


Division of Mines and Mineral Resources — Report 1990/05

Completion report: Sub-basalt Drilling Project Hole 7

by P. W. Baillie and G. R. Green

Abstract

SBDP Hole 7 penetrated approximately 356 m of latest Eocene and Oligocene basalt and sediments unconformably overlying limestone correlated with the Ordovician Gordon Group. An intrusion of basalt occurs within the Tertiary sediments.

INTRODUCTION

This report is the sixth in the series which will be written for each of the holes completed in the Department of Mines Sub-basalt Drilling Project (SBDP). Hole 7 is located on Yellow Marsh Road, close to the Medway River (fig. 1) at:-

Easting	397 126 mE
Northing	5 406 220 mN

Chemical analyses were performed by the Department of Mines Laboratories, Launceston; palynology by Dr R. P. Morgan, Maitland, South Australia; down-hole logging by J. V. Wright; and magnetic susceptibility measurements by G. Eagling and PWB.

STRATIGRAPHY

The hole penetrated 438.0 m of the Tertiary and Palaeozoic section; a lithological log is presented as Appendix 1.

Basalt, often vesicular or brecciated, was encountered from 0 to 224 m. Fresh basalt suitable for dating was not seen, and some degree of deuteric alteration is ubiquitous. A well-developed hyaloclastic succession is present from 170–224 m, and consists of glassy hyaloclastic debris and often-broken pillow lavas.

Several intrabasalt sedimentary horizons are present, especially in the lower, hyaloclastic, part of the succession.

A further basalt body occurs from 277.8–319.7 m and consists of very fresh, massive basalt containing abundant olivine up to 40 mm in diameter. Possible chilled margins, and baked sediments at both the upper and lower contacts, indicate that the body is an intrusion (further evidence presented in following section). A sample was forwarded to AMDEL for possible dating, but was found to be not suitable.

Basement rocks were first encountered at 356 m and consist dominantly of well-bedded and cleaved light grey micrite and darker dolomitic silty layers. The rocks are identical with known successions of the Ordovician Gordon Group which occur widely throughout western and north-western Tasmania.

GEOPHYSICAL LOGGING

A gamma ray (GR) tool was run in the top 393 m of the hole; the log is shown as Figure 2. The log clearly differentiates several broad lithologic zones: basalt from the surface to 122 m; a zone of higher radiation from 122–129 m corresponding to a silty sedimentary horizon; dominantly basalt from 129 to 223 m; a zone of variable GR readings from 223 to 278 m corresponding to sediments, the variations probably representing sedimentary cycles; a regular “convex” zone from 278 to 318 m corresponding to the lower basalt body; a zone of relatively high gamma radiation in the interval 318–356 due to Tertiary sediments; a basal zone of low gamma radiation in the Gordon Group limestones.

Magnetic susceptibility measurements were made on representative core samples and subsequently corrected according to core diameter. Figure 3 is a log of the measurements and clearly contrasts the upper and lower basalt intervals.

The susceptibility variation in the upper basalt (0–222 m) is similar to other measured basalt piles in the region, and it is probable that the fluctuations are due to changes in the component of magnetic minerals in individual flows. Zones of low magnetic intensity within the succession from 120–128 and 224–278 m correspond to a sedimentary horizon and a well-developed hyaloclastic breccia respectively.

The lower basalt shows a regular magnetic susceptibility pattern, quite unlike any other susceptibility profile measured during the project. This, together with the regular GR pattern and the observed baked contacts, confirm that the body is an intrusion within the sediments.

PALYNOLOGY

Four core samples were submitted for palynological analysis; all yielded excellently preserved, diverse assemblages. A checklist of determined palynomorphs is presented as Appendix 2.

The samples are dominated by *Nothofagidites* spp. and *Cyathidites* spp., with prominent *Dacrycarpidites australiensis*. The presence of *Nothofagidites flemingii* and *Periporopollenites vesicus* indicate a mid *P. tuberculatus* or older zonal assignment (Stover and Evans, 1973; Stover and Partridge, 1973; Partridge, 1976). The lack of many middle *N. asperus* Zone markers, together with evidence from previous SBDP holes, suggests an upper *N. asperus* Zone (latest Eocene / earliest Oligocene) age for the sediments.

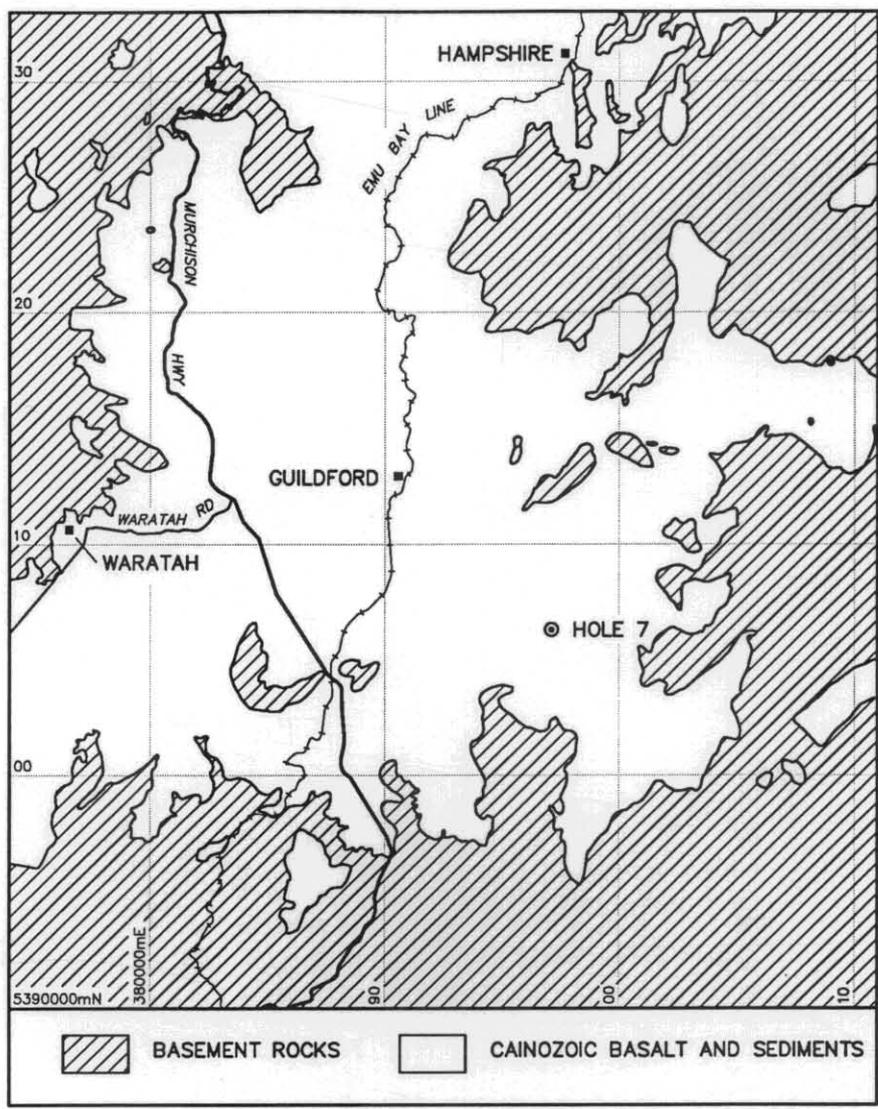


Figure 1. Location of SBDP Hole 7.

Non-marine environments are indicated by the total lack of marine microplankton, and the common and diverse spores and pollen.

GEOCHEMISTRY

Analyses of eight relatively fresh basalt samples (882789–96) are shown in Table 1. Figure 4 is an alkali-silica diagram (constructed after Brown, 1986), and shows that the analysed specimens vary from strongly alkaline to tholeiitic, with the more alkaline varieties having been erupted first.

SUMMARY

The hole has shown the existence of a largely unexpected occurrence of Gordon Group rocks in the Painter Plain region. Recent mapping (Vicary and Pemberton, 1988) has shown the nearest outcropping rocks, a little over three kilometres to the south, to be Denison Group correlates.

This drilling, together with the recent mapping, has indicated the presence of a Palaeozoic syncinal structure in the upper reaches of the Medway River.

A summary geological log is:-

0–224 m	Oligocene and late Eocene basalt with minor sediments
224–278 m	Sediments
278–320 m	Basalt intrusion
320–356 m	Sediments
356–438 m	Ordovician Gordon Limestone

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PARTRIDGE, A. D. 1976. The geological expression of eustasy in the early Tertiary of the Gippsland Basin. *APEA J.* 16:73–79.

STOVER, L. E.; EVANS, P. R. 1973. Upper Cretaceous–Eocene spore-pollen zonation, offshore Gippsland Basin, Australia. *Spec. Publ. geol. Soc. Aust.* 4:55–72.

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VICARY, M.; PEMBERTON, J. 1988. Mt Read Volcanics Project Map 7. Geology of the Back Peak–Cradle Mountain Link Road area. *Department of Mines, Tasmania.*

[12 March 1990]

Table 1. Analyses of basalt samples, SBDP Hole 7.

Analysis No.	882789	882790	882791	882792	882793	882794	882795	882796
Field No.	102717	102718	102719	102720	102721	102722	102726	102727
Depth (m)	33.5	57.8	94.5	115.4	156.7	201.0	213.4	220.9
SiO ₂	49.87	48.59	48.06	47.52	46.48	47.68	44.05	43.61
TiO ₂	1.59	1.69	1.49	1.51	1.81	1.59	2.15	1.96
Al ₂ O ₃	14.66	14.58	14.87	15.12	13.83	13.24	12.05	11.32
Fe ₂ O ₃	2.72	3.01	3.30	3.77	2.69	3.60	3.13	2.88
FeO	8.04	7.98	7.90	7.94	8.21	8.32	7.89	8.11
MnO	0.16	0.15	0.20	0.17	0.17	0.16	0.17	0.17
MgO	8.72	9.76	10.18	9.11	9.73	8.44	12.32	15.23
CaO	8.88	8.89	7.81	8.57	8.58	8.85	10.08	9.54
Na ₂ O	2.46	2.84	2.58	2.43	2.31	2.72	3.85	2.68
K ₂ O	0.41	0.74	0.83	0.44	1.11	0.95	1.58	1.37
P ₂ O ₅	0.26	0.31	0.20	0.22	0.31	0.37	0.74	0.58
H ₂ O	2.08	1.73	2.99	3.01	3.99	3.03	1.88	1.99
CO ₂	0.14	0.11	0.10	0.11	0.74	0.53	0.12	0.04
SO ₃	0.27	0.15	0.05	0.18	0.15	0.17	0.08	0.08
Majors Total	100.26	100.53	100.56	100.10	100.11	99.65	100.09	99.56
Ag	*	*	*	*	*	*	*	*
As	*	*	*	*	*	*	*	*
Ba	110	130	165	125	175	210	360	290
Bi	*	*	*	*	*	*	*	*
Ce	*	*	*	*	41	51	90	55
Co	55	55	60	55	58	53	58	65
Cr	340	360	360	290	320	330	540	780
Cu	30	33	38	51	42	48	48	47
Ga	*	*	*	*	*	*	*	*
La	*	*	*	*	*	26	43	31
Mo	*	6	*	*	*	*	6	8
Nb	14	18	12	10	22	24	59	50
Nd	*	*	*	*	*	*	30	35
Ni	165	180	195	160	220	220	330	500
Pb	*	*	*	*	*	*	*	*
Rb	17	8	17	9	24	18	31	28
Sc	23	27	20	23	20	21	24	24
Sn	*	*	*	*	*	*	*	*
Sr	290	310	250	280	310	430	850	660
Ta	*	*	*	*	*	*	*	*
Th	*	*	*	*	13	*	*	13
U	*	*	*	*	*	*	*	*
V	160	185	165	170	175	185	220	210
W	31	115	86	45	39	67	56	140
Y	21	18	21	17	22	22	25	24
Zn	92	105	92	97	94	115	90	86
Zr	120	115	110	100	140	150	220	180

* = below detection limit for that particular element

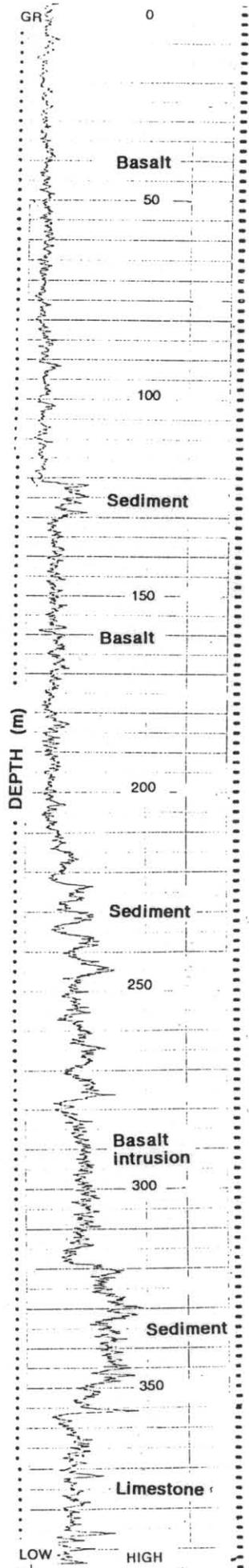


Figure 2. Gamma-ray log, SBDP Hole 7.

5 cm

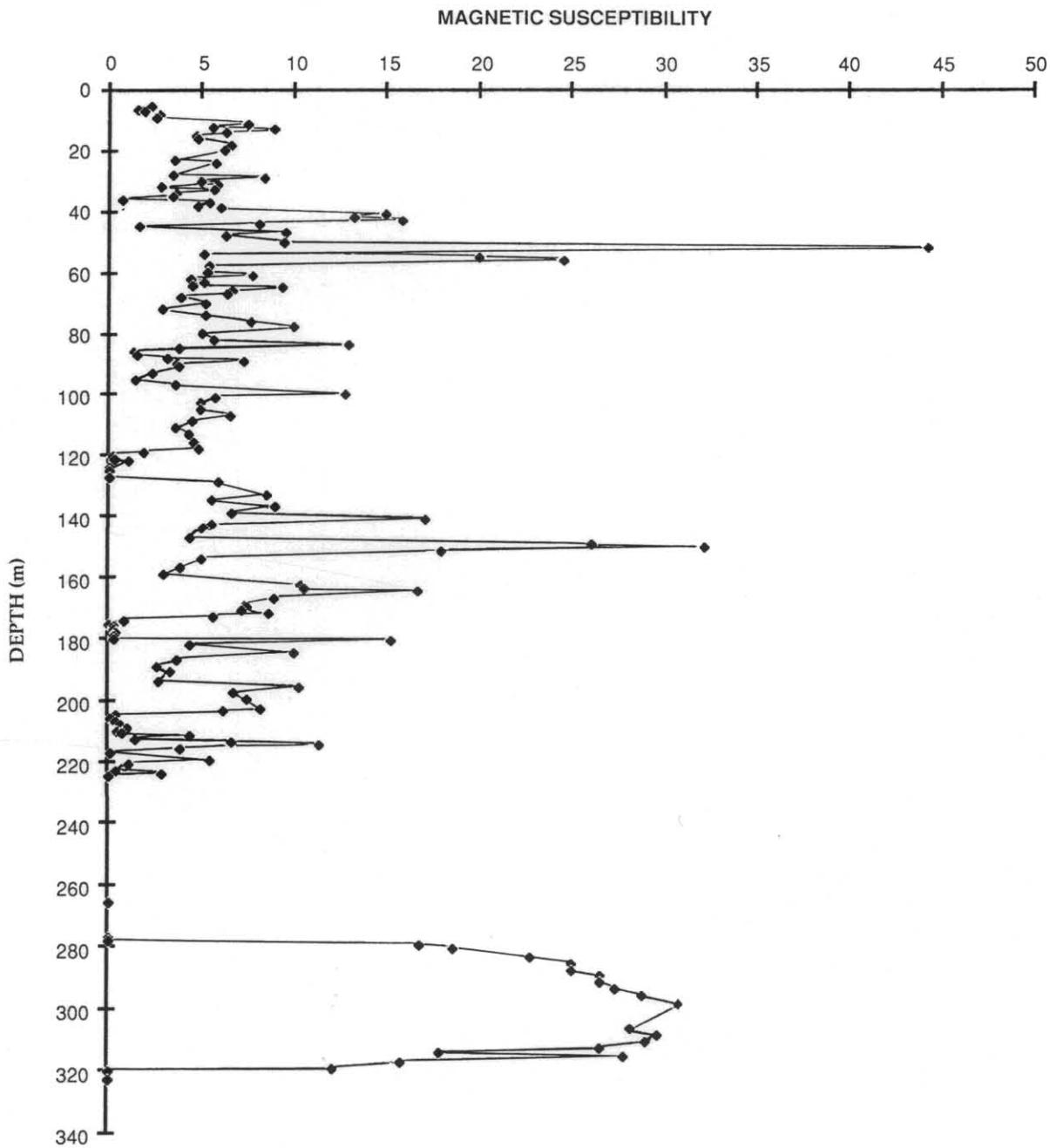


Figure 3. Magnetic susceptibility, SBDP Hole 7.

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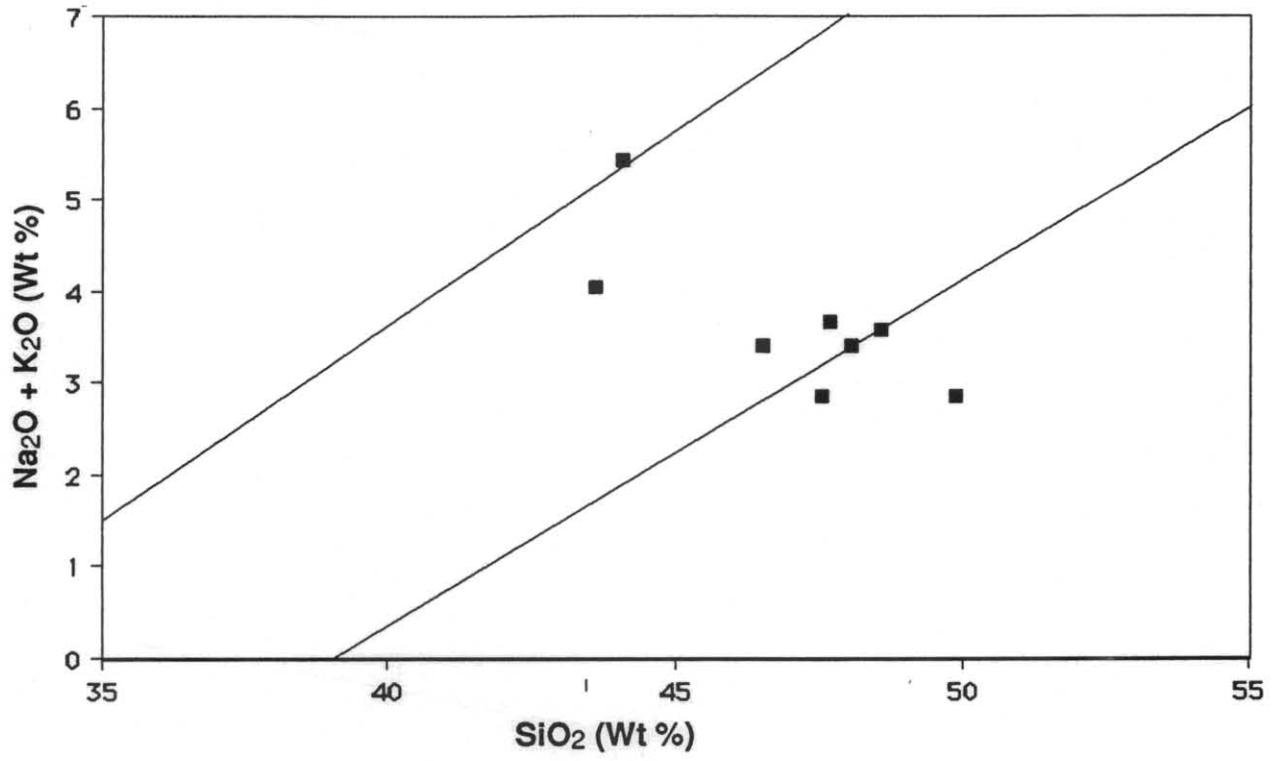
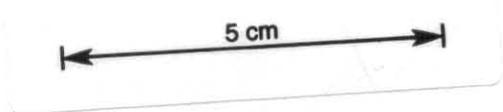


Figure 4. Alkali-silica diagram (after Brown, 1986), Tertiary basalt, SBDP Hole 7.



APPENDIX 1

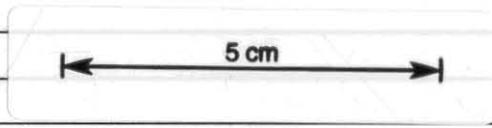
Lithological log of Hole SBDP 7

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DIAMOND DRILL CORE GEOLOGICAL RECORD

HOLE No. SBDP#7
REF. No. _____ SHEET No. 1 of 6

Core lift	Core loss (%)	Depth (m)	Graphic Log	Sample No. Depth (m) Prep'n	DESCRIPTION
		0			0-216.0 m Dominantly basalt and basaltic hyaloclastic tuff or breccia with minor silty horizons. Basalt massive or vesicular, dark coloured, vesicles often filled with chabazite, montmorillonite, or calcite. Zones of weathering (often red-coloured) usually indicate flow tops; other flow tops indicated by change in grain size or vesicles.
		10			
		20			
		30			
		33.5	▲▲▲▲	33.5 m Anal, TS	
		40			
		50			
		57.8		57.8 m Anal, TS	
		60			
		70			
		80			

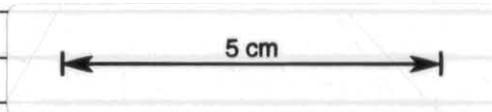


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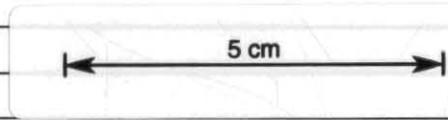
DIAMOND DRILL CORE GEOLOGICAL RECORD

HOLE No. SBDP#7
REF. No. _____ SHEET No. 2 of 6

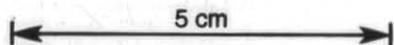
Core lift	Core loss (%)	Depth (m)	Graphic Log	Sample No. Depth (m) Prep'n	DESCRIPTION
		80			
		90			
		94.5 m		Anal, TS	
		100			
		110			
		115.4 m		Anal, TS	
		120			118.0 - 122.4 m Pillow lavas and glassy hyaloclastic tuff or breccia.
		125.5 m		paly	122.4 - 128.2 m Carbonaceous siltstone or very fine-grained sand with basal layer of well-rounded pebbles. Top of underlying flow slightly weathered.
		130			
		140			
		150			
		156.7 m		Anal, TS	
		160			



Core lift	Core loss (%)	Depth (m)	Graphic Log	Sample No. Depth (m) Prep'n	DESCRIPTION
		160			
		170			170.5 - 185.5 m Glassy hyaloclastic tuff and breccia, with minor sedimentary intercalations; rocks were clearly erupted into water.
		180			
		190			
		200		201.0 m Anal, TS	203.8 - 216.0 m Hyaloclastic breccia.
		210		213.4 m TS	
50		220		220.9 m TS	216.0 - 218.0 m Carbonaceous sand.
20		230			218.0 - 224.2 m Epiclastic tuffaceous breccia, variable in grain size from less than 1 mm to 50 mm, dominantly of basalt with lesser quartzite sandstone.
100		240			100% core loss, 227 - 263.5 m, presumably sand.



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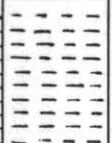
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GEOLOGICAL SURVEY

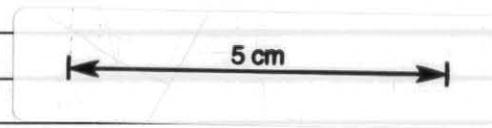
DIAMOND DRILL CORE GEOLOGICAL RECORD

HOLE No. SBDP#7
REF. No. _____ SHEET No. 4 of 6

Core lift	Core loss (%)	Depth (m)	Graphic Log	Sample No. Depth (m) Prep'n	DESCRIPTION
100		240			
100		250			
100		260			
		263.5 - 277.8			Brown siltstone, occasionally sandy.
		266.8		266.8 m	
		270		paly	
		277.6		277.6 m TS	
		277.8 - 319.7			Usually very fresh massive basalt with abundant olivine nodules up to 40 mm in diameter; possible chilled margin and baked sed at contact.
		302.0		302.0 m	
				Anal, TS	
		316.0		316.0 m	
				Anal, TS,	
				K-Ar	
		319.8 - 349.6			Brown siltstone becoming very well laminated in lower parts.
		320			

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Core lift	Core loss (%)	Depth (m)	Graphic Log	Sample No. Depth (m) Prep'n	DESCRIPTION
		320			
		330			
		340			
		350			349.6 - 356.5 m Sandy gravel or bouldery gravel; clasts of volcanics, conglomerate, quartzite in gravelly matrix (washed out).
		360			356.5 - 438.0 m Generally grey limestone succession, consisting of interbedded grey micrite darker grey silty layers and usually mottled brown dolomitic patches; abundant styolites and some calcite veining. Some sandy infill due to cavern infilling. Bedding at about 45° to hole.
		370			Occasionally limestone is well laminated, laminae defined by darker grey layers; very often rock is mottled or burrowed.
		380			
		390			
		400			



APPENDIX 2

Range chart of graphic abundances by alphabetical order

