciation in laminated mudstone/ siltstone.
766.6 -	780.8	Dominantly greywacke with black mudstone units. Sample ABS67 from 771.0 m, greywacke. ABS68 from 772.0 m, greywacke. ABS69 from 773.5 m, greywacke.
780.8 -	790.5	Interbedded laminated black mudstone, siltstone and carbonate units, some with a high sulphide mineral content. Minor greywacke (the amount of carbonate in the sequence is increasing down sequence). Sample ABS70 from 782.7 m, bedded carbonate-mudstone
790.5 -	804.4	Bedded carbonate units with minor black mudstone. Sample ABS71 from 793.0 m, bedded carbonate-siltstone. ABS72 from 800.5 m, bedded carbonate-siltstone. ABS73 from 802.9 m, bedded greywacke-siltstone.
804.4 -	809.0	Laminated carbonate - black mudstone - siltstone.
809.0 -	810.5	Laminated black mudstone.
810.5 -	816.4	Interbedded laminated carbonate and mudstone.
816.4 -	821.8	Interbedded carbonate units. Sample ABS74 from 818.3 m, calcareous siltstone.
821.8 -	823.3	Interbedded carbonate and black mudstone.
823.3 -	837.3	Pyritic black mudstone. Sample ABS75 from 826.65 m, pyritic mudstone. ABS76 from 833.2 m, bedded carbonate-mudstone.
837.3 -	846.5	Pyritic pebbly black mudstone. Sample ABS77 from 842.0 m, conglomerate.
846.5 -	847.1	Bedded carbonate.
847.1 -	848.2	Black mudstone.
848.2 -	854.1	Pebbly black mudstone with minor carbonate units. Sample ABS78 from 850.0 m, calcareous conglomerate.
854.1 -	854.5	Calcareous pebbly mudstone.
854.5 -	857.9	Carbonate.

857.9 - 869.5	Calcareous pebbly conglomerate. Sample ABS79 from 858.0 m, mixtite. ABS80 from 866.5 m, fine-grained conglomerate.
869.5 - 873.5	Bedded carbonate with minor mudstone.
873.5 - 874.5	Calcareous pebble conglomerate. Sample ABS81 from 874.0 m, dolomite.
874.5 - 876.0	Bedded carbonate units.
876.0 - 877.0	Pyritic pebbly mudstone.
877.0 - 880.5	Bedded carbonate. Sample ABS82 from 877.75 m, stromatolitic breccia.
880.5 - 881.0	Laminated pyritic black mudstone.
881.0 - 884.4	Calcareous pebble mudstone. Sample ABS83 from 883.5 m, stromatolitic breccia.
884.4 - 886.5	Brecciated interbedded carbonate and mudstone.
886.5 - 926.7	Mixtite (calcareous pebble conglomerate), with stromatolite clasts and minor interbedded carbonate units. Sample ABS84 from 890.0 m, conglomerate. ABS85 from 904.4 m, stromatolitic conglomerate. ABS86 from 910.0 m, stromatolitic conglomerate.
926.7 - 934.0	Pyritic and calcareous, black, pebble mudstone. Sample ABS87 from 927.0 m, stromatolitic conglomerate.
934.0 - 941.2	Calcareous to muddy mixtite with stromatolite clasts, and minor mudstone units.
941.2 - 955.8	Pebble-bearing muddy carbonate.
955.8 - 961.6	Brecciated pebbly carbonate.
961.6 - 964.1	Calcareous mudstone.
964.1 - 970.0	Bedded carbonate.
970.0 - 973.4	Calcareous mudstone.
973.4 - 994.4	Bedded carbonate units.
994.4 - 1002.5	Bedded green and grey mudstone and carbonate. Sample ABS88 from 990.0 m, dolomitic limestone. ABS89 from 1002.5 m, laminated limestone/mudstone. ABS90 from 1002.5 m, laminated limestone/mudstone.
1002.5 - 1005.5	Interbedded red mudstone and carbonate.
1005.5 - 1008.8	Interbedded green and grey mudstone and carbonate.
1008.8 - 1015.0	Bedded carbonate.
1015.0 - 1032.8	Brecciated, bedded calcareous mudstone, with thin chert unit. Sample ABS91 from 1032.0 m, chert.
1032.8 - 1034.5	Bedded carbonate.
1034.5 - 1046.8	Black mudstone and minor carbonate. Sample ABS92 from 1042.0 m, muddy limestone.
1046.8 - 1048.9	Bedded carbonate.
1048.9 - 1076+	Muddy carbonate. Sample ABS93 from 1062 m, muddy limestone. ABS94 from 1073 m, muddy limestone.

APPENDIX 2

Chemical analyses

Samples of two basalt flows, a basaltic agglomerate, and two basaltic lithic wacke units were analysed for major and trace element chemistry. The analyses, and those of sixteen other basalt samples from the Crimson Creek Formation correlate in the Smithton Basin are also listed for reference (table 1). Locations for all samples analysed are also listed (table 2).

Chemical discriminant diagrams and correlation of the chemistry of the basalt samples with other areas in Tasmania and elsewhere can be found in Geological Survey Bulletin 62 (in press), and further work will be included in the Explanatory Notes for the Smithton Quadrangle (in preparation).

Table 1. ANALYSES OF SAMPLES

Field No.	ABS36	ABS37	ABS38	AB56	ABS20	ABS21	ABS22	ABS23	ABS24	ABS25	ABS26	ABS28	ABS40
Analysis No.	814100	814101	814102	814081	814087	814088	814089	814090	814091	814092	814093	814094	814104
SiO_2	45.87	47.03	46.69	49.44	47.41	48.29	48.65	48.48	48.05	48.20	48.44	48.58	47.74
TiO_2	0.66	0.67	0.68	1.63	1.69	1.74	2.34	2.31	2.39	2.35	2.32	1.68	1.56
Al_2O_3	14.44	14.76	14.48	12.67	13.81	13.83	13.44	13.45	13.47	13.66	13.25	14.32	13.96
Fe_2O_3	3.68	2.71	3.18	5.60	5.54	5.01	4.77	5.85	4.76	5.38	5.57	4.50	4.70
FeO	6.04	6.72	6.27	11.28	7.63	7.33	8.16	7.63	8.62	7.86	7.71	7.94	7.94
MnO	0.19	0.16	0.17	0.24	0.17	0.20	0.21	0.21	0.20	0.19	0.21	0.25	0.20
MgO	10.67	10.11	10.04	4.53	6.49	6.60	6.11	5.66	5.85	5.73	6.43	6.88	6.66
CaO	9.95	9.87	10.30	7.91	10.01	8.32	8.31	9.48	10.32	10.49	8.06	10.58	10.46
Na_2O	2.61	2.13	2.70	2.73	2.67	2.87	3.76	3.12	2.30	2.51	3.27	2.12	2.45
K_2O	0.14	0.63	0.15	0.80	0.35	0.16	0.24	0.56	0.23	0.36	0.12	0.13	0.56
P_2O_5	0.16	0.17	0.16	0.32	0.19	0.19	0.26	0.27	0.29	0.29	0.25	0.21	0.20
CO_2	0.08	0.07	0.04	0.08	0.05	0.05	0.11	0.17	0.06	0.09	0.08	0.05	0.28
H_2O^+	4.62	4.20	4.32	2.68	3.29	4.36	2.95	2.33	2.62	2.64	3.57	2.37	2.77
H_2O^-	0.23	0.26	0.22	0.00	0.04	0.06	0.13	0.10	0.10	0.14	0.26	0.15	0.10
Total	99.34	99.49	99.40	99.91	99.34	99.01	99.44	99.62	99.26	99.89	99.54	99.76	99.58
Cr	952	767	777	84	161	161	143	142	152	161	161	249	169
Ni	297	230	226	42	81	83	82	76	84	88	85	95	87
Zr	72	65	72	119	95	98	147	148	148	144	114	100	93
Y	15	18	20	43	20	22	24	23	24	23	22	20	15
Nb	15	13	13		6	7	14	17	15	15	15	7	5
Rb	<4	9	<4	18	5	<4	7	15	6	9	4	<4	4
Sr	566	140	532	177	225	243	297	266	224	245	293	176	210
Ba													
V													
Sc													
Co													

Table 1. Analyses of samples (continued)

Field No.	SB11	SB16	SB18	ABS44	ABS52	ABS56+	ABS49*	ABS55*
Analysis No.	813132	813133	813134	830782	830784	830786	830783	830785
SiO_2	49.72	47.23	46.78	50.99	45.22	38.79	48.11	53.33
TiO_2	1.57	1.67	1.63	1.75	3.59	4.16	3.19	2.28
Al_2O_3	14.12	14.27	13.87	11.40	12.30	15.01	11.99	10.46
Fe_2O_3	7.60	5.23	7.80	4.70	1.93	4.38	5.97	5.09
FeO	4.68	7.18	5.28	11.87	13.06	12.32	8.86	6.13
MnO	0.15	0.18	0.17	0.27	0.20	0.24	0.16	0.15
MgO	4.65	6.51	5.64	4.17	5.81	7.76	6.48	7.16
CaO	7.73	11.24	7.79	7.15	8.21	6.03	5.72	8.08
Na_2O	0.21	2.28	3.71	2.80	2.96	1.69	2.38	2.07
K_2O	0.15	0.22	0.20	0.77	0.19	0.66	0.36	0.39
P_2O_5	0.16	0.20	0.19	0.40	0.44	0.53	0.44	0.29
CO_2	0.85	0.15	0.23	0.11	0.42	1.05	0.93	0.78
H_2O^+	6.79	2.79	3.24	2.86	4.09	5.84	4.27	3.48
H_2O^-	1.18	0.29	0.48	0.14	0.19	0.27	0.19	0.24
Total	99.56	99.44	99.01	99.38	98.61[x]	98.73[x]	99.05	99.94
Cr	227	260	150	50	30	98	590	530
Ni	84	92	82	34	54	74	270	250
Zr	84	97	98	130	230	300	230	190
Y	29	23	22	49	33	40	31	26
Nb				27	28	37	28	23
Rb	4	<4	5	25	10	18	9	10
Sr	24	290	142	110	145	200	81	670
Ba				290	75	320	115	145
V				420	410	440	350	250
Sc				53	26	36	33	24
Co				42	45	47	49	42

+ = Basaltic breccia

* = Greywacke

[x] X_{SO_3} = 0.51 X_{SO_3} = 0.27

Table 2. LOCATION OF SAMPLES ANALYSED

Field No.	*Analysis No.*	*AMG Co-ordinates*	*Rock type*
ABS36	814100	CQ43207935	Olivine phyric basalt
ABS37	814101	CQ43207945	Olivine phyric basalt
ABS38	814102	CQ43207960	Olivine phyric basalt
ABS6	814081	CQ52757985	Cpx and/or plagioclase phyric basalt
ABS20	814087	CQ40906240	Cpx and/or plagioclase phyric basalt
ABS21	814088	CQ40806845	Cpx and/or plagioclase phyric basalt
ABS22	814089	CQ24308360	Cpx and/or plagioclase phyric basalt
ABS23	814090	CQ24108355	Cpx and/or plagioclase phyric basalt
ABS24	814091	CQ20858605	Cpx and/or plagioclase phyric basalt
ABS25	814092	CQ21158515	Cpx and/or plagioclase phyric basalt
ABS26	814093	CQ42307940	Cpx and/or plagioclase phyric basalt
ABS28	814094	CQ42607850	Cpx and/or plagioclase phyric basalt
ABS40	814104	CQ41907245	Cpx and/or plagioclase phyric basalt
SB11	813132	CQ49207125	Cpx and/or plagioclase phyric basalt
SB16	813133	CQ48757140	Cpx and/or plagioclase phyric basalt
SB18	813134	CQ48807165	Cpx and/or plagioclase phyric basalt
ABS44	830782	Forest DDH 12.3 m	Cpx and/or plagioclase phyric basalt
ABS52	830784	Forest DDH 270.5 m	Cpx and/or plagioclase phyric basalt
ABS56	830786	Forest DDH 495.4 m	Basaltic breccia
ABS49	830783	Forest DDH 178 m	Basaltic lithic wacke
ABS55	830785	Forest DDH 339.9 m	Basaltic lithic wacke