DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

REPT.BK.NO. 86/47
HONEYSUCKLE FLAT (CAROLINE) LIMESTONE DEPOSIT, SECTIONS 538, 539, HUNDRED CAROLINE, COUNTY GREY ML 4671-4673 AND 4913 - ACI RESOURCES LTD -

GEOLOGICAL SURVEY

by

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FRONTISPIECE: Honeysuckle Flat Limestone Deposit.
Panoramic view east and south-east over proposed quarry area from windmill on ML 4671 showing extensive subcrop of Gambier Limestone. Old farmhouse left background. South Australian - Victorian border runs along road in front of pine-trees. Low vegetation in front of pine trees is uncleared remnant of original bushland.
14 December 1978 NEG. NOS. 31706, 31707, 31708

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HONEYSUCKLE FLAT (CAROLINE) LIMESTONE DEPOSIT
sections 538, 539, hundred Caroline,
county Grey
ML 4671-4673 and 4913

ACI Resources Ltd.

ABSTRACT

Geological mapping and drilling have proved 2.1 million tonnes of high purity limestone at Honeysuckle Flat in the South-East of South Australia. Large additional reserves are available south of the area investigated. The deposit is required to supplement the depleted reserves in the existing quarry at Marte.

The limestone, part of Gambier Limestone of Middle to Late Tertiary age is remarkably pure, and uniform, averaging 98.7% total carbonate. The major deleterious component is iron oxide staining related to joints and/or clay filled solution holes in the upper part of the limestone.

Depth to water table averages 15 to 16 m, compared with 3 to 8 m elsewhere in the Mount Gambier area, making Honeysuckle Flat a most attractive quarrying proposition.

Whiting milled from Honeysuckle Flat limestone is suitable for a variety of uses where a high degree of whiteness is not required. Further drilling and sampling may define limestone suitable for glass manufacture.

Further geological investigtion is recommended in the Marte area to locate a small deposit of white, pure limestone to supplement production from the Caroline area.

INTRODUCTION

In November 1978, Minerals Pty. Ltd. (Minerals) requested S.A. Department of Mines and Energy (SADME) to carry out drilling to evaluate Honeysuckle Flat Limestone Deposit.

Reserves of economically mineable, whiting grade limestone at the company's Marte Quarry were becoming depleted and another source of high purity white limestone was required urgently.

Preliminary investigations showed that an area within the Caroline State Forest Reserve near 'Honeysuckle' was underlain by white limestone. Following protracted negotiations with Woods and Forests Department (SAWFD), Minerals pegged three Mineral Claims (MC) in sections 538 and 539 hundred Caroline.

In December 1978, fifty shallow drillholes were completed at Honeysuckle Flat under the supervision of P.C. Smith (Senior Geologist). Samples, at 1 m intervals, were submitted to Australian Mineral Development Laboratories (AMDEL) for chemical analysis; results are included with the drill logs in Appendix A.

From 12 to 14 December 1978, Mineral Leases (ML) 4671-4673 were mapped geologically using stadia theodolite by the author and R.J. Harris (Technical Officer).

Two surface samples from Honeysuckle Flat and two from Marte Quarry were submitted to AMDEL for chemical analysis and petrographic examination; results are included in Appendices B and C.

After Honeysuckle Flat was opened in late 1980, three samples from the pit face and stockpiles were submitted to AMDEL for chemical analysis and brightness determination, results are included in Appendix B.

While Minerals had been evaluating Honeysuckle Flat, which they referred to as Caroline Limestone Deposit, Australian Consolidated Industries (ACI) were testing similar limestone from Wye Limestone Deposit, ML 4810, 4811 and 5155 and EML 5180, sections 328, 329, 830 hundred Caroline, 6 km southwest of Honeysuckle Flat for glass manufacture.

In 1981, ACI Tennant Pty. Ltd. acquired the South Australian assets of Minerals. Most mining tenements held by Minerals, including ML 4671-4673 and 4913 were transferred to ACI.

Following acquisition of Minerals, ACI have centralised mining and treatment operations at Wye, now called Caroline Limestone Deposit and both glass and whiting grade limestone are produced from this deposit. The former Caroline Limestone Deposit was renamed Honeysuckle Flat and will in future be mined only intermittently.

LOCATION, ACCESS, PHYSIOGRAPHY

Honeysuckle Flat Limestone Deposit is located 23 km southeast of Mount Gambier, in sections 538 and 539, hundred Caroline, county Grey (Fig. 1). The South Australian - Victorian border defines the eastern boundary of sections 538 and 539, the Glenelg River is about 1 km to the south, and the small Victorian township of Nelson is 7.5 km to the southeast. The deposit is within the District Council of Port MacDonnell, part of the South East Planning Area, which policy states -

> 'Quarrying and similar extractive and associated manufacturing industries should not be permitted to mar the landscape unduly. The permanent effect of such operations on the appearance of the landscape should be considered before development occurs and the suitability of alternative sites investigated. It is desirable that old structures are removed and the natural cover of land restored after workings are finished.'

Access from Mount Gambier is via the Princes Highway eastwards for about 8 km to the saleyards then southerly on a sealed road for 0.7 km, then southeasterly on sealed and unsealed roads for 11 km to Border Road, an unsealed road along the SA-Victoria border. Border road is followed southerly for about 5 km, past the turnoff to Princess Margaret Rose Caves, where a gate in the fence and a formed track provide access to the deposit.

Alternative access is provided by the sealed Mount Gambier-Nelson Road, turning northerly onto Border Road at the Victorian border about 30 km from Mount Gambier. Border Road, on the western banks of the Glenelg River is followed for about 8 km, past Donovans to the deposit.

The area is undulating plain, maximum relief being only a few metres related to the irregular karstic surface of the underlying limestone (Frontispiece). Numerous shallow depressions and infilled sinkholes are scattered through the area, whilst some open sinkholes are present in the southwestern corner of ML 4671 (Plate 1).

Drainage is mainly internal via the numerous sinkholes, although Dry Creek, a shallow, normally dry tributary to the Glenelg River traverses the southern part of section 539.

Honeysuckle Flat is within the Caroline State Forest Reserve and the area has been extensively cleared and planted with Monterey Pine (Pinus radiata). Although completely surrounded by pine plantations, soil cover within sections 538 and 529 is too thinly developed to support tall trees and vegetation is now limited to grasses, and is suitable only for grazing.

A remnant of the original low scrubby bushland is present in the southeastern part of ML 4672 (Frontispiece) whilst south and west of the deposit taller, eucalpyt dominated bushland borders cleared areas and pine plantations. A few clumps of eucalypts are present within the leases, particularly in the southwestern part of ML 4671.

The name Honeysuckle Flat is taken from Honeysuckle homestead, 1.5 km north of the deposit, the name being derived from the honeysuckle trees (?banksia) prominent through the area, particularly immediately north of the area investigated.

Annual rainfall is about 800 mm, most of which falls from April to September. Consequently mining operations will be restricted to summer months, after allowing sufficient time for the ground to dry.

MINERAL TENURE AND PRODUCTION

Mineral tenure covering Honeysuckle Flat Limestone Deposit is summarised in Table I.

TABLE I

MINERAL TENURE - HONEYSUCKLE FLAT LIMESTONE DEPOSIT

Tenement	Area (ha)	Section	Holder	Commencement	Comment
MC 845	16	538,539	Minerals P/L	Registered 13/9/77	Converted to ML4671
MC 846	16	539	"	"	Converted to ML4672
MC 847	20	538	"	"	Converted to ML4673
ML4671	16	538,539	"	Granted 14/2/79 for 7 years	13/12/79 transferred to Omya-Minerals P/L 7/9/81 transferred to ACI Resources Ltd. Renewed to 13/2/93
ML4672	16	539	"	Granted 14/2/79 for 7 years	13/12/79 transferred to Omya-Minerals P/L 7/9/81 transferred to ACI Resources Ltd. Renewed to 13/2/93
ML4673	20	538	"	Granted 14/2/79 for 7 years	13/12/79 transferred to Omya-Minerals P/L 7/9/81 transferred to ACI Resorces Ltd. Renewed to 13/2/93
ML1212	19.9	539	"	Registered 8/1/80	Converted to ML4913
ML4913	19.9	539	"	Granted 5/5/81 for 7 years	5/9/81 transferred to ACI-Resources Ltd.

Mining began at Honeysuckle Flat in the latter half of 1980 and continued intermittently until the end of 1981.

Production has totalled 11 334 tonnes, all from the small quarry on ML4672 (Fig. 5).

Following acquisition of Honeysuckle Flat in 1981, and commencement of mining operations at Caroline Limestone Deposit (ML 4810, 4811, and 5155) in 1982, ACI have placed Honeysuckle Flat on 'care and maintenance'. Labour conditions are amalgamated with Caroline.

Production, based on returns submitted to SADME, is summarised in Table II.

TABLE II

PRODUCTION - HONEYSUCKLE FLAT LIMESTONE DEPOSIT

Year	Production (tonnes)	Operator
1980	1 760	Omya-Minerals P/L
1981	4 334	Omya-Minerals P/L
	5 240	ACI
Total	11 334	

GEOLOGICAL SETTING

The regional geological plan, Figure 1, is adapted from PENOLA 1:250 000 geological sheet (Sprigg, et al., 1951) and GEOLOGY OF THE SOUTH EAST 1:500 000 geological sheet (Rogers, 1980).

Honeysuckle Flat is located in the extreme southeastern corner of the South Australian onshore portion of the Murray Basin, a Tertiary marine basin that occupies most of the southeastern part of the State.

Within South Australia, Tertiary sediments are poorly exposed and stratigraphic data are derived from oil exploration wells, resulting in several interpretations. Different stratigraphic nomenclature has been used in Victoria, where Tertiary sediments are more completely exposed and attempts to correlate across the border have resulted in a changing stratigraphic nomenclature which is summarised in Keeling (1983).

The schematic cross section (Fig. 1) correlates the most recent South Australian nomenclature (Ludbrook, 1969, 1971 and Firman, 1973) with the Victorian nomenclature (Abele et al, 1976).

Sediments exposed in the Mount Gambier area are in ascending stratigraphic order (Victorian equivalents in parenthesis).

KNIGHT GROUP - Tartwaup Formation (Dilwyn Formation): coarse sand, silt and clay representing terrestrial and marginal marine deposits of Middle Eocene age. The only exposure is in Allens sand quarry, section 715 hundred Blanche, 8 km northwest of Mount Gambier (Keeling, 1983).

Overlying Tartwaup Formation are three thin, laterally discontinuous formations.

Kongorong Sand (Mepunga Formation) : brown limonitic coarse quartz sand of Middle Eocene age.

Lacapede Formation (Narrawatark Marl) : brown carbonaceous silt, dark grey sandy and greenish brown shelly marl.

Compton Conglomerate (Clifton Formation) : thin limonite and calcite cemented glauconitic sand.

These units are not everywhere present and in many places Gambier Limestone, a transgressive Oligo-Miocene marine unit rests directly on Tartwaup Formation.

Gambier Limestone (Port Campbell Limestone) : ranges from richly fossiliferous calcirudite through calcarenite and calcisiltite to glauconitic marl. Black flint is common, particularly in the upper part of the unit.

Lindsay (1967) recognised three zones within Gambier Limestone,

- 'upper, grey cherty limestone'
- 'middle, cream limestone'
- 'lower, grey limestone'.

Although this subdivision can be broadly recognised throughout the South East, irregular flint formation, dolomitisation and the repetitive nature of the sequence make detailed lithological correlation difficult. In particular, cream, flint-free limestone can be thickly developed in the upper part of Gambier Limestone.

Building stone quarries at Compton and Marte west of Mount Gambier, the previous source of whiting grade limestone, are within 'middle, cream limestone'.

Gambier Limestone varies considerably in thickness ranging from a few metres northwest of Mount Gambier to 300 m at the southern coast. About 250 m of Gambier Limestone was intersected in Stratigraphic Bore Caroline 11 about 10 km south of Honeysuckle Flat (Fig. 1).

Where exposed limestone is jointed, with a dominant northwest-southeast trend and in places linear caves have been developed along the joints. Solution features, mainly dolines and centes, and large sink holes are common.

The Tertiary succession is overlain by the following thin sequence of Pleistocene and Holocene sediments.

Coomandook Formation (Whalers Bluff Formation) : shallow marine calcareous sand, fossiliferous sandy limestone and oyster beds of Early Pleistocene age forming extensive thin spreads east of Mount Gambier.

Bridgewater Formation (Bridgewater Formation) : the most widely developed Pleistocene unit comprises aeolian calcarenite with occasional shelly beds derived from underlying Gambier Limestone, which formed a widespread dune system during periods of lowered sea-level. Remnants of this ancient dune system are present as numerous sub-parallel elongate ridges parallel to the present coastline. Extensive thin calcareous sand spreads blanket Gambier Limestone east and southeast of Mount Gambier. Numerous calcrete layers are developed within Bridgewater Formation.

Younger Pleistocene units include Padthaway Formation, comprising lagoonal dolomitic mud and clay cropping out north and west of Mount Gambier. A thin sequence of Holocene carbonate sediments, with peat deposits, is developed within coastal lagoons in the Port MacDonnell area.

Penetrating the Tertiary and Pleistocene succession are volcanic vents, of several ages, which have formed the many lava and ash cones of southeastern South Australia and western Victoria, including Mount Gambier and Mount Schank.

GEOLOGICAL INVESTIGATIONS

In 1974, Jarvis Industries P/L recognised that reserves at their Marte Limestone Quarry (Fig. 1) were limited and a new source of whiting grade limestone was required in the Mount Gambier area to supply Adelaide and Melbourne markets. From 1974 to 1976, geologists from Minerals inspected surface and quarry exposures and discussed prospects with local contract water drillers and SADME officers. As reserves at Marte dwindled and operations were reduced to removing pillars between disused building stone quarries (Plate 5), many of which were badly discoloured (Plate 3), the search for a replacement quarry intensified.

Criteria used for selection of potential quarry sites were:

- purity and whiteness of limestone
- depth of overburden
- depth to water table
- present land use

Many potential sites were discarded because of land use constraints either residential or industrial development, or within Forest Reserve.

One factor limiting development at Marte had been depth to water table, about 3.5 m. The highly porous nature of Gambier Limestone precludes working below water table. A search of hydrogeological records revealed that water table is shallow throughout the Mount Gambier area, with areas northwest of Marte having progressively shallower depths to water. In the Mount Gambier - Mount Schank - Kongorong, area abundant deleterious impurities and overall cream colour of Gambier Limestone precluded mining of whiting grade material.

Honeysuckle Flat area was brought to the attention of the company by Mr. J.R. Davidson (contract water well driller) who advised that a drillhole in section 538 hundred Caroline contained limestone of outstanding whiteness (Bore unit no. 7022002 WW 00542, Appendix D). Departmental bore records confirmed white, pure Gambier Limestone at shallow depths throughout Honeysuckle Flat area, and as depth to water table was about 16 m, this area was selected for further investigation.

All of the prospective area was within the Caroline State Forest Reserve and thus exempt land under the provisions of section 9 of the Mining Act (1972).

Minerals considered that with Gambier Limestone subcropping throughout sections 538 and 539, and very thin soil cover the land was suitable only for grazing and unlikely to be required for pine plantations. The company applied to SAWFD for permission to carry out further investigations in Sections 538 and 539. Lengthy negotiations followed between SAWFD, Minerals and SADME. The history of these negotiations, acquisition of mining tenements and geological investigations are summarised in Table III.

TABLE III

HISTORY OF HONEYSUCKLE FLAT LIMESTONE DEPOSIT

1974-1976	-	Reconnaissance exploration throughout Mount Gambier district. Caroline selected as most promising target area.
16/2/76	-	Minerals served Notice of Entry on SAWFD for permission to enter sections 538, 539 hundred Caroline, evaluate limestone and peg MC.
15/3/76	-	SAWFD refuse entry.
11/6/76	-	SAWFD apply for exclusion of Forest Reserves from the Operative Provisions of the Mining Act.
8/11/76	-	Jarvis Industries advised Minister of Mines that they were seeking a new whiting grade limestone deposit and made application under Section 9 of the Mining Regulations, 1972, for permission to conduct quarrying operations subject to completion of detailed geological site evaluation. In support of this application, Jarvis Industries submitted a brief geological report (Nichol, 1976).
9/2/77	-	Director of Mines wrote to Director, SAWFD strongly supporting company's application to enter the Forest Reserve as being in the State's interest.

17/5/77 - Following discussions with SADME officers, SAWFD agreed to co-operate to the extent of permitting the granting of an Exploration Licence (EL) to Minerals.

27/5/77 - SAWFD varied the agreement to allow Minerals to peg MC on sections 538 and 539, hundred Caroline.

24/6/77 - Mining Registrar advised company to peg tenement so that drilling can be undertaken.

16/8/77 - D. Nichol (Minerals geologist) explained company's interest and intent to the District Forrester, and Mr. Rawlinson (holder of the grazing sub-lease).

17/8/77 - Minerals pegged 3 MC.

- 14 drill holes each 5 m deep drilled in scatter pattern across area (3 in MC 845, 5 in MC 846, and 6 in MC 847) using truck-mounted Hydromaster cable tool rig hired from Langford and Davison, (Well Drilling Contractors, Mount Gambier). There is no plan showing location of drillholes. Some were located during mapping in 1978 (Fig. 3). Composite sludge samples forwarded to AMDEL.

19/8/77 - Applications for registration of three MC lodged.

18/9/77 - MC 845-847 registered.

22/9/77 - Minerals lodge plaint in Wardens Court seeking permission to remove samples of 20 tonnes for trial milling.

29/9/77 - Wardens Court dismisses application because permission of Director of Mines was required.

- Minerals applied to Director of Mines for permission under Section 25(2) of the Mining Act to extract sample of 20 tonnes.

12/10/77 - Director of Mines approved removal of bulk sample.

20/10/77 - 20 tonnes removed from trial pit 1 (Fig. 3).

25/10/77 - Trial sample milled at Beverley.

31/10/77 - Minerals applied to Director of Mines seeking permission to remove another 20 tonnes. Milled colour of first sample had been unacceptable because of contamination by surface soil. The

first sample was obtained using a small backhoe, extraction being limited to 1 m depth. It was believed a more representative sample would be obtained by removing surface soil with a bulldozer, then obtaining the sample by trenching.

15/11/77 - SADME advised SAWFD that Minerals had applied for permission to remove another bulk sample and sought comments.

25/11/77 - SAWFD advised they had no objection to removal of another sample but expected 'the company to get sampling right' the second time.

2/12/77 - Director of Mines approved removal of second 20 tonnes.

Late 1977 - Bulk sample removed from trial pit No. 2 (Fig. 3). Milled at Beverley, milled colour apparently acceptable.

21/8/78 - SAWFD advised SADME that they had no objection in principle to conversion of claims to leases, pending lodgement of cadastral plan showing precise location of proposed leases. SAWFD wished to be consulted regarding conditions to be applied to leases.

5/9/78 - Application for ML lodged, with sketch plan and development proposal (Nichol, 1978).

- Minerals advised D.C. of Mount Gambier of proposed change of land use. (Area actually in D.C. of Port MacDonnell).

19/9/78 - SADME sought comment from SAWFD regarding conditions to be applied to leases.

10/10/78 - SAWFD advised conditions, mainly related to bushfire protection.

14/11/78 - SADME advised no objection to granting of leases.

28/11/78 - Lease conditions approved by Minister of Mines and Energy.

- Minerals requested quotation for grid drilling of deposit and sought geological assistance.

5/12/78- - MC 845-847 surveyed by R.J. Harris and S.J. Ewen

7/12/78		(Field Assistant) claims were not rectangular and there was overlap. Minerals advised to seek permission of Warden's Court to rectify claims.
6/12/78-11/12/78	-	Drilling with Halco rig fitted with down hole hammer, supervised by P.C. Smith (Senior Geologist) and F.N. Aslin (Field Assistant). 52 holes totalling 658 m drilled. Samples were taken at 1 m intervals and split on site. One split sent to AMDEL (654 samples) and other split has been retained in SADME Glenside Core Library.
11/12/78-14/12/78	-	Area mapped geologically by author and R.J. Harris. All drill holes were located and levelled.
20/12/78	-	Letter of Offer to Minerals advised lease conditions.
14/2/79	-	ML 4671-4673 granted to Minerals for 7 years.
23/3/79	-	Minerals advised SADME that all corner posts had been destroyed by bushfires and had been replaced. A plan of the leases prepared by a licensed surveyor was lodged at SADME.
26/3/79	-	Minerals sought approval of Chief Inspector of Mines to commence mining operations.
31/7/79	-	Supplementary development proposals submitted to Chief Inspector of Mines.
18/10/79	-	Notice of Entry served on SAWFD by Minerals seeking to peg another claim.
20/11/79	-	Claim pegged adjoining to south of ML 4671-72.
5/12/79	-	Application for registration of MC lodged together with plan of new claim.
13/12/79	-	SAWFD grant Cessor of Exemption, recovering section 539.
	-	ML 4671-73 transferred to Omya Minerals P/L.
8/1/80	-	MC1212 registered.
22/1/80	-	MC1212 inspected by P.C. Smith who strongly recommended that no mining take place in, or to the south of Dry Creek which was an important geomorphological site.

18/7/80	-	Another development plan, being an amalgamation of previous submissions with extra information requested by Inspector of Mines, lodged with SADME.
28/8/80	-	Chief Inspector of Mines approved Development Plan, with limitations on area to be worked and depth of excavation.
Sept.-Oct. 1980	-	Quarrying commenced and continued intermittently until end of 1981.
20/10/80	-	Lease application for MC1212 lodged.
8/12/80	-	Chief Inspector approved Development Plan.
2/3/81	-	Quarry mapped by J.L. Keeling (Senior Geologist) with P.P. Crettenden and M.W. Flintoft (Field Assistants).
5/5/81	-	ML4913 transferred to ACI.
7/9/81	-	ML4671-73 transferred to ACI.
3/2/82	-	Quarry inspected by author after completion of mining operations and quarry placed on 'care and maintenance'.

SITE GEOLOGY

Stratigraphy

Honeysuckle Flat is everwhere underlain by Gambier Limestone, which either crops out poorly as low rounded grey sheets or irregular patches (Frontispiece), or is obscured by a veneer of grey soil.

Palpara 4 Stratigraphic Bore, in Victoria a few hundred metres east of the investigated area (Bore 3595, Fig. 2), intersected 258 m of Gambier Limestone before entering quartz sand of Mepunga Formation (Kongorong Sand equivalent). All other bores in the area are entirely within Gambier Limestone. The limestone thickness southwards, to about 300 m at the coast south of Honeysuckle Flat (CAR 10, Fig. 1).

Through most of the area investigated Gambier Limestone is overlain by grey, calcareous quartz silt, rarely more than 0.1 to 0.2 m thick. In a prominent topographic depression in the northwestern part of the area grey soil and alluvium is up to 1 m thick, completely obscuring Gambier Limestone.

In the southeast of the area, red-brown, aeolian quartz sand is up to 2 m thick in a low dune and bracken-covered sand spread (Plate 1).

Aeolian sand and grey alluvial mud, up to 6 m thick infills Dry Creek at the southern end of ML 4913.

West of Honeysuckle Flat rolling dunes and spreads of Bridgewater Formation calcareous aeolianite up to 10 m thick overlie Gambier Limestone, providing sufficient soil cover for pine plantations (Plate 9).

Lithology

Within the area investigated, Gambier Limestone is generally partly recrystallised fossiliferous calcilutite or calcisiltite, but is generally described as calcarenite. Petrographic description (RS 37,38, Appendix C) showed that about 60% of the rock is a framework of fossil shells, corals, tenuous cellular structures (?bryozoa) and well defined cellular microfossils, all now replaced by very fine grained calcite. Between relict fossil fragments there is either extremely fine grained calcite mud or clearer patches of relatively coarse grained calcite (crystals up to 0.04 mm diameter).

Traces of dolomite are present both in the fossil fragments and in coarser matrix material. The only other minerals present are scattered dark patches of iron oxide/hydroxide disseminated in the calcite, and very rare quartz grains.

A series of Water Observation Bores, CAR 22, 26-32 and 35 drilled in 1973-74 along Border Road adjacent to Honeysuckle Flat, (Fig. 2) all intersected fossiliferous calcarenite and calcisiltite. The only variation being colour, ranging from off-white to orange-yellow, which depends on iron oxide/ hydroxide mineral content (Table IV and section AA' Fig. 2).

TABLE IV

SUMMARY LOGS, WATER OBSERVATION BORES - HONEYSUCKLE FLAT LIMESTONE DEPOSIT

Bore	Depth (m) from	Depth (m) To	Description
CAR 22	0	28.3(T.D.)	Calcarenite with calcisiltite: fossiliferous, off-white to buff, pale yellow near base.
WW 00542	0	18.0	Calcarentite: fossiliferous, unconsolidated white. 20%-40% white calcisiltite.
	18.0	27.0	Calcarenite: fossiliferous, friable to well cemented, white to iron stained. 5-10% calcisiltite.
	27.0	30.0(T.D.)	Calcarenite: strongly cemented, off-white.
CAR 35	0	0.1	Quartz sand and silt.
	0.1	17.0	Calcarenite: fossiliferous, friable to moderately cemented, white to cream. 30-50% calcisiltite.
	17.0	30.0	Calcarenite: fossiliferous, weakly to strongly cemented. Off-white and yellow stained. Minor calcisiltite.
	30.0	30.3(T.D.)	Calcarenite: fossiliferous, off-white. Minor calcisiltite.
CAR 26	0	1.0	Sand and silt: orange-brown.
	1.0	4.0	Calcarenite: fossiliferous, cream. 30% calcisiltite.
	4.0	16.0	Calcarenite: fossiliferous, weakly cemented, off-white. 50% calcisiltite.
	16.0	18.0	Calcarenite: fossiliferous, off-white - yellow.
	18.0	22.0	Calcarenite: fossiliferous, mustard yellow.
	22.0	28.0	Calcarenite: fossiliferous, cream, 30-50% calcisiltite.
	28.0	43.0(T.D.)	Calcarenite: fossiliferous, moderately to well cemnted, off-white to cream. Minor calcisiltite.
CAR 27	0	0.5	Quartz sand.
	0.5	6.0	Calcarenite: fossiliferous, weakly cemented, cream to pale brown. 40-50% calcisiltite.
	6.0	20.0	Calcarenite: fossiliferous, off-white. 50% calcisiltite.
	20.0	28.0	Calcarenite: fossiliferous, cream & yellow stained. 20-30% calcisiltite.
	28.0	40.0(T.D.)	Calcarenite: fossiliferous, off-white, trace yellow staining. Minor calcisiltite.
CAR 28	0	2.0	Quartz sand.
	2.0	4.0	Calcarenite: fossiliferous, buff. 30% calcisiltite.
	4.0	12.0	Calcarenite: fossiliferous, weakly cemented, off-white to buff. 50% calcisiltite.
	12.0	32.0	Calcisiltite: off-white. 30-50% fossiliferous calcarenite.
	32.0	36.0	Calcisiltite: cream. 50% fossiliferous calcarenite.
	36.0	50.0(T.D.)	Calcarenite: fossiliferous, off-white to buff, minor yellow staining. Trace calcisiltite.
CAR 29	0	3.0	Sand and silt.
	3.0	6.0	Calcarenite: fossiliferous, cream to buff. 25% calcisiltite, trace orange-brown silt.
	6.0	18.0	Calcarenite: fossiliferous, weakly cemented, off-white. 50% calcisiltite.
	18.0	22.0	Calcisiltite: cream. 30% fossiliferous calcarenite.
	22.0	26.0	Calcarenite: fossiliferous, off-white. 20-50% calcisiltite.
	26.0	32.0	Calcisiltite: off-white. 25-40% fossiliferous calcarenite.
	32.0	46.0(T.D.)	Calcarenite: fossiliferous, off-white to buff, yellow stained near base. Minor calcisiltite.
CAR 30	0	0.5	Sand and silt.
	0.5	4.0	Calcarenite: fossiliferous, weakly cemented, buff. 20-30% calcisiltite.
	4.0	6.0	Calcarenite: fossiliferous, cream.
	6.0	10.0	Calcarenite: fossiliferous, off-white.
	10.0	30.0	Calcisiltite: off-white. 20-50% fossiliferous calcarenite.
	30.0	40.0	Calcarenite: fossiliferous, off-white. 10-30% calcisiltite.
	40.0	45.0(T.D.)	Calcarenite: off-white to light grey, orange stained.
CAR 31	0	0.2	Sand.
	0.2	22.0	Calcarenite: fossiliferous, off-white. 30% calcisiltite.
	22.0	26.0	Calcarenite: fossiliferous, cream with orange staining.
	26.0	36.0(T.D.)	Calcarenite: fossiliferous, buff with orange staining. 5% calcisiltite.
CAR 32	0	6.0	Quartz sand: red-brown.
	6.0	8.0	Calcarenite: fossiliferous, buff to light pink. 40% calcisiltite.
	8.0	20.0	Calcarenite: fossiliferous, off-white. 5-30% calcisiltite.
	20.0	22.0	Calcarenite: fossiliferous, off-white to light grey. 25% calcisiltite.
	22.0	26.0(T.D.)	Calcisiltite: pale grey. 25% fossiliferous calcarenite.

Structure

Gambier Limestone is flat lying, bedding orientation varying by only a few degrees from the horizontal*(Plate 4).

Jointing within limestone is prominent and abundant, being defined by

- ironstaining within limestone adjacent to joints
- case hardening of limestone adjacent to joints producing a slightly raised, elongate outcrop along the joint
- orientation of karstic features.

Most joints are aligned northwesterly to north-northwesterly, the regional trend of jointing in the South East, and presumably are near vertical to steeply dipping (Plate 4).

Karst

Solution features are common, ranging from pitting and 'rillen' on weathered surfaces to dolines and open sinkholes. Major features are aligned along the prominent joint direction and many of the larger sinkholes are elongate in this direction.

Karstic depressions (dolines) are generally infilled with grey soil and sand, similar to those exposed in Marte Quarry (Plates 2 and 3). In some places these solution features are concentrated in shallow depressions up to 30 m across. Open solution features, sinkholes, are most abundant in Zone C (Fig. 3), the largest being about 4 m north-south by 2 m east-west (Plate 1). They extend to unknown depth and may connect to caves. Several drillholes in Zone C were abandoned in cavities.

Ironstaining

Gambier Limestone varies in colour from off-white, through pale yellow to yellow-orange and brown, colour being related to iron oxide/hydroxide content.

Iron staining is of three types

- Beneath dolines

Water moving downwards from dolines carries iron hydroxides and iron-stained clay minerals, both derived from the overlying surficial material, causing discolouration of limestone beneath the doline (Plates 2 and 3). Large solution features may have associated discoloured zones many metres across (Plate 4).

. Associated with joints

Yellow and orange staining is developed within and immediately adjacent to joints, presumably related to ground water movement through the joint. Zone B (Fig. 3) contains numerous joints and much of the limestone is stained yellow. Not all joints have associated iron staining (Plate 4).

. Horizontal bands

P.D. Johnson (ACI, pers. comm.) described near horizontal, yellow stained limestone bands up to 1 m thick at Caroline Limestone Deposit. Similar bands are displayed in the Glenelg River Cliffs (Plate 4) where two prominent brownish bands are exposed in the lower third of the cliff. These bands may be related to slight lithological differences within Gambier Limestone and/or fluctuating water tables. In some quarries in the Mount Gambier area, similar bands are not horizontal but mirror topography. Although based on limited data, a similar pattern is evident from Water Observation Bores along Border Road (Section AA', Fig. 2).

Drilling data at Honeysuckle Flat are not sufficient to define iron-stained bands.

Groundwater

Underground water is one of the most important resources of the South East and being within a few metres of the surface in most areas can significantly influence mining operations.

At Honeysuckle Flat, maximum (winter) water-table is at RL 4 m with a summer variation of approximately -1 m. Groundwater table contours are parallel to the Glenelg River, with a gradient to the south of approximately 1 in 375 (Fig. 2). The water table is connected to the river, the river gaining by groundwater flow. Water sample W 1551/75 taken from CAR 35 (Fig. 2) in February 1975 contained 294 p.p.m. total solids, with pH of 7.8 (Appendix D).

PRODUCTION, SPECIFICATIONS AND USES OF WHITING

Whiting is a general term used for the four types of pure white calcium carbonate of fine particle size.

Chalk Whiting

Traditionally the term whiting has been restricted to this type, prepared by powdering chalk, a sedimentary rock composed almost entirely of coccoliths, the minute remains of small marine organisms. Individual coccoliths are about 3 microns across but are made up of numerous segments of tabular or rounded calcite crystals about 1 micron across. The bond between coccoliths is weak and when crushed the chalk is broken down into individual coccoliths or coccolith segments. The best whiting, containing a high proportion of particles between 1 and 5 microns in size, comes from Europe, notably England and France. These supplied much of the world's demand for high purity whiting for many years. Chalk deposits elsewhere in the world generally have more impurities and have different, less desirable, physical and/or chemical properties.

Milled limestone (including marble)

Although limestone is one of the most common rock types, deposits of white limestone suitable for whiting manufacture are relatively rare and most operations use recrystallised limestone or white marble as the raw material.

Because such rocks are composed of tightly interlocking coarse calcite crystals, up to 10 mm across in some cases, the crushed product contains a much wider range of particle sizes than chalk whiting, and the particles are generally significantly coarser and more angular.

Both wet and dry grinding processes are used to produce whiting, the wet process involves grinding in ball or pebble mills, classification, filtering and drying whereas the dry process generally uses a roller mill and air classification. Although more expensive, the wet process generally produces higher grade whiting as smaller, less angular particles are produced.

Ultra-fine whitings can be produced, from either chalk or milled limestone, using a microniser or fluid energy mill (Kelsey, 1978). Milled whiting is introduced into a grinding chamber where a high velocity gaseous fluid bed imparts differential speeds to the particles. Size reduction takes place by particle collision, resulting in a product with particles below 20 microns.

Precipitated Calcium Carbonate (PCC)

Produced by four main methods, two direct (true PCC) and two where the calcium carbonate precipitate is a by-product of another operation. Being a chemical product, PCC can be produced with uniform particle size.

Direct processes

- Calcining limestone - the resulting lime and carbon dioxide is purified and then recombined. Water is added to lime to produce a slurry of milk of lime, through which purified carbon dioxide is bubbled, precipitating calcium carbonate.
- As part of the Solvay process for production of soda ash, calcium chloride is produced. Soda ash is added to calcium chloride to produce uniformly sized PCC.

By-product processes

- In production of caustic soda, soda ash is added to milk of lime producing caustic soda and PCC. This PCC is generally of coarse particle size and has slight alkalinity, both factors limiting useage.
- In water softening plants, dissolved calcium bicarbonate is removed by addition of milk of lime, calcium carbonate being precipitated.

Coated Whiting

Produced by chemical treatment of whiting, either chalk or milled limestone, by coating the surface of the particles, generally with a fatty acid such as stearic acid. Particles can be coated with the addition of only 0.2% by weight stearic acid but in practice up to 3% is used. Usually a range is produced e.g. 0.5%, 1%, 2% coating, etc. To facilitate coating, whitings are micronised.

Specifications

Essential requirements for whiting are purity and whiteness but particle size, shape and size distribution are also important. Most quality whitings have calcium carbonate content between 96% and 99%. Deleterious impurities are silica, which results in grit in the whiting, and ferric oxide, which causes discolouration.

Australian specification ASTM D1199-52T requires milled limestone to contain

- minimum 95% $CaCO_3$
- maximum 2% moisture
- maximum 0.35 mg NaOH/g

and PCC to contain

- minimum 98% $CaCO_3$
- maximum 1% moisture
- maximum 0.5 mg NaOH/g

Moisture content can be important in some applications and in practice, a moisture content of about 0.1% is maintained at the bagging stage.

Whiteness, measured relative to a pure magnesia block should be in the range 85% to 95%, but less bright whitings are suitable for many applications. In general, the higher the degree of crystallinity in limestone, the whiter the milled product (plates 7 and 8). Coarse marble produces whiting with 90% to 95% reflectivity whereas milled, partially recrystallised limestone has brightness of about 85%. Gambier Limestone produces whiting with brightness 75% to 82%. European chalk whitings have brightness from 85% to 90% and PCC has brightness of 96% to 99%.

By selectively mining and/or milling, and using various grinding techniques, including coating and micronising, a large range of whiting grades, with various particle sizings and size distributions can be produced.

Table V summarises the physical and chemical properties of four commercially available Australian whitings. The major Australian producers distinguish between milled marble (calcite) and milled organic limestone (whiting).

TABLE V

PHYSICAL AND CHEMICAL PROPERTIES OF FOUR AUSTRALIAN WHITINGS

Type	Calcite High grade white filler	Calcite White filler	Whiting Cream/white general filler	Whiting Coated micronised whiting (1% Stearic acid)
Raw Material	Angaston marble (Penrice)	Angaston marble (Penrice)	Gambier Limestone (Marte)	Gambier Limestone (Marte)
$CaCO_3$	98.2	95.63	98.47	98.47
$MgCO_3$	0.03	2.44	0.70	0.70
SiO_2	0.8	1.07	0.53	0.53
Al_2O_3	0.3	0.15	0.16	0.15
Fe_2O_3	0.27	0.01	0.16	0.16
MnO	0.09	0.04	0.006	0.006
K_2O	0.05	0.03	0.04	0.04
TiO_2	0.02	0.01	0.01	0.01
Brightness (%)	95.2	91.1	85.0	-
Oil absorption	1.9 ml/10g	2.7 ml/10g	2.1-2.7 ml/10g	-
Specific gravity	2.60	2.7	2.68	2.68
Particle size characteristics	Retained 75) max 5% Retained 45) max 35% Retained 10) max 75%	Retained 53) max 1%	Retained 53) max 1%	Retained 45) max 0.1%

Uses

Whiting has a wide range of uses and in general any one of the four types may be used. However, cost, and in some cases, specific properties often result in one type being preferred. Principal uses are:

- Paint - as a filler to increase bulk and to lower cost, and as a pigment in ceiling white. Type depends on price and availability, some premium quality paints use PCC. Often used in conjunction with other fillers such as, barite, kaolin, talc, etc.
- Putty - consists of about 85% whiting and 15% linseed oil. Particle size distribution is the critical specification, chalk whiting is ideal but milled limestone can be used if particle size range is similar. Coarse whiting produces a 'short' putty.
- Rubber - as a filler to provide body and to lower cost. Type depends upon cost and availability, generally milled limestone. Coated whiting and PCC are used to improve mixing, extrusion ad electrical insulation.
- Plastics - as a filler, particularly in PVC polyesters and epoxy resins. May comprise up to 65% of the plastic body. Chalk whiting is preferred for extruded products because sharp particles in milled limestone scratch the extruders. Coated whiting is often used to improve dispersibility of the whiting in PVC mixes, to lower the viscosity, and to improve extrusion performance. Milled limestone is preferred in PVC floor tiles because of superior wear characteristics.

- Paper - as a filler to load (fill the insterstices between paper fibres) and coat paper (produce a smooth finish). Traditionally, kaolin was used to load paper but is being replaced increasingly by chalk whiting, although PCC is used for loading specialty papers, e.g. cigarette papers. In coating, PCC used with kaolin to increase brightness, but chalk whiting used for matt finished paper.
- Carpets - in adhesives, comprising latex and 60% whiting which bond the yarn to the backing material. Each square metre of carpet requires 2 kg of adhesive. Cost dictates type.
- Linoleum - as a bulk filler.
- Pharmaceuticals - as a bulk filler. Chalk whiting is preferred for toothpaste, as angular fragments in milled limestone scratch tooth enamel.
- Glass - Must be consistently pure with iron content less than 0.15%. Very fine particle size results in 'dusting' in the glass furnace and hence coarsely milled limestone, or in South Australia shellgrit, has been used. Until recently, chalk whiting has been regarded as unsuitable for glass manufacture.

Minor uses include glazes and enamels, soap, detergent and chemicals, in welding electrodes, pesticides and animal feeds and coal dusting.

Australian whiting consumption, based on Tuffley (1978) is detailed in Table VI.

TABLE VI

USE OF WHITING IN AUSTRALIA

Use	percentage of total consumption, 100 000 t)
Rubber	38
Wall board and tiles	13
Paint and protective coatings	10
Plastics	8
Adhesives, putties, grouts and polishes	5
Electric cables	4
Chemicals	4
Soaps and detergents	3
Insulation	2
Pharmaceuticals	1
Others (including welding rods, enamels, inks, brake linings, crayons, plasticene and insecticides)	11

Production

For many years, North European chalk whiting was the most widely used whiting in the western world. During World War II, chalk whiting supplies to U.S.A. were cut off and substitute materials, such as milled limestone and PCC were used. Improved technology rapidly developed these products to replace chalk whiting in most applications, and U.S.A. now prefers milled limestone and PCC, although small quantities of chalk are imported. Many countries now produce milled limestone and PCC.

In Australia, all whiting is produced by milling of limestone and marble. The market is too small to warrant production of PCC, these limited requirements being imported. White, coarsely crystalline marble is the preferred raw material but partly recrystallised limestone is also used. Gambier Limestone, being largely composed of organic remains has many physical properties similar to chalk whiting, and has a small, but important share of the market.

Scanning electron micrographs (Plate 7) and optical micrographs (Plate 8) of whitings produced from various Australian limestone show the difference between coarsely crystalline marble, recrystallised limestone and Gambier Limestone.

The crystalline nature of the raw material results in whiting with differing physical properties, principally particle sizing, size distribution and brightness.

In 1978, total Australian production of whiting was about 90 000 tonnes, with a further 12 000 tonnes imported mainly of coated whiting and PCC (Tuffley, 1978). The introduction of micronising and coating facilities in Australia reduced imports, to 6 500 tonnes in 1980-81. In 1978, 61 000 tonnes of milled limestone was used for glassmaking and 22 000 tones used for coal dusting.

New South Wales

Devonian limestone and marble are mined near Bathurst in central N.S.W. Omya Minerals P/L mill white marble to produce whiting.

A large crushing plant, operated by Southern Limestone P/L (jointly owned by Commercial Minerals Ltd. and Blue Circle Southern Cement) at Berrima southeast of Sydney produces various materials including whiting from recrystallised Middle to Late Silurian Wombeyan Limestone from Wombeyan and recrystallised Late Silurian limestone from Marulan.

Queensland

High purity coarse to very coarse white to grey saccharoidal marble is mined at South Ulam, 70 km west of Gladstone by Minerals P/L. Coralline limestone of Early to Middle Devonian Mount Holly Beds has been metamorphosed to coarse marble. White marble is mined selectively and milled to produce whiting.

South Australia

Coarse white and grey Cambrian Angaston Marble is mined near Nuriootpa, 65 km north-northeast of Adelaide by ICI Australia Ltd. and Adelaide Brighton Cement Ltd. In 1982, 29 000 tonnes of selected white and off-white marble was milled in Adelaide by ACI-Tennant Ltd. and Steetley Industries Ltd. for production of whiting.

Of the 25 500 tonnes of Gambier Limestone mined at Caroline by ACI in 1982, about 3 800 tonnes was milled for whiting in Victoria, the remainder being used in glass and fibreglass manufacture. Another 500 tonnes of whiting was produced from stockpiles remaining at Marte (Plate 6).

At Coffin Bay, 50 km west of Port Lincoln, The BHP Company Ltd. mines limesand from dunes derived by reworking of Bridgewater Formation calcarenite. In 1982, about 3 000 tonnes, was used as whiting in manufacture of plastics.

1982 whiting production for South Australia is summarised in Table VII.

TABLE VII

SOUTH AUSTRALIAN WHITING PRODUCTION - 1982

	Tonnes	Proportion (%)
Angaston Marble (milled in Adelaide)	28 998	79.8
Gambier Limestone (milled in Adelaide)	518	1.4
Gambier Limestone (milled in Melbourne)	3 800	10.5
Coffin Bay Limesand (milled in Melbourne)	3 038	8.4
	36 354	

LIMESTONE QUALITY

Particle size and shape, purity and colour are factors critical in determining suitability of limestone as a source of whiting.

Particle size and shape

Petrographic examination shows that limestone from Honeysuckle Flat is very fine grained identical to Gambier Limestone from other areas of the South East.

When milled, Gambier Limestone produces a high proportion of very fine particles, e.g. when crushed so that 99% is less than 53 µm 40% is less than 10 µm which is much finer than other Australian whiting. Also in contrast to other crushed limestone, whitings particles are mainly sub-rounded and rounded (Plates 7 and 8).

Gambier Limestone is similar to European chalk whiting and can be used for many applications where chalk whiting is preferred, particularly extruded plastics and pharmaceuticals.

Purity

Overall, Honeysuckle Flat limestone is very pure and remarkably uniform, based on 21 complete analyses summarised below.

CaO - excluding 1 sample contaminated by surface soil averages 54.25%.

MgO - from 0.74% to 0.95% and averages 0.87%

This corresponds to an average composition of

4.0% dolomite

94.7% calcite

confirming the average of 20 analyses reported in Johns (1963).

SiO_2 - is variable from 0.73% to 1.93% reflecting detrital quartz sand.

Total Iron as Fe_2O_3 - varies widely from 0.11% in white limestone to 0.88% in orange-stained limestone.

In Zone A - 55 samples from 6 holes - from 0.11% to 0.24%, average 0.16% Fe_2O_3

In Zone B - 13 samples from 2 holes average 0.25% Fe_2O_3.

Colour

Honeysuckle Flat contains the following three grades which are depicted graphically on cross sections (Fig. 4) and on drill logs (Appendix A).

- Off-white clean limestone with only minor iron staining - whiting grade.
- Very pale yellow limestone with traces of yellow/orange staining - probable second grade whiting although badly iron-stained material will have to be dumped or stockpiled for separate sale.
- Yellow to orange limestone - not whiting grade.

However, best limestone is inferior in whiteness to limestone from Marte. Physical and chemical properties of Honeysuckle Flat limestone are compared with limestone from Marte quarry in Table VIII, from details in Appendix B.

TABLE VIII

PHYSICAL AND CHEMICAL PROPERTIES OF LIMESTONE FROM HONEYSUCKLE FLAT AND MARTE

Sample	CaO	MgO	SiO_2	Total Iron as Fe_2O_3	Total Carbonate	Brightness (R457)
HONEYSUCKLE FLAT						
A2547/79* Surface sample from near B5	53.1	0.8	1.07	0.16	96.5	71.1
A2548/79* Surface sample from near C5	53.7	0.8	0.54	0.12	97.7	70.9
A468/81 Channel sample down quarry face	54.0	0.95	1.26	0.18	95.4	69.6
MARTE						
A2549/79 Selected sample from quarry floor (south)	53.2	0.59	1.34	0.28	95.9	76.9
A2550/79 Selected sample from quarry face (north)	53.9	0.49	0.57	0.16	96.5	83.3

* Surface samples probably slightly leached.

Uses

Honeysuckle Flat limestone is identical to, and can replace Marte limestone except in those uses requiring high brightness.

ACI have lost some markets for Caroline limestone which is similar in brightness to Honeysuckle Flat, because of reduced whiteness.

Lower brightness is due to physical differences (not chemical) between Marte and Caroline-Honeysuckle Flat. Marte is in the 'middle zone' of Gambier Limestone whereas Honeysuckle Flat and Caroline are near the top of the stratigraphic unit. The degree of recrystallisation of Gambier limestone is likely to vary stratigraphically. Marte limestone is more recrystallised resulting in a denser limestone with a greater amount of transparent calcite, and hence increased brightness.

In the past Gambier Limestone has been regarded as too fine grained for glass manufacture but specialised treatment at Caroline removes fine particles to produce glass-grade limestone. The fine fraction from this process is suitable for fibreglass manufacture. Although limestone from Honeysuckle Flat would be amenable to similar treatment, iron content may be too high. Within Zone A, iron content averages 0.16% (55 samples) comparing favourably with an average of 0.19% from Marte (10 samples). Glass grade limestone requires less than about 0.12% iron. Caroline averages 0.08%-0.1%, anomalously low for Gambier Limestone. Detailed sampling at Honeysuckle Flat may delineate zones suitable for glass manufacture. Initial sampling suggested that the central southern part of Zone A contains slightly less iron, four samples averaging 0.12% over 9 m in hole E7 at the southern end.

Heavily iron-stained limestone, if stockpiled separately, could be sold for either agricultural purposes or for road rubble. If the latter use is contemplated, Extractive Mineral Lease(s) are required over the quarry.

QUARRY LOCATION AND MINE DEVELOPMENT

Quarry Location

Based on drilling and geological mapping, the investigated area has been divided into three zones with boundaries parallel to the major joint trend.

Zone A - central subzone A1 with only very minor stained limestone, flanked by subzones A2 and A3 with some stained limestone in drillholes and/or numerous solution features suggesting surface material may be badly stained.
Zone A is about 100 m wide at the northern end, but widens to about 300 m at the southern end, and extends further southwards into ML 4913.

Zone B - yellow and yellow-orange limestone with iron staining related to numerous joints. Numerous intersections, up to 4 m thick, of badly ironstained limestone (Fig. 4).

Zone C - badly stained limestone related to numerous sink holes. Cavities encountered during drilling would be a hazard to mining.

The proposed quarry is restricted to Zone A, mainly within subzone A1 but includes less iron-stained parts of subzones A2 and A3.

Quarry shape was determined by proposed mining which was to be by scraper (Nichol, 1978).

Unlike Marte, where pre-ripping by bulldozer was required (Plate 5), this quarry would be of sufficient length to permit the scraper to be filled in one pass, shaving only a few millimetres at a time. The eastern quarry face is a low angle, regular slope permitting the scraper to move in and out of the quarry at any point.

Given the highly porous nature of Gambier Limestone, and the potential for pollution of the underground water, it is considered that mining operations should be limited to a depth 2 m above maximum (winter) water table level, (P.C. Smith, SADME, pers. comm.). Accordingly the base of the proposed quarry is taken as RL 6.0 m.

Quarry Development

The quarry would start as a long narrow slot, and progressively enlarge and deepen.

With the securing of ML4913, the southern end of the quarry can be open ended, to provide eventual extension.

Up to three separate stockpiles, each containing up to 12 000 tonnes, would be established on the eastern side of the pit. Stockpiling is essential to permit mixing of limestone to produce consistent grade. A front-end loader would load limestone onto trucks for transport to rail sidings.

Soil and overburden would be stockpiled in two mounds, one north of Dry Creek in the southern part of ML4913 to screen operations from the road along the southern boundary of section 539, the other to screen operations from Border Road (Fig. 5).

With completion of quarry operations the excavation could be rehabilitated by battering back all faces, spreading the stockpiled topsoil and overburden and regrassing.

Mining was proposed during summer in a single annual operation lasting two to three weeks. Initial production was planned at 15 000 tonnes per annum, rising to 30 000 tonnes per annum after five years.

The Development Plan for Honeysuckle Flat, as approved by the Chief Inspector of mines on 8 December 1980, confines quarrying to the area shown on Figure 5 and limits excavation to a depth of not less than 1 m above the known water table. This limit should be amended to RL 6 m.

RESERVES

Reserves within the quarry outlined on Figure 5 and shown on sections 1 to 6 (Fig. 3) are geological and classed as measured.

A specific gravity of 1.4, based on two determinations (Appendix B) is used for reserve calculations.

Total reserves within quarry area.

	Volume m^3	Tonnes
BLOCK 1	80 000	112 000
BLOCK 2	260 000	364 000
BLOCK 3	295 000	413 000
BLOCK 4	426 000	596 000
BLOCK 5	440 000	616 000
BLOCK 6	50 000	70 000
TOTAL	1 551 000	2 171 000

Overburden comprises 34 000 m^3 or 51 000 tonnes of soil and stained limestone assuming an average depth of 0.3 m, and specific gravity of 1.5.

Available reserves of limestone total 2 120 000 tonnes which includes ironstained limestone (probably less than 10%) which will have to be either rejected or stockpiled separately.

Large additional reserves of limestone extend beyond the proposed quarry, particularly to the south on ML4913 where Holes B7, C7, D7 and E7, all intersected white limestone.

CONCLUSIONS

At Honeysuckle Flat, in the South East of South Australia over 2.1 million tonnes of high purity limestone have been proved by geological mapping and drilling. Limestone of Middle to Late Tertiary age, is part of Gambier Limestone, overlain only by a thin veneer of soil.

High purity limestone is confined to a zone about 200 to 300 m wide flanked by zones either of more ironstained and clay filled, limestone or with open solution holes. Large reserves of high purity limestone extend southwards outside the investigated area.

Chemical composition is remarkably uniform, averaging 98.7% total carbonate of which 4.0% is dolomite. The most significant variation is in iron oxide content, iron staining being related to joints, and/or clay filled solution holes in the upper part of the limestone.

Honeysuckle Flat limestone is physically and chemically similar to limestone from Marte and for most applications will be a suitable replacement when reserves at Marte are exhausted. However, limestone from Honeysuckle Flat has a brightness of 74-78% compared to 80-85% for Marte Limestone because of differing degree of recrystallisation reflecting different stratigraphic position in Gambier Limestone.

Hence, Honeysuckle Flat is not suitable for applications where a high degree of whiteness is specified.

Within the proposed quarry, iron content averages 0.16%, below average for Gambier Limestone, but significantly above the specification of 0.12% for glass manufacture. Limestone from the nearby Caroline deposit averages 0.08%-0.1% Fe_2O_3 and is used for glass manufacture. Further sampling at Honeysuckle Flat, particularly in the southern extension of Zone A may define limestone suitable for glass manufacture.

There is little likelihood of major production from Honeysuckle Flat in the short term as mining operations are centralised at Caroline. At Caroline, water table is about 8 m below surface compared to 15 to 16 m at Honeysuckle Flat.

RECOMMENDATIONS

1. Honeysuckle Flat quarry be mapped after each major mining stage to locate iron stained joints and clay-filled solution holes, and thus assist long term quarry planning.
2. The southern part of the proposed quarry, and the extension of Zone A onto ML4913 be drilled on a 50 m grid pattern to test for glass grade limestone.
3. An Extractive Mineral Lease be obtained so that iron stained limestone can be mined and sold for road rubble.
4. The Development Plan be amended to restrict excavation to above RL 6 m.
5. Marte area be re-investigated to locate a small deposit of white pure limestone to supplement production from Caroline and Honeysuckle Flat and to regain markets lost because of inferior whiteness of Caroline limestone.

L.C. BARNES

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APPENDIX A

Halco drill holes- geological Logs, and assay results

Apart from a thin surface soil layer, all holes are entirely within white to very pale yellow, slightly recrystallised fossiliferous calcarenite - Gambier Limestone.

Chemical analyses of drill hole samples extracted from AMDEL report AC 2832/79 by D.K. Rowley.

Acid soluble CaO on all samples and accurate CaO, MgO, Total Fe as Fe_2O_3, SiO_2 and CO_2 on selected samples.

AC 4447/79 by D.K. Rowley, and AMDEL report.

FeO and total Fe as Fe_2O_3 on selected samples.

Approximate total carbonate content (to nearest %) assuming 4.0% dolomite present in each sample - see Appendix B.

Key to Quality Code

Limestone Colour.

White, clean limestone, very minor pale yellow or orange staining - WHITING GRADE.

Very pale yellow limestone - traces of yellow/orange staining - PROBABLE WHITING GRADE.

Pale yellow to yellow/orange limestone. Badly stained in places - NOT WHITING GRADE.

CAROLINE LIMESTONE DEPOSIT.

LOGS OF DRILL HOLES

HOLE NO.	DEPTH m	COLOUR	QUALITY	A. NO.	ACID SOLUBLE CaO	APPROX. TOTAL CARBONATE	CaO (ACCURATE)	MgO	CO_2	SiO_2	TOTAL Fe as Fe_2O_3	FeO
A1	0-1	White		A1/79	54	98						
	1-2	White		A2/79	54	98						
	2-3	White		A3/79	54	98						
	3-4	White		A4/79	54	98						
	4-5	White		A5/79	54	98						
	5-6	White		A6/79	54	98						
	6-7	White- with trace yellow		A7/79	54	98						
	7-8	"		A8/79	54	98						
	8-9	"		A9/79	54	98						
	9-10	Very pale yellow		A10/79	54	98						
	10-11	Pale yellow		A11/79	47	86						
	11-12	White-with trace yellow		A12/79	54	98						
	12-13	"		A13/79	54	98						
B1	0-1	White with surface material		A14/79	50	91						
	1-2	White		A15/79	54	98						
	2-3	"		A16/79	54	98						
	3-4	"		A17/79	54	98						
	4-5	"		A18/79	54	98						
	5-6	White-very pale yellow		A19/79	54	98						
	6-7	"		A20/79	54	98						
	7-8	White		A21/79	54	98						
	8-9	"		A22/79	54	98						
	9-10	"		A23/79	54	98						
	10-11	White -10% yellow staining		A24/79	54	98						
	11-12	Very pale yellow		A25/79	54	98						
	12-13	"		A26/79	54	98						

CAROLINE LIMESTONE DEPOSIT.

LOGS OF DRILL HOLES

HOLE NO	DEPTH m	COLOUR	QUALITY	A. NO.	ACID SOLUBLE CaO	APPROX. TOTAL CARBONATE	CaO (ACCURATE)	MgO	CO_2	SiO_2	TOTAL Fe as Fe_2O_3	FeO
C1	0-1	White with surface soil		A27/79	54	98						
	1-2	Very pale yellow		A28/79	54	98						
	2-3	"		A29/79	54	98						
	3-4	"		A30/79	54	98						
	4-5	White		A31/79	54	98						
	5-6	White - 20% yellow staining		A32/79	54	98						
	6-7	White-yellow tinge		A33/79	54	98						
	7-8	"		A34/79	54	98						
	8-9	White		A35/79	54	98						
	9-10	"		A36/79	54	98						
	10-11	"		A37/79	54	98						
	11-12	"		A38/79	54	98						
	12-13	"		A39/79	54	98						
	13-14	"		A40/79	54	98						
	14-15	"		A41/79	54	98						
D1	0-1	White with surface material		A42/79	54	98						
	1-2	White		A43/79	54	98						
	2-3	Pale yellow		A44/79	54	98						
	3-4	"		A45/79	54	98						
	4-5	Very pale yellow		A46/79	54	98						
	5-6	White		A47/79	54	98						
	6-7	"		A48/79	54	98						
	7-8	"		A49/79	54	98						
	8-9	"		A50/79	54	98						
	9-10	Pale yellow		A51/79	54	98						
	10-11	White-yellow tinge		A52/79	54	98						
	11-12	White		A53/79	54	98						
	12-13	"		A54/79	54	98						

CAROLINE LIMESTONE DEPOSIT.

LOGS OF DRILL HOLES

HOLE NO.	DEPTH m	COLOUR	QUALITY	A. NO.	ACID SOLUBLE CaO	APPROX. TOTAL CARBONATE	CaO (ACCURATE)	MgO	CO_2	SiO_2	TOTAL Fe as Fe_2O_3	FeO
E1	0-1	Yellow with surface material		A55/79	54	98						
	1-2	Yellow/orange		A56/79	54	98	54	.79	43.1	.45	.88	
	2-3	Pale yellow		A57/79	54	98	54.1	.83	42.7	.38	.27	
	3-4	Very pale yellow		A58/79	54	98	54.6	.74	43.6	.37	.21	
	4-5	White		A59/79	54	98						
	5-6	"		A60/79	54	98	54.4	.95	43.6	.57	.14	
	6-7	"		A61/79	54	98						
	7-8	White-very pale yellow		A62/79	54	98						
	8-9	Very pale yellow		A63/79	54	98						
	9-10	Yellow		A64/79	54	98	54.5	.81	43.6	.38	.39	
	10-11	Pale yellow		A65/79	54	98	54.5	.89	43.6	.48	.27	
	11-12	White-very pale yellow		A66/79	54	98						
	12-13	White, very pale yellow at base		A67/79	54	98						
	13-14	"		A68/79	54	98	54.3	.95	43.6	.64	.20	
	14-15	"		A69/79	54	98						
X6	0-1	Pale yellow with surface soil		A87/79	54	98						
	1-2	Very pale yellow		A88/79	54	98						
	2-3	White		A89/79	54	98						
	3-4	White-25% orange		A90/79	54	98						
	4-5	Very pale yellow-10% orange		A91/79	54	98						
	5-6	Yellow		A92/79	54	98						
	6-7	White		A93/79	54	98						
	7-8	"		A94/79	54	98						
	8-9	White-20% yellow		A95/79	54	98						
	9-10	White		A96/79	54	98						
	10-11	"		A97/79	54	98						

CAROLINE LIMESTONE DEPOSIT.

LOGS OF DRILL HOLES

HOLE NO.	DEPTH m	COLOUR	QUALITY	A. NO.	ACID SOLUBLE CaO	APPROX. TOTAL CARBONATE	CaO (ACCURATE)	MgO	CO_2	SiO_2	TOTAL Fe as Fe_2O_3	FeO
F1	0-1	Surface soil										
	1-2	White-pale yellow		A70/79	54	98						
	2-3	Pale yellow		A71/79	54	98						
	3-4	Off white - pale yellow		A72/79	54	98						
	4-5	"		A73/79	54	98						
	5-6	"		A74/79	54	98						
	6-7	"		A75/79	54	98						
	7-8	"		A76/79	54	98.						
	8-9	White		A77/79	54	98						
	9-10	"		A78/79	54	98						
	10-11	"		A79/79	54	98						
	11-12	"		A80/79	54	98						
	12-13	"		A81/79	54	98						
	13-14	Yellow orange		A82/79	54	98						
	14-15	"		A83/79	54	98						
	15-16	Yellow -dirty white		A84/79	54	98						
	16-17	"		A85/79	54	98						
				A86/79	54	98						

CAROLINE LIMESTONE DEPOSIT.

LOGS OF DRILL HOLES

HOLE NO.	DEPTH m	COLOUR	QUALITY	A. NO.	ACID SOLUBLE CaO	APPROX. TOTAL CARBONATE	CaO (ACCURATE)	MgO	CO_2	SiO_2	TOTAL Fe as Fe_2O_3	FeO
X7	0-1	white with surface material		A98/79	51	93	-					
	1-2	White		A99/79	51	93						
	2-3	"		A100/79	51	93						
	3-4	"		A101/79	54	98						
	4-5	White - very pale yellow		A102/79	54	98						
	5-6	White		A103/79	54	98						
	6-7	"		A104/79	54	98						
	7-8	"		A105/79	54	98						
	8-9	"		A106/79	54	98						
	9-10	"		A107/79	54	98						
	10-11	White - 10% yellow orange		A108/79	54	98						
	11-12	Very pale yellow		A109/79	54	98						
	12-13	White		A110/79	54	98						
X8	0-1	white with surface soil		A111/79	51	93						
	1-2	White		A112/79	54	98						
	2-3	"		A113/79	54	98						
	3-4	"		A114/79	54	98						
	4-5	"		A115/79	54	98						
	5-6	"		A116/79	54	98						
	6-7	"		A117/79	54	98						
	7-8	"		A118/79	54	98						
	8-9	White, 5-10% yellow orange		A119/79	54	98						
	9-10	Yellow-pale orange		A120/79	54	98						
	10-11	White, 10-15% yellow		A121/79	54	98						
	11-12	White, trace yellow staining		A122/79	54	98						
	12-13	White		A123/79	54	98						

CAROLINE LIMESTONE DEPOSIT.

LOGS OF DRILL HOLES

HOLE NO.	DEPTH m	COLOUR	QUALITY	A. NO.	ACID SOLUBLE CaO	APPROX. TOTAL CARBONATE	CaO (ACCURATE)	MgO	CO_2	SiO_2	TOTAL Fe as Fe_2O_3	FeO
A2	0-1	White with surface material										
	1-2	White		A124/79	52	95						
	2-3	"		A125/79	54	98						
	3-4	"		A126/79	54	98						
	4-5	"		A127/79	54	98						
	5-6	"		A128/79	54	98						
	6-7	"		A129/79	54	98						
	7-8	Very pale yellow		A130/79	54	98						
	8-9	Pale yellow		A131/79	54	98						
	9-10	"		A132/79	54	98						
	10-11	Yellow		A133/79	54	98						
	11-12	"		A134/79	54	98						
	12-13	Yellow orange		A135/79	54	98						
				A136/79	54	98						
B2	0-1	White with surface material										
	1-2	White		A137/79	54	98						
	2-3	White to very pale yellow		A138/79	55	100						
	3-4	"		A139/79	54	98						
	4-5	"		A140/79	54	98						
	5-6	"		A141/79	54	98						
	6-7	"		A142/79	54	98						
	7-8	White		A143/79	54	98						
	8-9	"		A144/79	54	98						
	9-10	"		A145/79	54	98						
	10-11	"		A146/79	54	98						
	11-12	"		A147/79	54	98						
	12-13	"		A148/79	54	98						
				A149/79	54	98						

CAROLINE LIMESTONE DEPOSIT.
LOGS OF DRILL HOLES

HOLE NO.	DEPTH m	COLOUR	QUALITY	A. NO.	ACID SOLUBLE CaO	APPROX. TOTAL CARBONATE	CaO (ACCURATE)	MgO	CO_2	SiO_2	TOTAL Fe as Fe_2O_3	FeO
C2	0-1	White		A150/79	54	98						
	1-2	"		A151/79	54	98						
	2-3	White to very pale yellow		A152/79	54	98					.24	.045
	3-4	White		A153/79	54	98					.20	.040
	4-5	"		A154/79	54	98					.22	.040
	5-6	White to very pale yellow		A155/79	54	98					.19	.040
	6-7	White		A156/79	54	98						
	7-8	"		A157/79	54	98					.20	.030
	8-9	"		A158/79	54	98					.18	.025
	9-10	"		A159/79	54	98					.17	.030
	10-11	"		A160/79	54	98					.18	.030
	11-12	"		A161/79	54	98					.19	.025
	12-13	"		A162/79	54	98					.18	.025
											.16	.045
D2	0-1	White with surface soil		A163/79	54	98						
	1-2	White		A164/79	54	98						
	2-3	"		A165/79	54	98						
	3-4	White, 10-20% yellow		A166/79	54	98						
	4-5	White		A167/79	54	98						
	5-6	"		A168/79	54	98						
	6-7	"		A169/79	54	98						
	7-8	White, 10-20% yellow		A170/79	54	98						
	8-9	White		A171/79.	54	98						
	9-10	"		A172/79	54	98						
	10-11	White, 5% yellow staining		A173/79	54	98						
	11-12	White		A174/79	54	98		-				
	12-13	"		A175/79	54	98						

CAROLINE LIMESTONE DEPOSIT.

LOGS OF DRILL HOLES

A 8

HOLE NO.	DEPTH m	COLOUR	QUALITY	A. NO.	ACID SOLUBLE CaO	APPROX. TOTAL CARBONATE	CaO (ACCURATE)	MgO	CO_2	SiO_2	TOTAL Fe as Fe_2O_3	FeO
E2	0-1	White with surface soil		A176/79	46	84						
	1-2	White		A177/79	54	98						
	2-3	Very pale yellow		A178/79	54	98						
	3-4	"		A179/79	54	98						
	4-5	Pale yellow-yellow orange		A180/79	54	98						
	5-6	"		A181/79	54	98						
	6-7	Pale yellow		A182/79	54	98						
	7-8	"		A183/79	54	98						
	8-9	White, trace of yellow staining		A184/79	54	98						
	9-10	"		A185/79	54	98						
	10-11	"		A186/79	54	98						
	11-12	Yellow		A187/79	54	98						
	12-13	White, trace of yellow staining		A188/79	55	100						
F2	0-1	White		A189/79	54	98						
	1-2	"		A190/79	54	98						
	2-3	White, 10% yellow		A191/79	54	98						
	3-4	Yellow		A192/79	54	98						
	4-5	"		A193/79	54	98						
	5-6	Pale yellow		A194/79	54	98						
	6-7	White		A195/79	54	98						
	7-8	"		A196/79	54	98						
	8-9	"		A197/79	54	98						
	9-10	White, trace of yellow staining		A198/79	54	98						
	10-11	Yellow/orange		A199/79	54	98						
	11-12	"		A200/79	54	98						
	12-13	Yellow, white at base		A201/79	54	98						

CAROLINE LIMESTONE DEPOSIT.
LOGS OF DRILL HOLES

HOLE NO.	DEPTH m	COLOUR	QUALITY	A. NO.	ACID SOLUBLE CaO	APPROX. TOTAL CARBONATE	CaO (ACCURATE)	MgO	CO_2	SiO_2	TOTAL Fe as Fe_2O_3	FeO
X5	0-1	Very pale yellow with surface soil		A202/79	54	98						
	1-2	White-very pale yellow		A203/79	54	98						
	2-3	"		A204/79	54	98						
	3-4	"		A205/79	54	98						
	4-5	"		A206/79	54	98						
	5-6	Pale yellow		A207/79	54	98						
	6-7	Pale yellow, 20% yellow/ orange staining		A208/79	54	98						
	7-8	White, trace yellow staining		A209/79	54	98						
	8-9	White-10% yellow		A210/79	54	98						
	9-10	White, trace yellow/ orange staining		A211/79	54	98						
	10-11	"		A212/79	54	98						
	11-12	"		A213/79	54	98						
	12-13	"		A214/79	33	61						
X9	0-1	White with surface material		A215/79	54	98						
	1-2	White		A216/79	54	98						
	2-3	"		A217/79	54	98						
	3-4	"		A218/79	54	98						
	4-5	"		A219/79	54	98						
	5-6	"		A220/79	54	98						
	6-7	"		A221/79	54	98						
	7-8	"		A222/79	54	98						
	8-9	"		A223/79	54	98						
	9-10	White-very pale yellow		A224/79	54	98						
	10-11	Pale-yellow-yellow		A225/79	54	98						
	11-12	"		A226/79	54	98						
	12-13	"		A227/79	54	98						

CAROLINE LIMESTONE DEPOSIT.

LOGS OF DRILL HOLES

HOLE NO.	DEPTH m	COLOUR	QUALITY	A. NO.	ACID SOLUBLE CaO	APPROX. TOTAL CARBONATE	CaO (ACCURATE)	MgO	CO_2	SiO_2	TOTAL Fe as Fe_2O_3	FeO
A3	0-1	Very pale yellow with surface material		A228/79	40	73						
	1-2	White		A229/79	54	98						
	2-3	"		A230/79	54	98						
	3-4	"		A231/79	54	98						
	4-5	"		A232/79	54	98						
	5-6	White, 40% yellow		A233/79	54	98						
	6-7	Pale yellow		A234/79	54	98						
	7-8	Very pale yellow		A235/79	54	98						
	8-9	Yellow		A236/79	54	98						
	9-10	Pale yellow		A237/79	54	98						
	10-11	"		A238/79	54	98						
	11-12	White		A239/79	54	98						
	12-13	Very pale yellow		A240/79	54	98						
B3	0-1	White with some surface material		A241/79	54	98						
	1-2	White		A242/79	54	98						
	2-3	"		A243/79	54	98						
	3-4	"		A244/79	54	98						
	4-5	"		A245/79	54	98						
	5-6	"		A246/79	54	98						
	6-7	"		A247/79	54	98						
	7-8	"		A248/79	54	98						
	8-9	"		A249/79	54	98						
	9-10	"		A250/79	54	98						
	10-11	"		A251/79	54	98						
	11-12	"		A252/79	54	98						
	12-13	Very pale yellow		A253/79	54	98						

CAROLINE LIMESTONE DEPOSIT.

LOGS OF DRILL HOLES

HOLE NO.	DEPTH m	COLOUR	QUALITY	A. NO.	ACID SOLUBLE CaO	APPROX. TOTAL CARBONATE	CaO (ACCURATE)	MgO	CO_2	SiO_2	TOTAL Fe as Fe_2O_3	FeO
C3	0-1	White		A254/79	54	98						
	1-2	"		A255/79	54	98						
	2-3	"		A256/79	54	98					·17	0·045
	3-4	"		A257/79	54	98					·16	0·035
	4-5	"		A258/79	54	98					·15	0·035
	5-6	"		A259/79	54	98					·15	0·020
	6-7	"		A260/79	54	98					·14	0·015
	7-8	"		A261/79	54	98					·19	0·020
	8-9	"		A262/79	54	98					·18	0·025
	9-10	"		A263/79	54	98					·17	0·025
	10-11	"		A264/79	54	98					·16	0·025
	11-12	"		A265/79	54	98					·15	0·020
	12-13	"		A266/79	54	98					·16	0·020
											·16	0·020
D3	0-1	White with surface material		A267/79	54	98						
	1-2	White		A268/79	54	98						
	2-3	"		A269/79	54	98						
	3-4	"		A270/79	54	98						
	4-5	White, 10% yellow		A271/79	54	98						
	5-6	White, very pale yellow		A272/79	54	98						
	6-7	Pale yellow		A273/79	54	98						
	7-8	White, very pale yellow		A274/79	54	98						
	8-9	White		A275/79	54	98						
	9-10	"		A276/79	54	98						
	10-11	"		A277/79	54	98						
	11-12	"		A278/79	54	98						
	12-13	"		A279/79	54	98						
	13-14	"		A280/79	54	98						
	14-15	"		A281/79	54	98						

CAROLINE LIMESTONE DEPOSIT.

LOGS OF DRILL HOLES

HOLE NO.	DEPTH m	COLOUR	QUALITY	A. NO.	ACID SOLUBLE CaO	APPROX. TOTAL CARBONATE	CaO (ACCURATE)	MgO	CO_2	SiO_2	TOTAL Fe as Fe_2O_3	FeO
E3	0-1	Very pale yellow		A282/79	54	98	54.0	.87	43.0	1.14	.23	
	1-2	Pale yellow		A283/79	54	98	54.3	.85	43.4	.41	.26	
	2-3	White, trace pale yellow		A284/79	54	98	54.4	.87	43.2	1.93	.19	
	3-4	White, 10% yellow staining		A285/79	54	98						
	4-5	White, trace yellow staining		A286/79	54	98						
	5-6	"		A287/79	54	98						
	6-7	"		A288/79	54	98	54.2	.91	43.4	.52	.16	
	7-8	Very pale yellow		A289/79	54	98						
	8-9	Pale yellow		A290/79	54	98						
	9-10	"		A291/79	54	98	54.5	.95	43.2	1.26	.21	
	10-11	Yellow		A292/79	54	98	54.1	.89	43.4	.40	.43	
F3	0-1	Surface material		A293/79	43	79						
	1-2	Pale yellow		A294/79	54	98						
	2-3	Very pale yellow		A295/79	54	98						
	3-4	White-very pale yellow		A296/79	54	98						
	4-5	"		A297/79	54	98						
	5-6	"		A298/79	54	98						
	6-7	Very pale yellow		A299/79	54	98						
	7-8	"		A300/79	54	98						
	8-9	"		A301/79	54	98						
	9-10	Yellow		A302/79	54	98						
	10-11	Very pale yellow		A303/79	54	98						

CAROLINE LIMESTONE DEPOSIT.
LOGS OF DRILL HOLES

HOLE NO.	DEPTH m	COLOUR	QUALITY	A. NO.	ACID SOLUBLE CaO	APPROX. TOTAL CARBONATE	CaO (ACCURATE)	MgO	CO_2	SiO_2	TOTAL Fe as Fe_2O_3	FeO
X4	0-1	White with surface material		A304/79	54	98						
	1-2	White		A305/79	54	98						
	2-3	"		A306/79	54	98						
	3-4	"		A307/79	54	98						
	4-5	"		A308/79	54	98						
	5-6	"		A309/79	54	98						
	6-7	White, trace yellow staining		A310/79	54	98						
	7-8	White, 40% yellow staining		A311/79	54	98						
	8-9	"		A312/79	54	98						
	9-10	White, very pale yellow		A313/79	54	98						
	10-11	Pale yellow, yellow/ orange with depth		A314/79	54	98						
X10	0-1	White, trace yellow staining		A315/79	54	98						
	1-2	"		A316/79	54	98						
	2-3	White		A317/79	54	98						
	3-4	"		A318/79	54	98						
	4-5	White, 5% yellow staining		A319/79	54	98						
	5-6	"		A320/79	54	98						
	6-7	Yellow		A321/79	54	98						
	7-8	Pale yellow		A322/79	54	98						
	8-9	White, trace yellow staining		A323/79	54	98						
	9-10	"		A324/79	54	98						
	10-11	"		A325/79	54	98						
	11-12	Pale yellow		A326/79	54	98						
	12-13	White-very pale yellow		A327/79	54	98						

CAROLINE LIMESTONE DEPOSIT.

LOGS OF DRILL HOLES

HOLE NO	DEPTH m	COLOUR	QUALITY	A. NO.	ACID SOLUBLE CaO	APPROX. TOTAL CARBONATE	CaO (ACCURATE)	MgO	CO_2	SiO_2	TOTAL Fe as Fe_2O_3	FeO
A4	0-1	White		A328/79	54	98						
	1-2	"		A329/79	54	98						
	2-3	"		A330/79	54	98						
	3-4	"		A331/79	54	98						
	4-5	"		A332/79	54	98						
	5-6	White-very pale yellow		A333/79	54	98						
	6-7	Pale yellow		A334/79	54	98						
	7-8	White-30% yellow staining		A335/79	54	98						
	8-9	Yellow		A336/79	54	98						
	9-10	"		A337/79	54	98						
	10-11	Very pale yellow 20% yellow/orange staining		A338/79	54	98						
	11-12	"		A329/79	54	98						
	12-13	"		A340/79	54	98						
B4	0-1	White		A341/79	54	98						
	1-2	"		A342/79	54	98						
	2-3	"		A343/79	54	98						
	3-4	"		A344/79	54	98						
	4-5	"		A345/79	54	98						
	5-6	"		A346/79	54	98						
	6-7	"		A347/79	54	98						
	7-8	Yellow/orange		A348/79	54	98						
	8-9	Very pale yellow		A349/79	54	98						
	9-10	"		A350/79	54	98						
	10-11	White, very pale yellow		A351/79	54	98						
	11-12	"		A352/79	54	98						
	12-13	Yellow-pale orange		A353/79	54	98						

CAROLINE LIMESTONE DEPOSIT.
LOGS OF DRILL HOLES

A15

HOLE NO.	DEPTH m	COLOUR	QUALITY	A. NO.	ACID SOLUBLE CaO	APPROX. TOTAL CARBONATE	CaO (ACCURATE)	MgO	CO_2	SiO_2	TOTAL Fe as Fe_2O_3	FeO
C4	0-1	White with some surface material		A354/79	50	91						
	1-2	White. Some dark staining (?Mn) at 11-12		A355/79	54	98						
	2-3	"		A356/79	54	98					.15	.020
	3-4	"		A357/79	54	98					.11	.020
	4-5	"		A358/79	54	98					.17	.020
	5-6	"		A359/79	54	98					.15	.015
	6-7	"		A360/79	54	98					.13	.015
	7-8	"		A361/79	54	98					.12	.015
	8-9	"		A362/79	54	98					.12	.015
	9-10	"		A363/79	54	98					.14	.015
	10-11	"		A364/79	54	98					.15	.015
	11-12	"		A365/79	54	98					.16	.020
	12-13	"		A366/79	54	98					.16	.025
D4	0-1	White with surface material									.15	.015
	1-2	White		A367/79	54	98						
	2-3	"		A368/79	54	98						
	3-4	"		A369/79	54	98						
	4-5	"		A370/79	54	98						
	5-6	"		A371/79	54	98						
	6-7	"		A372/79	54	98						
	7-8	"		A373/79	54	98						
	8-9	"		A374/79	54	98						
	9-10	White-very pale yellow		A375/79	54	98						
	10-11	"		A376/79	54	98						
	11-12	"		A377/79	54	98						
	12-13	"		A378/79	54	98						
	13-14	"		A379/79	52	95						
	14-15	White, 10% yellow		A380/79	54	98						
				A381/79	54	98						

CAROLINE LIMESTONE DEPOSIT.

LOGS OF DRILL HOLES

HOLE NO.	DEPTH m	COLOUR	QUALITY	A. NO.	ACID SOLUBLE CaO	APPROX. TOTAL CARBONATE	CaO (ACCURATE)	MgO	CO_2	SiO_2	TOTAL Fe as Fe_2O_3	FeO
E4	0-1	White with surface material		A382/79	54	98						
	1-2	White, trace pale yellow		A383/79	54	98						
	2-3	"		A384/79	54	98						
	3-4	Very pale yellow		A385/79	54	98						
	4-5	Pale yellow		A386/79	54	98						
	5-6	White		A387/79	54	98						
	6-7	Very pale yellow		A388/79	54	98						
	7-8	White-very pale yellow		A389/79	54	98						
	8-9	"		A390/79	54	98						
	9-10	"		A391/79	54	98						
	10-11	Pale yellow		A392/79	54	98						
X3	0-1	White		A393/79	54	98						
	1-2	"		A394/79	54	98						
	2-3	White, trace pale yellow		A395/79	54	98						
	3-4	"		A396/79	54	98						
	4-5	"		A397/79	54	98						
	5-6	White		A398/79	54	98						
	6-7	"		A399/79	54	98						
	7-8	White, trace pale yellow		A400/79	54	98						
	8-9	"		A401/79	54	98						
	9-10	"		A402/79	54	98						
	10-11	"		A403/79	54	98						
	11-12	"		A404/79	54	98						
	12-13	"		A405/79	54	98						

CAROLINE LIMESTONE DEPOSIT.

LOGS OF DRILL HOLES

HOLE NO.	DEPTH m	COLOUR	QUALITY	A NO.	ACID SOLUBLE CaO	APPROX. TOTAL CARBONATE	CaO (ACCURATE)	MgO	CO_2	SiO_2	TOTAL Fe as Fe_2O_3	FeO
X11	0-1	White, some surface material		A406/79	54	98						
	1-2	White		A407/79	54	98						
	2-3	"		A408/79	54	98						
	3-4	"		No sample								
	4-5	"		A409/79	54	98						
	5-6	White, 10% yellow		A410/79	54	98						
	6-7	White-very pale yellow		A411/79	54	98						
	7-8	"		A412/79	54	98						
	8-9	White, 10% yellow/ orange		A413/79	54	98						
	9-10	White-very pale yellow		A414/79	54	98						
	10-11	Pale yellow/orange		A415/79	54	98						
A5	0-1	White		A416/79	54	98						
	1-2	"		A417/79	54	98						
	2-3	"		A418/79	54	98						
	3-4	"		A419/79	54	98						
	4-5	"		A420/79	54	98						
	5-6	"		A421/79	54	98						
	6-7	"		A422/79	54	98						
	7-8	White trace yellow staining		A423/79	54	98						
	8-9	"		A424/79	54	98						
	9-10	White		A425/79	54	98						
	10-11	"		A426/79	54	98						
	11-12	"		A427/79	54	98						
	12-13	"		A428/79	54	98						

CAROLINE LIMESTONE DEPOSIT.

LOGS OF DRILL HOLES

HOLE NO.	DEPTH m	COLOUR	QUALITY	A. NO.	ACID SOLUBLE CaO	APPROX. TOTAL CARBONATE	CaO (ACCURATE)	MgO	CO_2	SiO_2	TOTAL Fe as Fe_2O_3	FeO
B5	0-1	White with surface material		A429/79	52	95						
	1-2	White		A430/79	54	98						
	2-3	"		A431/79	54	98						
	3-4	"		A432/79	54	98						
	4-5	"		A433/79	54	98						
	5-6	"		A434/79	54	98						
	6-7	White-very pale yellow		A435/79	54	98						
	7-8	Pale yellow		A436/79	54	98						
	8-9	Yellow		A437/79	54	98						
	9-10	"		A438/79	54	98						
	10-11	Pale yellow		A439/79	54	98						
	11-12	"		A440/79	54	98						
	12-13	"		A441/79	54	98						
C5	0-1	White		A442/79	54	98						
	1-2	"		A443/79	54	98						
	2-3	"		A444/79	54	98						
	3-4	"		A445/79	54	98						
	4-5	"		A446/79	54	98						
	5-6	"		A447/79	54	98						
	6-7	"		A448/79	52	95						
	7-8	"		A449/79	52	95						
	8-9	"		A450/79	54	98						
	9-10	"		A451/79	54	98						
	10-11	Very pale yellow		A452/79	54	98						
	11-12	White, trace pale yellow		A453/79	54	98						
	12-13	"		A454/79	54	98						

CAROLINE LIMESTONE DEPOSIT.

LOGS OF DRILL HOLES

HOLE NO.	DEPTH m	COLOUR	QUALITY	A. NO.	ACID SOLUBLE CaO	APPROX. TOTAL CARBONATE	CaO (ACCURATE)	MgO	CO_2	SiO_2	TOTAL Fe as Fe_2O_3	FeO
D5	0-1	White		A455/79	54	98					.17	.015
	1-2	"		A456/79	54	98					.15	.010
	2-3	"		A457/79	54	98					.13	.010
	3-4	"		A458/79	54	98					.12	.010
	4-5	"		A459/79	54	98					.13	.010
	5-6	"		A460/79	54	98					.17	.010
	6-7			A461/79	54	98					.13	.015
	7-8	"		A462/79	54	98					.13	.010
	8-9	"		A463/79	54	98					.13	.010
	9-10	"		A464/79	54	98					.17	.010
	10-11	"		A465/79	54	98					.17	.015
	11-12	"		A466/79	54	98					.24	.045
	12-13	"		A467/79	54	98						
	13-14	"		A468/79	54	98						
	14-15	"										
E5	0-1	Mostly surface material		A469/79	50	91	51.1	.76	40.5	2.88	.40	
	1-2	White		A470/79	54	98						
	2-3	"		A471/79	54	98						
	3-4	"		A472/79	54	98						
	4-5	White, trace pale yellow		A473/679	54	98	54.5	.85	43.6	.48	.16	
	5-6	White		A474/79	54	98						
	6-7	"		A475/79	54	98						
	7-8	"		A476/79	54	98						
	8-9	"		A477/79	54	98						
	9-10	White, trace yellow staining		A478/79	54	98	54.6	.79	43.6	.38	.12	
	10-11	"		A479/79	54	98						
	11-12	White		A480/79	54	98						
	12-13	"		A481/79	54	98	54.2	.89	43.1	.63	.14	

CAROLINE LIMESTONE DEPOSIT.
LOGS OF DRILL HOLES

HOLE NO.	DEPTH m	COLOUR	QUALITY	A NO.	ACID SOLUBLE CaO	APPROX. TOTAL CARBONATE	CaO (ACCURATE)	MgO	CO_2	SiO_2	TOTAL Fe as Fe_2O_3	A 20 FeO
X12	0-1	white with surface material		A482/79	35	64						
	1-2	White (some surface material)		A483/79	54	98						
	2-3	Very pale yellow with some surface material		A484/79	52	95						
	3-4	Orange yellow		A485/79	54	98						
	4-5	"		A486/79	54	98						
A6	0-1	White		A487/79	54	98						
	1-2	"		A488/79	54	98						
	2-3	"		A489/79	54	98						
	3-4	"		A490/79	54	98						
	4-5	"		A491/79	54	98						
B6	0-1	Mostly surface material										
	1-2	White		A492/79	49	89						
	2-3	"		A493/79	54	98						
	3-4	"		A494/79	54	98						
	4-5	"		A495/79	54	98						
	5-6	Pale yellow		A496/79	54	98						
	6-7	"		A497/79	54	98						
	7-8	"		A498/79	54	98						
	8-9	Pale yellow/orange		A499/79	54	98						
	9-10	"		A500/79	54	98						
	10-11	"		A501/79	54	98						
	11-12	White-very pale yellow		A502/79	54	98						
	12-13	"		A503/79	52	95						
				A504/79	52	95						

CAROLINE LIMESTONE DEPOSIT.

LOGS OF DRILL HOLES

HOLE NO.	DEPTH m	COLOUR	QUALITY	A. NO.	ACID SOLUBLE CaO	APPROX. TOTAL CARBONATE	CaO (ACCURATE)	MgO	CO_2	SiO_2	TOTAL Fe as Fe_2O_3	FeO
C6	0-1	White with surface material		A505/79	54	98						
	1-2	White with trace of surface material		A506/79	54	98						
	2-3	White		A507/79	54	98						
	3-4	"		A508/79	54	98						
	4-5	"		A509/79	54	98						
	5-6	"		A510/79	54	98						
	6-7	"		A511/79	54	98						
	7-8	White?		NO SAMPLE								
	8-9	"		NO SAMPLE								
D6	0-1	White, some surface material										
	1-2	White		A527/79	54	98						
	2-3	"		A528/79	54	98						
	3-4	"		A529/79	54	98						
	4-5	"		A530/79	54	98						
	5-6	"		A531/79	54	98						
	6-7	"		A532/79	54	98						
	7-8	"		A533/79	54	98						
	8-9	"		A534/79	54	98						
	9-10	"		A535/79	54	98						
	10-11	"		A536/79	54	98						
	11-12	"		A537/79	54	98						
	12-13	"		A538/79	54	98						
	13-14	"		A539/79	54	98						
	14-15	"		A540/79	54	98						
	15-16	"		A541/79	54	98						
	16-17	"		A542/79	54	98						
				A543/79	54	98						

CAROLINE LIMESTONE DEPOSIT.

LOGS OF DRILL HOLES

HOLE NO.	DEPTH m	COLOUR	QUALITY	A. NO.	ACID SOLUBLE CaO	APPROX. TOTAL CARBONATE	CaO (ACCURATE)	MgO	CO_2	SiO_2	TOTAL Fe as Fe_2O_3	FeO
X1	0-1	White, some surface material		A512/79	54	98						
	1-2	White		A513/79	54	98						
	2-3	"		A514/79	54	98						
	3-4	"		A515/79	54	98						
	4-5	"		A516/79	54	98						
	5-6	"		A517/79	54	98						
	6-7	"		A518/79	54	98						
	7-8	"		A519/79	54	98						
	8-9	"		A520/79	54	98						
	9-10	"		A521/79	54	98						
	10-11	"		A522/79	54	98						
	11-12	"		A523/79	54	98						
	12-13	"		A524/79	54	98						
	13-14	"		A525/79	54	98						
	14-15	"		A526/79	54	98						
E6	0-1	White, some surface material		A544/79	54	98						
	1-2	White		A545/79	54	98						
	2-3	"		A546/79	54	98						
	3-4	"		A547/79	54	98						
	4-5	"		A548/79	54	98						
	5-6	"		A549/79	54	98						
	6-7	"		A550/79	54	98						
	7-8	"		A551/79	54	98						
	8-9	"		A552/79	54	98						
	9-10	"		A553/79	54	98						
	10-11	"		A554/79	54	98						
	11-12	"		A555/79	54	98						
	12-13	"		A556/79	54	98						

CAROLINE LIMESTONE DEPOSIT.

LOGS OF DRILL HOLES

HOLE NO.	DEPTH m	COLOUR	QUALITY	A NO.	ACID SOLUBLE CaO	APPROX. TOTAL CARBONATE	CaO (ACCURATE)	MgO	CO_2	SiO_2	TOTAL Fe as Fe_2O_3	FeO
X2	0-1	Mostly surface material		A557/79	54	98						
	1-2	White		A558/79	47	86						
	2-3	"		A559/79	54	98						
	3-4	"		A560/79	52	95						
	4-5	"		A561/79	54	98						
	5-6	"		A562/79	54	98						
	6-7	"		A563/79	54	98						
	7-8	"		A564/79	54	98						
	8-9	"		A565/79	54	98						
	9-10	"		A566/79	54	98						
	10-11	"		A567/79	54	98						
	11-12	"		A568/79	54	98						
	12-13	"		A569/79	54	98						
X14	0-1	White, some surface material		A570/79	52	95						
	1-2	White		A571/79	54	98						
	2-3	"		A572/79	54	98						
	3-4	"		A573/79	54	98						
	4-5	"		A574/79	54	98						
	5-6	"		A575/79	54	98						
	6-7	"		A576/79	54	98						
	7-8	"		A577/79	54	98						
	8-9	Pale yellow		A578/79	54	98						
	9-10	"		A579/79	54	98						
	10-11	Yellow/orange		A580/79	54	98						

CAROLINE LIMESTONE DEPOSIT.

LOGS OF DRILL HOLES

A 24

HOLE NO.	DEPTH m	COLOUR	QUALITY	A. NO.	ACID SOLUBLE CaO	APPROX. TOTAL CARBONATE	CaO (ACCURATE)	MgO	CO_2	SiO_2	TOTAL Fe as Fe_2O_3	FeO
X13	0-1	Mostly surface material		A581/79	40	73						
	1-2	White		A582/79	54	98						
	2-3	"		A583/79	54	98						
	3-4	"		A584/79	54	98						
	4-5	"		A585/79	54	98						
	5-6	"		A586/79	54	98						
	6-7	"		A587/79	54	98						
	7-8	"		A588/79	54	98						
	8-9	White-pale yellow		A589/79	54	98						
	9-10	Very pale yellow		A590/79	54	98						
	10-11	White		A591/79	52	95						
	11-12	Very pale yellow		A592/79	54	98						
	12-13	Pale yellow		A593/79	54	98						
A7	0-1	white with much surface material		A594/79	50	91						
	1-2	White		A595/79	54	98						
	2-3	Very pale yellow		A596/79	54	98						
	3-4	White		A597/79	54	98						
	4-5	Very pale yellow		A598/79	54	98						
	5-6	Pale yellow		A599/79	54	98						
	6-7	Pale yellow, with yellow/orange staining		A600/79	54	98						
	7-8	Yellow-yellow/orange		A601/79	54	98						
	8-9	"		A602/79	54	98						

CAROLINE LIMESTONE DEPOSIT.

LOGS OF DRILL HOLES

A25

HOLE NO.	DEPTH m	COLOUR	QUALITY	A. NO.	ACID SOLUBLE CaO	APPROX. TOTAL CARBONATE	CaO (ACCURATE)	MgO	CO_2	SiO_2	TOTAL Fe as Fe_2O_3	FeO
B7	0-1	White		A603/79	52	95						
	1-2	"		A604/79	54	98						
	2-3	"		A605/79	54	98						
	3-4	"		A606/79	54	98						
	4-5	"		A607/79	54	98						
	5-6	"		A608/79	54	98						
	6-7	"		A609/79	54	98						
	7-8	"		A610/79	54	98						
	8-9	"		A611/79	54	98						
	9-10	White, trace yellow staining		A612/79	54	98						
	10-11	White, trace pale yellow staining		A613/79	54	98						
	11-12	"		A614/79	52	95						
	12-13	"		A615/79	54	98						
C7	0-1	White with some surface material		A616/79	50	91						
	1-2	White		A617/79	52	95						
	2-3	"		A618/79	54	98						
	3-4	"		A619/79	54	98						
	4-5	"		A620/79	54	98						
	5-6	"		A621/79	54	98						
	6-7	"		A622/79	54	98						
	7-8	"		A623/79	54	98						
	8-9	"		A624/79	54	98						
	9-10	White-very pale yellow		A625/79	50	91						
	10-11	"		A626/79	54	98						
	11-12	Very pale yellow-10% yellow staining		A627/79	54	98						
	12-13	Pale yellow		A628/79	54	98						

CAROLINE LIMESTONE DEPOSIT.

LOGS OF DRILL HOLES

HOLE NO.	DEPTH m	COLOUR	QUALITY	A. NO.	ACID SOLUBLE CaO	APPROX TOTAL CARBONATE	CaO (ACCURATE)	MgO	CO_2	SiO_2	TOTAL Fe as Fe_2O_3	FeO
D7	0-1	Surface material		A629/79	44	80						
	1-2	White		A630/79	54	98						
	2-3	"		A631/79	54	98						
	3-4	"		A632/79	54	98						
	4-5	"		A633/79	54	98						
	5-6	"		A634/79	54	98						
	6-7	"		A635/79	54	98						
	7-8	"		A636/79	54	98						
	8-9	"		A637/79	54	98						
	9-10	"		A638/79	54	98						
	10-11	"		A639/79	54	98						
	11-12	"		A640/79	54	98						
	12-13	"		A641/79	54	98						
E7	0-1	White		A642/79	54	98	53.6	.93	43.0	1.40	.15	
	1-2	"		A643/79	54	98						
	2-3	"		A644/79	54	98						
	3-4	"		A645/79	54	98						
	4-5	"		A646/79	54	98	54.4	.93	43.7	.57	.12	
	5-6	"		A647/79	54	98						
	6-7	"		A648/79	54	98						
	7-8	"		A649/79	54	98						
	8-9	"		A650/79	54	98	54.4	.93	43.6	.51	.11	
	9-10	"		A651/79	54	98						
	10-11	"		A652/79	54	98	53.8	.95	43.2	.65	.14	
	11-12	"		A653/79	54	98						
	12-13	"		A654/79	54	98	54.4	.95	43.6	.39	.12	

Bore No.
7022 002 OW 00538

DEPARTMENT OF MINES — SOUTH AUSTRALIA

SHEET 1 OF 2.

BORE LOG • HYDROGEOLOGY

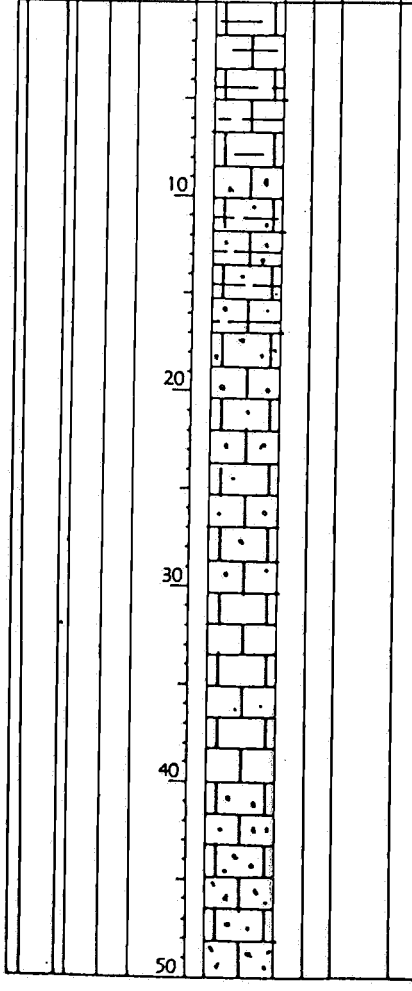
Purpose of Bore: Observation Bore CAR 22 (2X)
Hundred: Caroline
Section: Adj. 538
State No.
Bore Serial No.: 54/71
Owner: Dept. of Mines
Address:
Project No.
Driller: A.H. Ferguson
Docket No.: 231/69
Commenced: 19/4/71
Completed: 21/4/71
R.L. Collar (M.S.L.)
Depth: 93 feet
Drill type
Circulation
R.L. Surface
Co-ords E
Logged by: M.A. Cobb
Date: 16/6/71
Casing: 72' 10" of 10"
N

WATERS CUT

DEPTH (FT)	WATER LEVEL (FT)	SUPPLY (G.P.H.)	HOW TESTED	TOTAL SALTS PPM	ANALYSIS No.
60'	57'0"				

REMARKS: Grid Observation Bore CAR 22 (2X)

1 CASING	2 WATERS CUT	3 WATER LEVEL	4 DEPTH (FT)	5 CORE	6 GRAPHIC LOG	7 AGE	8 UNIT	9 PENETRATION RATE	10 DESCRIPTION



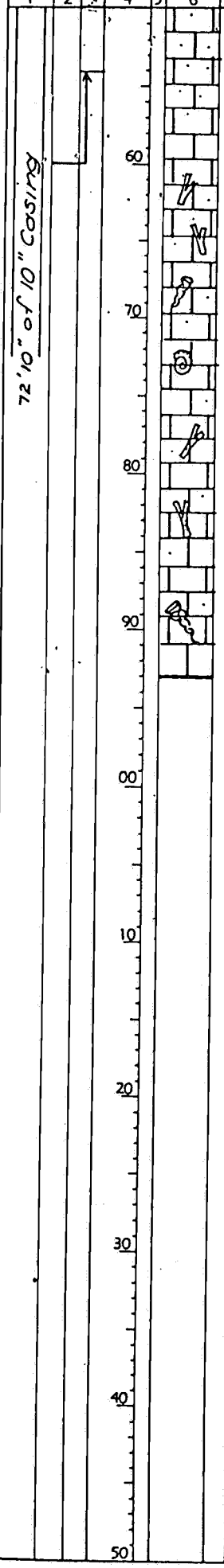
0-93 CALCARENITE Off white- buff
Average grain size 1mm. Some clay and well rounded quartz grains (1mm).
Bryazoa common and some shell fragments
Soft and friable

About 5% quartz

Odd organic tubules

5 - 10% quartz

1 2 3 4 5 6 7 8 9 10 · State No. . . . . SHEET 2. OF 2.



Compact when dry

Pale yellow - buff. Essentially bryazoal and shell fragments. Somewhat coarser grained 1·0mm - 2mm. Little quartz sand

End of Hole.

Bore No. 7022 002 OW 00541

DEPARTMENT OF MINES SOUTH AUSTRALIA

HYDROGEOLOGY SECTION

BORE LOG

HIRER DAM

Drill type Cable Tool
Circulation Water
Driller N.F. McMinn
Start 12.2.75.
Finish 17.2.75.

Logged by Fred.W.Aslin
Date logged 22.10.75.
Bore Diameter 152 mm
DEPTH 30.34 (m)

A.M.G. Zone
Coords E
" N
Datum Elev M S L Pt Adel
Rel. Pt Elev 22.777m T.O.C
Surface Elev 21.791m

HUNDRED Caroline
SECTION Adj. 538
STATE No 28605 3804
Project No. CAR 35
Docket No 231/38/69
Bore Serial No 154/75

Depth to Water cut m	Depth to standing water m	SUPPLY Litres/sec	SUPPLY Method of test	TOTAL DISSOLVED SOLIDS Milligrammes/litre	TOTAL DISSOLVED SOLIDS Analysis W No.
16.84	16.54		Hole depth 18.0	205	1550/75 pH 7.6
16.84	16.54		" " 30.0	294	1551/75 pH 7.8 Full

REMARKS Permit N° B256 Tubes 20.0–20.38, 30.0–30.34m

CASING: 30.0 m of 76mm PVC

WATERS CUT

WATER LEVEL

DEPTH (m)

CORE

GRAPHIC LOG

AGE: Oligo-Miocene

UNIT: Gambier Limestone

DEPTH (m) From	To	DESCRIPTION
0	0.1	Quartz arenite 0.1–1.0 mm (Av 0.2 mm) subangular to sub.rounded. colourless & orange stained. Organic matter. silty (brown) 20% Fossiliferous calcarenite as strongly cemented angular bryozoal fragments to 3.5 cm. white
1.0	4.0	50% Calcisiltite white 50% Fossiliferous calcarenite, white, as unconsolidated bryozoa fragments to 2mm (Av. 1mm) 0.1–2.0 Trace fine quartz arenite
4.0	10.0	Fossiliferous calcarenite, off white - cream, weak to moderately cemented. Minor yellow stain. Bryozoa fragments to 4mm (Av. 1mm) 30–40% Calcisiltite, off white - cream.
10.0	17.0	50% Fossiliferous Calcarenite, off white as unconsolidated bryozoa fragments to 4mm (Av. 1mm) 50% Calcisiltite off white

Drn:

Date:

Sheet 1 of 2

Bore Folder No. 3469

DEPARTMENT OF MINES — SOUTH AUSTRALIA

CASING: Bottom 6.00m slotted 30.0m of 76mm PVC

WATER STRUT | WATER LEVEL | DEPTH (m) | CORE | GRAPHIC LOG | AGE | UNIT

DEPTH (m) from	to	DESCRIPTION
17.0	30.0	Fossiliferous calcarenite, off white & yellow stained weakly cemented, bryozoal. Minor calcisiltite, white.
		Tube 20.0 – 20.38m as above but with full cementation range
		shelly (as well as bryozoal) below 22m 22.0 – 24.0 full cementation range.
		Tube 30.0 – 30.34 Fossiliferous calcarenite, off white full cementation range, bryozoal, minor yellow stain, minor calcisiltite.
		End of hole 30.34m.

Oligo-Miocene

Gambier Limestone

Borehole State No. 286053804

Drn.

Date

Sheet 2 of 2

Bore Folder No. 3469

Bore No. 7022 002 WW 00542

DEPARTMENT OF MINES SOUTH AUSTRALIA
HYDROGEOLOGY SECTION

BORE LOG

HIRER K.McEACHERN, BOX 98, MT. GAMBIER
Drill type CABLE TOOL
Circulation WATER
Driller J.R. DAVIDSON
Start 30/3/75
Finish 30/3/75
Logged by J.R. DAVIDSON
Date logged 6/8/76
Bore Diameter 15.2mm
DEPTH 30m
A.M.G. Zone
Coords. E
" N
Datum Elev
(m) Ref. Pt Elev
Surface Elev
HUNDRED CAROLINE
SECTION 538
STATE No. 286053905
Project No.
Docket No.
Bore Serial No.

Depth to Water cut m	Depth to standing water m	SUPPLY litres/sec	SUPPLY Method of test	TOTAL DISSOLVED SOLIDS Milligrammes/litre	TOTAL DISSOLVED SOLIDS Analysis W No
16m	16m	0.75		215 CONDUCTIVITY 440	W2918/75

REMARKS

Temporary No. WC08 Drilled to supply Stock
Unit No. 7022002WW00542

CASING: 2m of 152mm PVC

DEPTH (m) from	to	DESCRIPTION
0	18m	FOSSILIFEROUS CALCARENITE - white, unconsolidated. Well preserved Bryozoa to 10mm. 30% Calcisilitite - White
		40% Calcisiltite - White
		20% Calcisiltite - White

GRAPHIC LOG: 0, 5, 10, 15
UNIT: GAMBIER LIMESTONE

Drn
Date:
Sheet 1 of 2
Bore Folder No. 039564

DEPARTMENT OF MINES — SOUTH AUSTRALIA

CASING | WATERS CUT | WATER LEVEL | DEPTH (m) | CORE | GRAPHIC LOG | AGE | UNIT

DEPTH (m) from	to	DESCRIPTION
18m	27m	FOSSILIFEROUS CALCARENITE - offwhite to ironstained, strongly cemented to unconsolidated. Bryozoa and shelly material to 5mm. Fossils larger than previous 18m. 5 -10% Calcisilitite - white Traces of glauconite
27m	30m	CALCARENITE - off white, strongly cemented. 5% Fossiliferous CALCARENITE-As above
		END OF HOLE 30m

UNIT: GABTER

Borehole State No. 7022002 / 00542

Drn | Sheet 2 of 2

Date | Bore Folder No 03565

Bore No. 7022 002 OW 00544

DEPARTMENT OF MINES SOUTH AUSTRALIA
HYDROGEOLOGY SECTION

BORE LOG

HIRER *Dept. of Mines.*

Drill type *Cable Tool*
Circulation *Water*
Driller *R.J. Darby*
Start *14.1.74*
Finish *16.1.74*

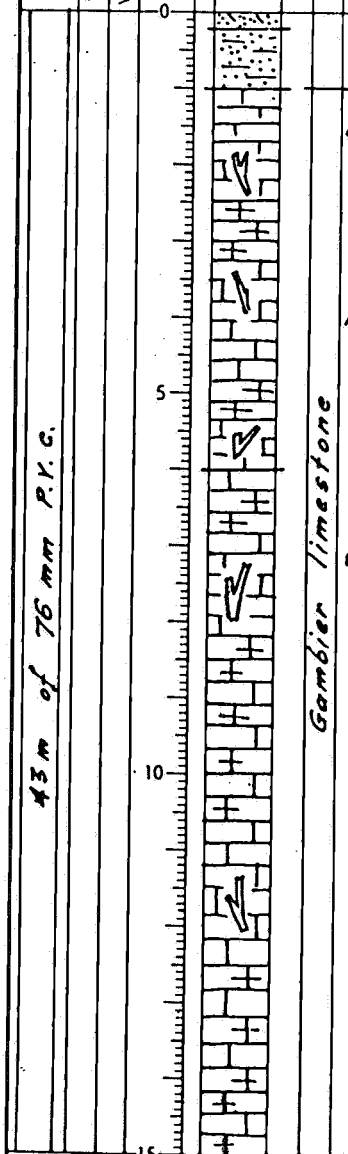
Logged by *F.W. Aslin*
Date logged *23.10.74*
Bore Diameter *152mm*
DEPTH *43.0 m*

A.M.G. Zone
Coords. E
" N
Datum Elev. *M.S.L.*
(m) Ref. Pt. Elev. *29.313*
Surface Elev. *28.563*

HUNDRED *CAROLINE*
SECTION *539*
STATE No. *286053902*
Project No. *CAR 26*
Docket No.
Bore Serial No.

Depth to Water cut (m)	Depth to standing water (m)	SUPPLY		TOTAL DISSOLVED SOLIDS	
		litres/sec.	Method of test	Milligrammes/litre	Analysis W. No.
28.0	26.52 (after development)	1.3	Bailer for one hour	390	8042/74
28.0	26.52			348	938/74 (final)

REMARKS *Permit A 535*



DEPTH (m) from	to	DESCRIPTION
0	0.2	QUARTZ ARENITE <0.1 – 1.5m (Av. 0.2mm) angular to subrounded, colourless (minor orange staining) organic matter.
0.2	1.0	LUTITE orange-brown.
		0.2 – 0.5 10–15% quartz arenite as above. Minor ferruginous nodules to 8 mm. organic matter.
		0.5 – 1.0 5% quartz arenite as above 5% calcarenite, off white.
1.0	6.0	FOSSILIFEROUS CALCARENITE cream paling to off white with depth. Weak to moderately cemented bryozoa fragments to 4 mm.
		1.0 – 2.0 40% calcisiltite, cream.
		2.0 – 6.0 20-30% calcisiltite off white. Odd strongly cemented angular calcarenite & shell fragments.
6.0	16.0	50% fossiliferous calcarenite, off white weakly cemented bryozoa fragments to 3 mm & shell fragments to 1cm.
		50% calcisiltite off white
		8.0 – 16.0 odd strongly cemented, angular. Shell absent.

Drn: B. S. G. | Sheet 1 of 3
Date: 6.11.74 | Bore Folder No. 51/-

DEPARTMENT OF MINES — SOUTH AUSTRALIA

CASING | WATERS CUT | WATER LEVEL | DEPTH (m) | CORE | GRAPHIC LOG | AGE | UNIT

43 m of 76 mm PVC

15 20 25 30 35 40

Limestone. Gambier

DEPTH (m) from	to	DESCRIPTION
16·0	22·0	Fossiliferous calcarenite, weakly cemented, as half off white & half mustard yellow. 30-40% Calcisiltite, mustard yellow. Below 18·0m white calcarenite absent.
22·0	26·0	50% fossiliferous calcarenite, weakly cemented, cream, bryozoa fragments to 3 mm. 50% Calcisiltite, cream.
26·0	28·0	Fossiliferous calcarenite, cream, full cementation range, fossil fragments to 5 mm 30-40% Calcisiltite, cream.
28·0	34·0	Fossiliferous calcarenite, off white, cream, moderate to strongly cemented, fossil fragments to 1 cm. Minor calcisiltite. 32·0 – 34·0 weakly cemented.
34·0	43·0	Fossiliferous calcarenite, off white, minor yellow staining, full cementation range. Trace silt. Fossil fragments to 7 mm.

Borehole State No. 286053902

Drn. B.S.G. | Sheet 2 of 3

Date 6·11·74 | Bore Folder No. 51/.

DEPARTMENT OF MINES — SOUTH AUSTRALIA

CASING	WATERS CUT	WATER LEVEL	DEPTH (m)	CORE	GRAPHIC LOG	AGE	UNIT	DEPTH (m) from	to	DESCRIPTION
Slotted between 37 and 43 m			40				Gambier limestone			END OF HOLE 43.0 m

Borehole State No. 286053902

Drn. R.S.G. | Sheet 3 of 3

Date 6·11·74 | Bore Folder No. 51/-

Bore No. 7022 002 OW 545

DEPARTMENT OF MINES SOUTH AUSTRALIA

HYDROGEOLOGY SECTION

BORE LOG

HIRER *Dept. of Mines.*

Drill type *Cable Tool*
Circulation *Water*
Driller *R. J. Darby.*
Start *10. 1. 74*
Finish *11. 1. 74*

Logged by *F.W. Aslin*
Date logged *25. 10. 74*
Bore Diameter *152 mm*
DEPTH *40.0 m*

AMG Zone
Coords E
N
Datum E.s. *M.S.L.*
m Ref P. E.s *24.120*
Surface E.s *23.534*

HUNDRED *CAROLINE*
SECTION *539*
STATE No *286053903*
Project No *CAR 27*
Docket No
Bore Serial No

Depth to Water cut m	Depth to standing water m	SUPPLY: Litres sec	SUPPLY: Method of test	TOTAL DISSOLVED SOLIDS: Milligrammes litre	TOTAL DISSOLVED SOLIDS: Analysis W No
24.0	22.52			560	8043/74
24.0	22.0	1.3	Bailer for 1 hour	597	437/74 full.

REMARKS *Permit 534.*

CASING: 40 m of 76 mm PVC

WATERS CUT

WATER LEVEL

DEPTH (m)

CORE

GRAPHIC LOG

AGE

UNIT: Gambier limestone.

DEPTH (m) from	to	DESCRIPTION
0	0.5	50% quartz arenite 0.1 – 0.2 mm angular to subrounded orange stained.
		50% fossiliferous calcarenite, off white, weakly cemented. Bryozoa fragments to 4 mm. Organic matter.
0.5	4.0	50% fossiliferous calcarenite, off white weakly cemented
		50% calcisiltite, creamy brown
4.0	8.0	fossiliferous calcarenite, as above
		40% calcisiltite, cream.
		6.0 – 8.0 both paled to off white.
8.0	24.0	50% fossiliferous calcarenite, as above, off white
		50% calcisiltite, off white.

Drn *R. S. G.* | Sheet *1* of *2*

Date *11. 11. 74* | Bore Folder No. *49/-*

APPENDIX B

Chemical analyses and physical properties of limestone from Honeysuckle and Marte. Extracted from AMDEL reports.

MD 265/80 by Lyn J. Day, - for samples.
A2457/79 - A2550/79.

MD 4576/81 by Lyn J. Day, - for samples.
A468/81, A671/81, A672/81.

SAMPLE DESCRIPTION

Sample No.	Location	Testing
A2547/79 (≡ RS37)	Honeysuckle Flat Limestone Deposit. Near B5.	Chemical analysis, brightness, specific gravity, bulk density.
A2548/79 (≡ RS38)	Honeysuckle Flat Limestone Deposit. Near C5.	Chemical analysis, brightness, specific gravity, bulk density.
A2549/79 (≡ RS41)	Marte Limestone Deposit. Southern end.	Chemical analysis, brightness.
A2550/79 (≡ RS40)	Marte Limestone Deposit. Northern end.	Chemical analysis, brightness.
A468/81	Honeysuckle Flat Limestone Deposit. Channel sample down quarry face.	Chemical analysis, brightness.
A671/81	Honeysuckle Flat Limetone Deposit. Stockpile by pit.	Brightness.
A672/81	Honeysuckle Flat Limestone Deposit. Stockpile by northern fence.	Brightness.

PROCEDURES

Samples A2547/79 - A2550/79 were analysed using wet chemical methods and X-ray fluorescence spectrometry. Chemical analysis of sample A468/81 was determined using inductively coupled plasma atomic emission spectroscopy.

Portions were milled to less than 75 millimetres for brightness determination by Zeiss Elrepho electric reflectance photometer. Brightness quoted is at 457 nanometres, using the R457 filter. Yellowness quoted is the difference between R457 and R57 values.

Specific gravities were determined using 25 millilitre specific gravity bottles with tetrachloroethylene. Entrained air was removed by evacuation. Individual temperature corrections were applied.

RESULTS

Results of physical and chemical testing are given in Table 1.

Total carbonate contents, as calculated from analytical results are given in Table 2.

Calculation of total Carbonate Content

Carbonate content can be calculated assuming either:

a) All MgO is present as dolomite, or
b) All CaO is present as calcite.

Petrography has shown trace amounts of dolomite in some samples but no other significant Mg bearing minerals.

In this report, all MgO has been assumed to be present as carbonate, and has been calculated as dolomite.

Calculation of total carbonate where MgO determined:

Example A2547/79 CaO 53.1 ; MgO 0.80 ; CO_2 42.7

All MgO in dolomite

$$0.8 \times \frac{100}{21.7} = 3.7\ \%\ \text{dolomite}$$

Requires 1.12% CaO and 1.77% CO_2

Leaving 51.98% CaO and 40.93% CO_2

Assume all CaO is in calcite

$$\frac{51.98}{56} \times 100 = 92.8\%\ \text{calcite}$$

Requires $92.8 \times \frac{44}{100} = 40.83\%\ CO_2$

Leaving 0.1% excess CO_2

TOTAL CARBONATE 92.8 x 3.7 = 96.5%

In general, after removing dolomite, CaO and CO_2 contents are compatible assuming both are contained in calcite.

In a few cases, excess CaO (eg A468/81 1.7% excess CaO) may be contained in trace amounts of feldspar reported in petrographic examination.

Calculation of total carbonate where MgO not determined 25 samples from Honeysuckle Flat and Marte averaged 0.87% MgO, ranging from 0.74% to 0.95%.

This equates to 4.0% dolomite. Johns (1963) calculated carbonate content assuming all MgO was in carbonate, magnesite. In 20 Gambier Limestone samples from 11 localities in the South East, magnesite content averaged 1.9% equivalent to 4.1% dolomite.

Thus an average dolomite content of 4% is assumed for limestone from Honeysuckle Flat and used for calculation of approximate total carbonate where MgO was not determined.

Example A1/79. Acid solubles CaO - 54%
Assume 4.0% dolomite.

$$\text{Requires } 4 \times \frac{30.4}{100} = 1.22\% \text{ CaO}$$

Leaves 52.78% CaO
Assume all CaO in calcite

$$52.78 \times \frac{100}{56} = 94.3\% \text{ calcite}$$

Approximate total carbonate = 94 + 4
= 98

APPENDIX B

TABLE 1
CHEMICAL ANALYSES, AND PHYSICAL PROPERTIES - HONEYSUCKLE FLAT AND MARTE LIMESTONE DEPOSITS

Element	Sample No. A2547/79 %	A2548/79 %	A2549/79 %	A2550/79 %	A468/81 %	A671/81 %	A672/81 %
SiO_2	1.07	0.54	1.34	0.57	1.26		
TiO_2	<0.01	<0.01	0.01	<0.01	<0.02		
Al_2O_3	0.19	0.12	0.42	0.16	0.26		
Fe_2O_3*	0.16	0.12	0.28	0.13	0.18		
MnO	0.01	0.01	0.01	0.01	0.01		
MgO	0.80	0.80	0.59	0.49	0.95		
CaO	53.1	53.7	53.2	53.9	54.0		
Na_2O	0.06	0.06	0.06	0.05	0.04		
K_2O	0.08	0.05	0.10	0.06	0.02		
P_2O_5	0.01	0.01	0.01	<0.01	0.06		
CO_2	42.7	43.3	42.3	42.5	42.1		
Total	98.2	98.7	98.4	97.9	100.2		
LOI	43.8	44.0	43.3	43.7	43.4		
Acid insoluble material	1.06	0.49	1.33	0.52	1.30		
Brightness (R457)	71.1	70.9	76.9	83.3	69.6	72.8	72.1
Yellowness (R57-R457)	10.1	9.7	10.1	7.6	9.0	8.6	8.4
Specific Gravity	2.68	2.65					
Bulk Density	1.35	1.58					

*Fe_2O_3 indicates total iron expressed as Fe_2O_3.

APPENDIX B
TABLE 2

TOTAL CARBONATE CONTENT - LIMESTONE FROM HONEYSUCKLE FLAT AND MARTE

Sample No.	Calcite %	Dolomite %	Total Carbonate %
A2547/79	92.8	3.7	96.5
A2548/79	94.0	3.7	97.7
A2549/79	93.2	2.7	95.9
A2550/79	94.1	2.3	96.5
A468/81	91.0	4.4	95.4

APPENDIX C

Petrological descriptions of limestone from Honeysuckle Flat and Marte

Extracted from AMDEL report GS261/80

By Dr. B. Steveson

Sample: RS37; TS41864

Location: Map sheet 7022, Honeysuckle Flat Limestone Deposit - near B5.

Rock Name:
Recrystallized fossiliferous limestone.

Hand Specimen:
This is a rather characteristically grey rock with a very pitted, weathered surface. The cut section is a cream colour and is grey and rather friable.

Thin Section:
The thin section consists almost entirely of calcite with only traces of dolomite and dispersed ferruginous material.

The calcite is generally extremely fine-grained and the thin section has a turbid appearance in plane polarized light due to the very small size of individual calcite crystals. Nevertheless, one can distinguish the common orientation of these minute crystals from the density of this turbidity and some bulk extinction effects. It is these which serve to distinguish the relics of fossils in the sample. Most of these are more or less elongate and irregular fragments of shells but there are one or two microcellular features also. In some places there are fragments of punctured flakes. Dolomite is present as characteristic fossil forms including ?cross-sections of corals. Between the fossil fragments there is rather indeterminate, extremely fine-grained, micritic mud also consisting of calcite. Dolomite is present as a few slightly larger crystals up to about 0.1 mm in size.

The sample is apparently completely free from silicate minerals, but there is a little iron oxide/hydroxide in many places, and this forms translucent dark patches widely disseminated in the calcite. Few are more than about 0.04 mm in size.

The sample is some kind of biomicrite, but it appears to have been at least partly recrystallized and even the fossil fragments are now essentially relics within the aggregates of extremely fine-grained calcite.

Sample: RS38; TS41865

Location: Map sheet 7022; Honeysuckle Flat Limestone Deposit - near C5.

Rock Name:
Partly recrystallized fossiliferous limestone (biomicrite)

Hand Specimen:
This is a massive and slightly friable rock which is essentially white in colour. the sample is clearly very fine-grained and has a rather powdery texture in the hand. In many respects it is similar to the sample from Honeysuckle Flat B5.

Thin Section:
In terms of both mineralogy and texture the rock is clearly closely related to that described immediately above. In general, this rock is distinguished by somewhat clearer cementing material and this, in turn, is an indication of the slightly coarser nature of this part of the rock. As far as can be determined the sample has a similar fossil content.

Approximately 60% of the volume of the rock consists of more or less dark, turbid fragments which are interpreted as being of fossiliferous origin. These appear to comprise a virtually contiguous framework. Few of the fragments can be specifically identified, but most are more or less elongate and appear to be part of relatively large shells. Others have rather tenuous, cellular structures and well-defined cellular microfossils are present in trace amounts only. Apart from the elongate shell fragments, the most typical objects are aggregate cells (sometimes as much as 1 mm in size) within which individual cells range in size from 0.02 to 0.15 mm. Most of the fragments identifiable in the rock now are not more than 0.1 mm in size overall.

Between the fossil fragments are clearer patches of relatively coarse-grained calcite in which crystals up to about 0.04 mm in diameter can be seen. As far as can be determined the material is granular and presumably represents some kind of late and recrystallized carbonate matrix.

There are one or two small fragments of quartz in the thin section and the sample contains disseminated iron and/or titanium oxide/hydroxide. The rock is interpreted as being a biomicrite which has undergone considerable recrystallization.

Sample: RS39; TS41866

Location: Map sheet 7022, Road cut, Section 632 Hd. Caroline, near Caroline Limestone Deposit.

Rock Name:
Fossiliferous limestone

Hand Specimen:
This sample is somewhat more compact than the two limestones described above and has a slightly darker colour also. The weathered surface is a pale buff or tan colour and shows some irregularities, but the cut surface has a pale cream or grey colour with lighter and more friable patches up to about 5 mm in size.

Thin Section:
The rock consists mainly of calcite with traces of iron oxides, clays and quartz. In most respects the limestone is similar to the two described above from Honeysuckle Flat, and it seems likely that this is a sample of the same rock unit.

Most of the volume of the rock consists of fossil fragments, one or two of which are as much as 4 mm in size. These are generally extremely fine-grained, perforated or reticulate structures which show marked bulk extinction indicating the orientation of the extremely fine-grained calcite crystals. Most of the fossil fragments are, however, less than 0.3 mm in size, and they are generally equant broken fragments, probably as large as shells. In some places the rock also contains rather more massive and structureless fragments showing a more equant shape than the shelly material. All of this fossil material is generally fine-grained and the calcite is turbid in thin section. Structures are shown by variations in this turbidity which, in turn, are probably reflections both of the grain size of the calcite and the presence or absence of ferruginous material.

The material between the fossil fragments is neither abundant nor well-defined, but it appears to be clear, fine-grained calcite probably derived from the recrystallization of micritic mud.

In a few places in the thin section there are very small patches of a green birefringent mineral tentatively interpreted as being glauconite. The patches are, in fact, less than 0.05 mm in size but one, at least, has a subround outline and may well represent a genuine detrital material. Elsewhere there are a few very widely dispersed silt- and sand-grade fragments of quartz and feldspar. Calcite, nevertheless, represents fully 98% of the volume of the rock.

Sample: RS40; TS41867

Location: Map unit 7022. Section 26, Hd. Blanche, Marte Limestone Quarry - northern end.

Rock Name:
Fossiliferous limestone (biomicrite)

Hand Specimen:
A friable, massive and compact fine-grained rock which is virtually white in colour. The cut surface is somewhat perforated and the rock appears to have a high natural porosity.

Thin Section:
The rock is similar in many respects to the limestones described above but it contains a larger number of pores and probably there are some areas in the thin section which represent fine-grained material which has been removed during sectioning. The rock consists very largely of calcite with only very small amounts of silicates and iron oxide material. Fossil fragments are generally more or less elongate but they have a wide size range from about 2 mm down to sand-grade material. Smaller fragments are generally fine-grained and compact and are rather turbid in thin section but larger fragments show a wide variety of textures, including elongate fibrous types and more massive fragments showing a bulk extinction. Characteristic large, equant fragments show a cellular structure and these can be correlated with similar fragments in the limestones described above, and it is very likely that all these limestones represent the same rock unit.

The thin section contains about 15-20% of pores and, in many cases, these are clearly an integral part of the rock. A few somewhat more ragged pores probably represent fine-grained micritic calcite that may have been removed during the thin section preparation. Despite this, it is generally possible to recognise some carbonate mud between the fossil fragments and it is usually characterized by the lack of texture. The grain size of this material is somewhat variable and there are a few crystals of calcite up to 0.1 mm in size.

The sample consists virtually entirely of calcite, generally present as remnants of fossil fragments. There is a somewhat soft matrix of micritic calcite. The rock is a typical biomicrite which may well have undergone some minor recrystallization.

Sample: RS41; TS41868

Location: Map sheet 7022; Section 26, Hd. Blanche, Marte Limestone Quarry - southern end.

Rock Name:
Fossiliferous limestone (biomicrite)

Hand Specimen:
A white, massive rock which is rather friable. The cut surfaces shows numerous pores, some of which are 2-3 mm in size.

Thin Section:
The sample is similar in every respect to the sample from Marte North described imediately above (RS40) and hence a description will not be given. The sample is a rather friable and porous limestone consisting very largely of fossil fragments now consisting of more or less fine-grained calcite. These are weakly cemented together by a soft micritic matrix, although the rock has a relatively high natural porosity also.

APPENDIX D

Summary of water well data and geological logs
of water well 7022 WW 00542 and
Observation Bores
CAR 22, 26-32 and 35,
Analyses of groundwater from
Observation Bore CAR 35

APPENDIX D

TABLE 1
HONEYSUCKLE FLAT LIMESTONE DEPOSIT - WATER WELL DATA

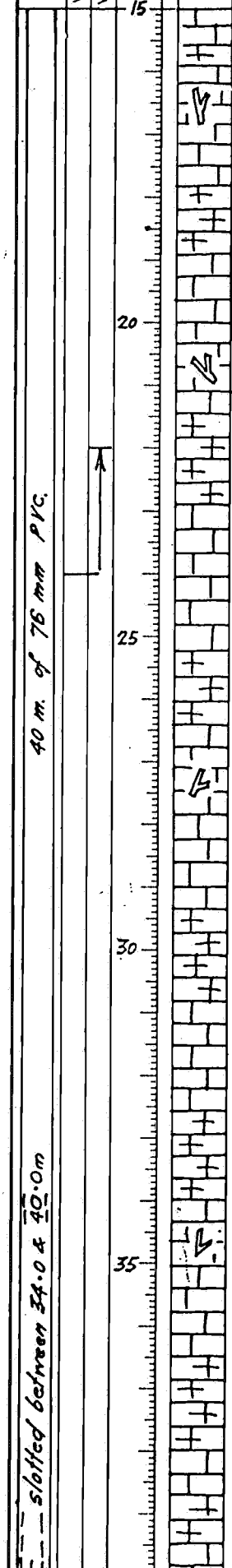
Bore File No.	Status	Location	Depth (m) (Fig. 2)	R.L. (ground)	Geological Log
7022 WW 00 538	Observation Bore CAR22 (formerly 2X)	Adj. sec. 538	28.3	21.40	Appendix D3-D4.
539	Unequipped dry well	Northern boundary sec. 538 (Not on Fig. 2)	15.4	-	Calcarenite.
540	Abandoned house well	sec. 538 Next to ruin	17.9	-	Calcarenite.
541	Observation Bore CAR35	Adj. sec. 538	30.3	21.32	Appendix D5-D6.
542	Stock bore with windmill, tank, trough	sec. 538	30.0	21.8 (approx.)	Appendix D7-D8.
543	Well with handpump	Between Secs. 539 & 614	4.3	-	0-2.0. River mud. 2.0-T.D. Calcarenite.
544	Observation Bor CAR26	Adj. sec. 539	43.0	28.07	Appendix D9-D11.
545	Observation Bore CAR27	Adj. sec. 539	39.6	23.04	Appendix D12-D13.
546	Observation Bore CAR28	Adj. sec. 539	49.2	33.38	Appendix D14-D16.
547	Observation Bore CAR29	Adj. sec. 539	46.0	30.49	Appendix D17-D19.
548	Observation Bore CAR30	Adj. sec. 539	44.7	30.09	Appendix D20-D22.
549	Observation Bore CAR 31	Adj. sec. 539	35.8	25.46	Appendix D23-D24.
550	Water Sample from Glenelg River		-	-	-
551	Water Sample from Glenelg River		-	-	-

Bore File No.	Status	Location	Depth (m) (Fig. 2)	R.L. (ground)	Geological Log
7022 WW 00 552	Observation Bor CAR 32	In Dry Creek Between secs. 539 & 614	26.0	11.27	Appendix D25-D26.
592	Abandoned well	Sec. 539 In lowest point of Dry Creek	3.4	-	Filled with rubbish.
593	Abandoned well	Sec. 614 (Not on Fig. 2)	1.5	-	Filled with rubbish.
669) 670)	Water samples from springs on bank of Glenelg River. Dry Creek huts.			-	-
3595	Stratigraphic Bore PALPARA 4	VICTORIA Approx. 50 m east of Border Road Adj. Sec. 539	1454.8	26.11 (top casing)	0-230 Bryazoal limestone marly interbeds GAMBIER LIMESTONE 230-258 Marl & dolomite GAMBIER LIMESTONE 258-275 Quartz sand. MEPUNGA FORMATION

DEPARTMENT OF MINES — SOUTH AUSTRALIA

CASING | WATERS CUT | WATER LEVEL | DEPTH (m) | CORE | GRAPHIC LOG | AGE | UNIT

DEPTH (m) from to | DESCRIPTION



below 20.0 both are cream

22.0 - 24.0 odd strongly cemented fragments.

24.0 28.0 fossiliferous calcarenite, off white & yellow stained, full cementation range.
20 - 30% calcisiltite, off white cream.

28.0 40.0 fossiliferous calcarenite, off white, trace of yellow staining, full cementation range.
5% calcisiltite, off white.

34.0 - 36.0 only trace of calcisiltite.

END OF HOLE 40.0 m

Borehole State No. 286053903.

Drn: B. S. G | Sheet 2 of 2

Date 11-11-74 | Bore Folder No. 49/—

Bore No.
7022 002 OW 00546

DEPARTMENT OF MINES SOUTH AUSTRALIA
HYDROGEOLOGY SECTION

BORE LOG

HIRER *Dept. of Mines*

Drill type *Cable Tool*
Circulation *Water*
Driller *R.J. Darby*
Start *11.12.73*
Finish *12.1.74*

Logged by *F.W. Aslin*.
Date logged *24.10.74*
Bore Diameter *152 mm*
DEPTH *50.0 m*

A.M.G. Zone
Coords. E
" N
Datum Elev *M.S.L.*
(m) Ref. Pt. Elev *34.606*
Surface Elev. *33.874*

HUNDRED *Caroline*
SECTION *539*
STATE No. *286053904*
Project No. *CAR 28*
Docket No.
Bore Serial No.

Depth to Water cut (m)	Depth to standing water (m)	SUPPLY litres/sec	SUPPLY Method of test	TOTAL DISSOLVED SOLIDS Milligrammes/litre	TOTAL DISSOLVED SOLIDS Analysis W No.
35.5	*35.0*			*490*	*8044/74*
35.5	*36.0*	*1.3*	*Bailer for 1 hour*	*559*	*438/74 full.*

REMARKS *Permit A 533.*

CASING: *50 m of 76 mm P.V.C.*
WATERS CUT
WATER LEVEL
DEPTH (m)
CORE
GRAPHIC LOG
AGE
UNIT: *Gambier limestone.*

DEPTH (m) from	to	DESCRIPTION
0	2.0	*Quartz orenite* 0.1 – 0.2 mm diam, angular to subrounded colorless, organic matter. 0.3 – 2.0 orange staining & minor orange-brown silt & minor white calcareous matter.
2.0	4.0	*Fossiliferous calcarenite* off white-buff, full cementation range. Bryozoa fragments to 7 mm. 30% calcisiltite, buff.
4.0	12.0	50% *Fossiliferous calcarenite* as above. 50% *Calcisiltite*, off white - buff. 6.0 – 12.0 cementation reduced to weak except for odd strongly cemented fragments.
12.0	20.0	*Calcisiltite*, off white. 30 – 40% fossiliferous calcarenite weakly cemented, off white.

Drn *B.S.G.* | Sheet *1* of *3*
Date: *7.11.74* | Bore Folder No. *52/*

DEPARTMENT OF MINES — SOUTH AUSTRALIA

CASING | WATERS CUT | WATER LEVEL | DEPTH (m) | CORE | GRAPHIC LOG | AGE | UNIT

50 m of 76 mm PVC

Gambier limestone

DEPTH (m) from	to	DESCRIPTION
20·0	36·0	50% Calcisiltite off white. 50% Fossiliferous calcarenite, off white, full cementation range.
		below 30.0 m weakly cemented.
		32.0 – 36.0 both cream
36·0	38·0	Fossiliferous calcarenite, full cementation range, off white – buff. Minor yellow staining. Fossil fragments to 1cm. Trace calcisiltite.
38·0	42·0	Fossiliferous calcarenite, half as off white loose fossils & half as strongly cemented buff angular fragments. 5% calcisiltite, off white.

Borehole State No. 286053904.

Drn: B.S.G. | Sheet 2 of 3

DEPARTMENT OF MINES — SOUTH AUSTRALIA

CASING | WATERS CUT | WATER LEVEL | DEPTH (m) | CORE | GRAPHIC LOG | AGE | UNIT

DEPTH (m) from | to | DESCRIPTION

40

42·0 | 50·0 | Fossiliferous calcarenite, full cementation range, off white & buff.
5-10% calcisiltite.

Slotted between 44·0-50·0

45

Gambier limestone

50

END OF HOLE 50·0 m

Borehole Slote No. 286053904

Drn: B.S.G. | Sheet 3 of 3

Date: 7·11·74 | Bore Folder No. 52/·

Bore No.
7022 002 OW 00547

DEPARTMENT OF MINES SOUTH AUSTRALIA
HYDROGEOLOGY SECTION

BORE LOG

HIRER Dept. of Mines.
Drill type Cable tool.
Circulation Water
Driller. R.J. Darby
Start 6·12·73
Finish 7·12·73.

Logged by F.W. Aslin.
Date logged 24·10·74
Bore Diameter 152 mm
DEPTH 46·0 m

A.M.G. Zone
Coords. E
" N
Datum Elev. M.S.L.
(m) Ref. Pt. Elev. 31·637
Surface Elev. 30·981.

HUNDRED CAROLINE
SECTION 539
STATE No. 286053905.
Project No. CAR. 29
Docket No.
Bore Serial No.

Depth to Water cut m	Depth to standing water m	SUPPLY litres/sec.	SUPPLY Method of test	TOTAL DISSOLVED SOLIDS Milligrammes/litre	TOTAL DISSOLVED SOLIDS Analysis W. No.
31·0	30·6			435	8402/73
31·0	30·0	1·3	Bailer for 1 hour	578	5623/73 full.

REMARKS Permit A 532.

CASING: 46 m of 76 mm PVC
WATERS CUT
WATER LEVEL
DEPTH (m)
CORE
GRAPHIC LOG
AGE
UNIT: Gambier Limestone.

DEPTH (m) from	to	DESCRIPTION
0	0.5	Quartz arenite. ∠0.1 – 1.0 mm Av. 0.2 mm. Angular to subangular, colourless. Organic matter. 0.2 – 0.5 Minor ferruginous nodules to 1cm.
0.5	3.0	Lutite · orange brown 0.5 – 2.0 Minor quartz arenite. 2.0 – 3.0 trace calcareous matter.
3.0	6.0	Fossiliferous calcarenite, full cementation range. Buff, bryozoa fragments to 3 mm 25% Calcisiltite cream buff. 3.0 – 4.0 10% Lutite as above. 4.0 – 60 Trace lutite as above.
6.0	18.0	50% fossiliferous calcarenite, off white, bryozoa fragments to 5 mm. Essentially weakly cemented. 50% Calcisiltite off white 6.8. – 8.0 - weakly cemented. 8.0 – 10.0 odd strongly cemented fragments. 10.0 – 12.0 weakly cemented fragments. 12.0 – 18.0 odd strongly cemented fragments.

Drn B.S.G. | Sheet 1 of 3

DEPARTMENT OF MINES — SOUTH AUSTRALIA

CASING | WATERS. CUT | WATER LEVEL | DEPTH (m) | CORE | GRAPHIC LOG | AGE | UNIT

DEPTH (m) from	to	DESCRIPTION
18·0	22·0	Calcisiltite cream, 30–40% calcarenite, cream, essentially as loose fossil fragments to 5mm.
22·0	24·0	50% calcisiltite, off white. 50% fossiliferous calcarenite, off white, full cementation range.
24·0	26·0	Fossiliferous calcarenite, off white, moderate to strongly cemented. 20% Calcisiltite.
26·0	32·0	Calcisiltite, off white. 26·0 – 28·0 25% fossiliferous calcarenite, full cementation range, off white. (odd buff strongly cemented angular fragments) 28·0 – 32·0. 40% fossiliferous calcarenite as above.
32·0	46·0	Fossiliferous calcarenite off white – buff. Moderate to strongly cemented down to 38 m below that full cementation range. 10% calcisiltite off white. 38·0 – 40·0 reduced calcisiltite.

46 m of 76 mm PVC

Borehole State No. 286053905

Drn: B. S. G. | Sheet 2 of 3

Date: 7·11·74 | Bore Folder No. 50/-

PF No S105376 MH

DEPARTMENT OF MINES — SOUTH AUSTRALIA

CASING	WATERS CUT	WATER LEVEL	DEPTH (m)	CORE	GRAPHIC LOG	AGE	UNIT	DEPTH (m) from	to	DESCRIPTION
slotted 40·0 - 46·0			40				Gambier limestone			42·0 - 46·0 off white - buff, plus some yellow staining.
			45							
			46							END OF HOLE 46·0 m

Borehole Slote No. 286053905

Drn: B. S. G. | Sheet 3 of 3

Date. 7·11·74 | Bore Folder No. 50/-

Bore No. 7022 002 OW 00548

DEPARTMENT OF MINES SOUTH AUSTRALIA

HYDROGEOLOGY SECTION

BORE LOG

HIRER Dept. of Mines.

Drill type Cable tool.
Circulation Water
Driller R. J. Darby
Start 17.1.74
Finish 18.1.74

Logged by F. W. Aslin
Date logged 22.10.74
Bore Diameter 152 mm
DEPTH 45 m

A.M.G Zone
Coords E
" N
Datum Elev M.S.L
Rel. Pt Elev 31.310 m.
Surface Elev 30.580

HUNDRED CAROLINE
SECTION 539
STATE No. 286053906
Project No. CAR 30.
Docket No.
Bore Serial No.

Depth to Water cut, m	Depth to standing water, m	SUPPLY: Litres/sec	SUPPLY: Method of test	TOTAL DISSOLVED SOLIDS: Milligrammes/litre	TOTAL DISSOLVED SOLIDS: Analysis W. No
30.50	29.80			520	8045/74
30.50	29.80	1.3	Bailer for one hour	567	939/74 full

REMARKS Permit A 531

CASING: 45.0 m. of 76 mm PVC

DEPTH (m) from	to	DESCRIPTION
0.0	0.2	50% Quartz arenite, 0.1 - 0.2 mm diam, subangular colorless. Silt, orange brown. Minor lutite, orange brown, organic matter.
0.2	0.5	Silt, orange brown. 20 - 30% quartz arenite <0.1 - 0.2mm (Av. 0.1mm) angular to subrounded. Minor lutite orange brown.
0.5	10.0	Fossiliferous calcarenite buff, essentially weakly cemented bryozoa fragments to 3 mm, but with odd strongly cemented fragments. 20 - 30% Calcisiltite, buff. 4.0 - 6.0 both have paled to cream. 6.0 - 10.0 both have paled to off white & the strongly cemented fragments diminish.
10.0	28.0	Calcisiltite, off white. 40% fossiliferous calcarenite as weakly cemented bryozoa fragments to 3 mm.

UNIT: Gambier limestone

Drn: B.S.G.
Date: 11-11-74
Sheet 1 of 3
Bore Folder No. 48/-

DEPARTMENT OF MINES — SOUTH AUSTRALIA

CASING | WATERS CUT | WATER LEVEL | DEPTH (m) | CORE | GRAPHIC LOG | AGE | UNIT

45·0 m of 76 mm PVC

Gambier Limestone

DEPTH (m) from	to	DESCRIPTION
		22.0 – 24.0 fossiliferous calcarenite percentage reduced to 20-30%
		24.0 – 28.0 fossiliferous calcarenite 30%
28·0	30·0	50% calcisiltite off white. 50% fossiliferous calcarenite, full cementation range loose & weakly cemented fragments off white strongly cemented – massive fragments buff.
30.0	32.0	Calcarenite as above 20 – 30% Calcisiltite, off white.
32·0	38.0	Calcarenite, off white moderately cemented fragments & buff strongly cemented angular fragments, minor calcisiltite.
38·0	40·0	Calcarenite, off white, full cementation range 20 – 30% calcisiltite, off white.

Borehole State No. 286053906

Drn B. S. G. | Sheet 2 of 3

Date: 11. 11. 74 | Bore Folder No. 481-

DEPARTMENT OF MINES — SOUTH AUSTRALIA

CASING	WATERS CUT	WATER LEVEL	DEPTH (m)	CORE	GRAPHIC LOG	AGE	UNIT	DEPTH (m) from	DEPTH (m) to	DESCRIPTION
Slotted 39.0 to 45.0 m			40				Gambier Limestone	40.0	44.0	Calcarenite, off white, 40% stained orange, weakly cemented but with odd strongly cemented fragments. Minor calcisiltite.
			45					44.0	45.0	calcarenite, full cementation range, off white, strongly cemented fragments are buff to light grey.

Borehole State No. 2860539O6.

Drn. B. S. G | Sheet 3 of 3

Date: 11.11.74 | Bore Folder No. 48/-

Bore No. 7022 002 OW 00549

DEPARTMENT OF MINES SOUTH AUSTRALIA
HYDROGEOLOGY SECTION

BORE LOG

HIRER *Dept. of Mines.*

Drill type *Cable tool.*
Circulation *Water*
Driller *R. B. Toohey*
Start *12. 2. 74*
Finish *15. 2. 74*

Logged by *F. W. Aslin*
Date logged *18. 10. 74*
Bore Diameter *152 mm*
DEPTH *36.0 m*

A.M.G. Zone
Coords E
" N
Datum Elev *M.S.L.*
(m) Ref Pt Elev *26.673*
Surface Elev *25.948*

HUNDRED *Caroline*
SECTION *539*
STATE No. *286053907*
Project No *CAR 31.*
Docket No
Bore Serial No

Depth to Water cut m	Depth to standing water m	SUPPLY litres/sec	SUPPLY Method of ...	TOTAL DISSOLVED SOLIDS Milligrammes/litre	TOTAL DISSOLVED SOLIDS Analysis W No
26.0	26.0			441	1052/74
26.0	26.0			580	1053/74 final

REMARKS *Permit A 530*

CASING: *36.0 m of 76 mm PVC.*
WATERS CUT
WATER LEVEL
DEPTH (m)
CORE
GRAPHIC LOG
AGE
UNIT: *Gambier limestone.*

DEPTH (m) from	to	DESCRIPTION
0	0.2	50% Quartz arenite 0.1–0.2 mm diam. subangular subrounded. Colorless & orange stained. 50% silt, tan organic matter.
0.2	26.0	Fossiliferous calcarenite, off white, weakly cemented fossil fragments (essentially bryozoa) to 3 mm. Approx 30% calcisiltite, off white.
		10–12 m plus 5% calcarenite, strongly cemented, buff angular fragments to 1 cm.
		14–16 m plus 5% calcarenite strongly cemented buff angular fragments to 1 cm.

Drn *B.S.G.* | Sheet *1* of *2*
Date *11. 11. 74* | Bore Folder No *54/-*

DEPARTMENT OF MINES — SOUTH AUSTRALIA

CASING | WATERS CUT | WATER LEVEL | DEPTH (m) | CORE | GRAPHIC LOG | AGE | UNIT

36.0 m of 76 mm PVC.

Slotted between 30 – 36.0 m

Gambier Limestone

DEPTH (m) from	to	DESCRIPTION
		22 - 24 m. Plus 5% calcarenite, strongly cemented buff angular fragments to 1 cm overall color deepens to cream. Minor orange staining on some fossils.
26.0	34.0	Fossiliferous calcarenite, buff, full cementation range. 5% calcisiltite off white.
34.0	36.0	Fossiliferous calcarenite, buff, weakly cemented 50% of the fossits are stained orange. 5% calcisiltite, buff
		End of hole 36.0 m

Borehole State No. 286053907.

Drn: B. S. G | Sheet 2 of 2

Date: 11-11-74 | Bore Folder No. 54/-

Bore No. 7022 002 OW 00552

DEPARTMENT OF MINES SOUTH AUSTRALIA
HYDROGEOLOGY SECTION

BORE LOG

HIRER Dept. of Mines.
Drill type Cable Tool.
Circulation Water
Driller R. J. Darby
Start 4.12.73
Finish 4.12.73

Logged by F. W. Aslin
Date logged 23.10.74
Bore Diameter 152 mm
DEPTH 26 m.

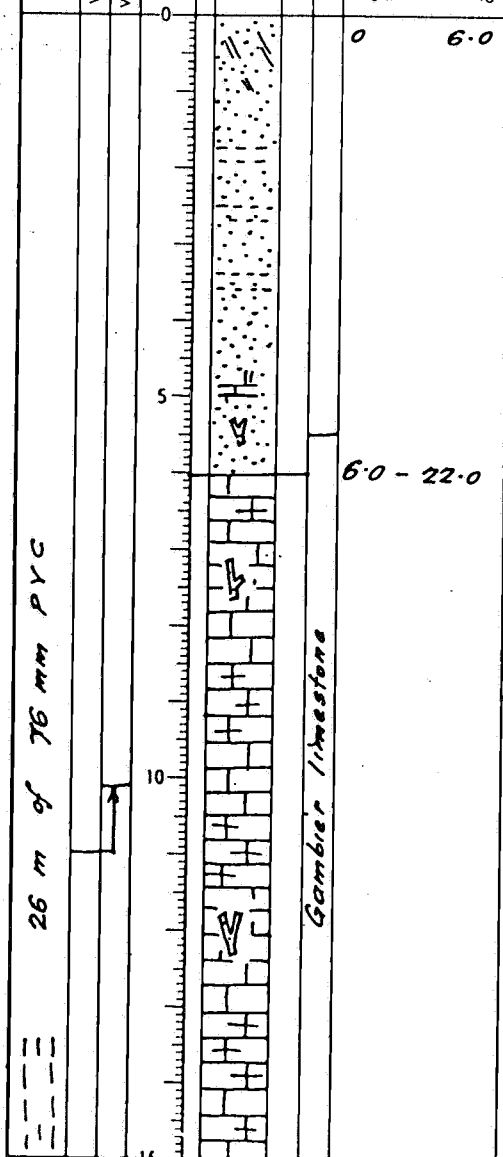
A.M.G. Zone
Coords. E
" N
Datum Elev M.S.L.
(m) Ref. Pt. Elev. 12.421
Surface Elev. 11.755

HUNDRED Caroline
SECTION 614
STATE No. 286061401
Project No. CAR 32
Docket No.
Bore Serial No.

Depth to Water cut (m.)	Depth to standing water m	SUPPLY		TOTAL DISSOLVED SOLIDS	
		litres/sec.	Method of test	Milligrammes/litre	Analysis W No.
11.0	10.1	2.5	Bailer for 1 hour.	250	8401/74
11.0	10.1			481	5622/73 full.

REMARKS Permit A 536

CASING | WATERS CUT | WATER LEVEL | DEPTH (m) | CORE | GRAPHIC LOG | AGE | UNIT



DEPTH (m) from	to	DESCRIPTION
0	6.0	Quartz arenite, angular subangular 0.1–0.2 mm colorless with minor orange staining. 0 – 0.6 organic matter, overall color light grey. 0 – 2.0 trace of silt, overall color light pink. 2.0–4.0 5–10% silt, overall color red. brown. 4.0 – 6.0 20% silt & lutite, red brown. 25% calcarenite, off white, full cementation range, bryozoa fragments to 4 mm
6.0 – 22.0		Fossiliferous calcarenite weakly cemented with odd strongly cemented fragments, bryozoa fragments to 4 mm. 6.0 – 8.0 Calcarenite buff, off white 30–40% calcisiltite, buff light pink 8.0 – 12.0 Calcarenite off white (to 22 m) 30% calcisiltite off white. 12.0 – 14.0 5% Calcisiltite, off white. 14.0 – 18.0 10% calcisiltite, off white.

Drn: B. S. G | Sheet 1 of 2
Date: 11.11.74 | Bore Folder No 53/–

DEPARTMENT OF MINES — SOUTH AUSTRALIA

CASING | WATERS CUT | WATER LEVEL | DEPTH (m) | CORE | GRAPHIC LOG | AGE | UNIT

Slotted between 13.5 & 26.0 m

15
20
25

Gambier limestone.

DEPTH (m) from	to	DESCRIPTION
		18.0 – 20.0 15-20% calcisiltite off white.
		20.0 – 22.0 25% Calcisiltite, off white, to pale grey.
		10% Strongly cemented calcarenite.
22.0	26.0	Calcisiltite, pale grey, slightly marly 25% calcarenite, essentially loose bryozoa-fragments to 4 mm.
		End of Hole 26.0 m

Borehole State No. 286061401

Drn. B. S. G. | Sheet 2 of 2

Date: 11-11-74 | Bore Folder No. 531.

WATER ANALYSIS REPORT
OBSERVATION BORE CAR 35

Date collected 14/2/75
Sample collected by N. McMinn

SAMPLE NO. W1551/75

CHEMICAL COMPOSITION		MILLIGRAMS PER LITRE MG/L	MILLIEQUIVS PER LITRE MG/L
CATIONS			
CALCIUM	(Ca)	63.	3.1
MAGNESIUM	(Mg)	10.	.8
SODIUM	(Na)	33.	1.4
POTASSIUM	(K)	1.	.0
ANIONS			
HYDROXIDE	(OH)	.	.0
CARBONATE	(CO_3)	.	.0
BICARBONATE	(HCO_3)	227.	3.7
SULPHATE	(SO_4)	7.	.2
CHLORIDE	(Cl)	54.	1.5
NITRATE	(NO_3)	14.	.2

TOTALS AND BALANCE

CATIONS	(ME/L)	5.4	DIFF = .2
ANIONS	(ME/L)	5.6	SUM = 11.1

$$\frac{\text{DIFF} \times 100.}{\text{SUM}} = 1.8$$

DERIVED AND OTHER DATA

CONDUCTIVITY (E.C.)
MICRO-S/CM AT 25 DEG. C 636.

	MILLIGRAMS PER LITRE MG/L
TOTAL DISSOLVED SOLIDS	
A. BASED ON E.C.	
B. CALCULATED (HCO3 = CO3)	294.
C. RESIDUE ON EVAP. AT 180 DEG. C	
TOTAL HARDNESS AS CACO3	198.
CARBONATE HARDNESS AS CACO3	186.
NON-CARBONATE HARDNESS AS CACO3	12.
TOTAL ALKALINITY AS CACO3	186.
FREE CARBON DIOXIDE CO2	
SUSPENDED SOLIDS	
SILICA (SIO2)	
BORON (B)	

	UNITS
REACTION - PH	7.8
TURBIDITY (JACKSON)	
COLOUR (HAZEN)	
SODIUM TO TOTAL CATION RATIO (ME/L)	26.5%

WATER CUT - 16.84
WATER LEVEL - 16.54
DEPTH HOLE - 30.00

PLATE 1. Honeysuckle Flat Limestone Deposit.
View northerly from southwestern corner of ML 4671 showing sinkhole development in Gambier Limestone. Between sinkhole and mallee trees in mid-distance is low bracken covered sand dune with little Gambier Limestone subcrop.
14 December 1978 NEG. NO. 31699

PLATE 2. Marte Limestone Quarry (PM 9).
Karstic surface on Gambier Limestone, infilled by Holocene sand and clay with discoloured limestone beneath each depression.
December 1978 NEG. NO. 31709

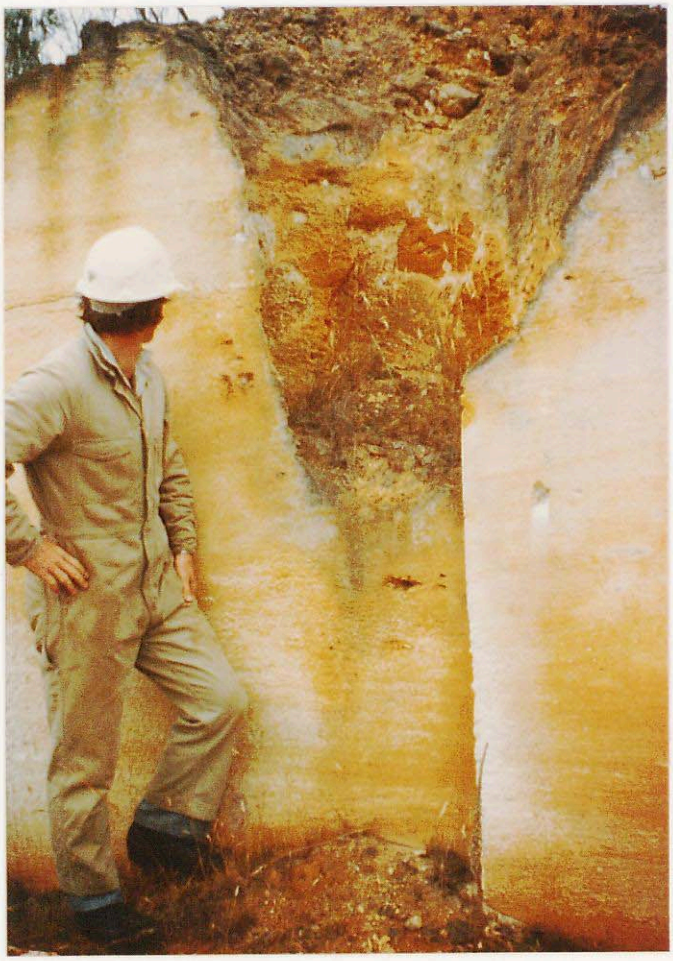


PLATE 3.

Marte Limestone Quarry (PM 9). Infilled karstic depression (doline) with discoloured limestone beneath.
December 1978
NEG. NO. 31710

PLATE 4. Glenelg River - South Australia.
Gambier Limestone exposed in river cliffs near Donovans, 2.5 km south of Honeysuckle Flat Limestone Deposit.

Note: Iron-stained limestone beneath vegetation lined sinkhole on right, steeply dipping joint with no associated iron staining in centre, and horizontal bands of pale orange-brown iron-stained limestone in lower third of cliffs.

February 1982 SLIDE NO. 24422

PLATE 5. Marte Limestone Quarry, (PM 9)
Mining operations: Limestone is ripped by bulldozer, then loaded and carted by scraper to Marte Railway Siding 3 km to the north. Old building stone quarries in background.
December 1978

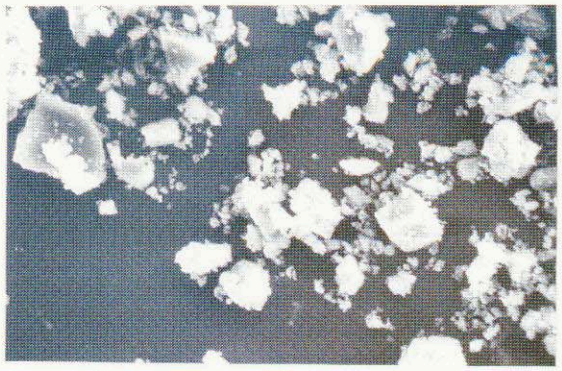
NEG. NO. 31711

PLATE 6. Marte Railway Siding, stockpiles of limestone, white in foreground and offcolour in background. Material despatched by rail to Adelaide and Melbourne.
December 1978

NEG. NO. 31712

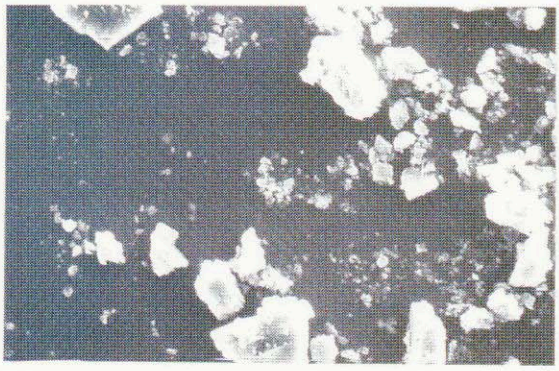
PLATE 7

Scanning electron micrographs of various Australian carbonate rocks used for whiting. All micrographs approximately 1000 magnifications. All samples crushed so that 99% (wt) passes 53 μm (300#) sieve. With the exception of Gambier Limestone, all samples have 90% (wt) coarser than 10 μm.

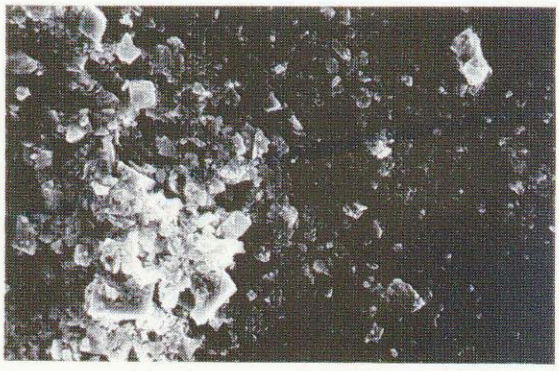


(a) Rockhampton (South Ulam) Queensland. Coarse grained white marble. Neg. No. 31713.

(b) Penrice, South Australia. Coarse grained white Angaston Marble. Neg. No. 31714.

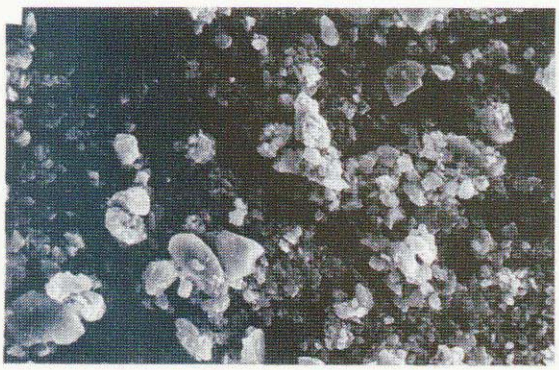


(c) Bathurst - New South Wales. White marble. Neg. No. 31715.

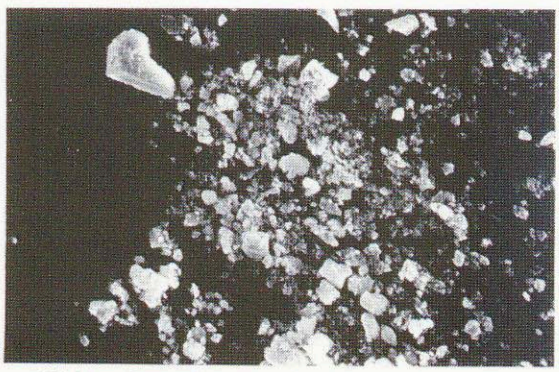


(d) Wombeyan - New South Wales. Coarse grained white marble. Neg. No. 31716.

STANDARD REFLECTIVITY 90-95 %

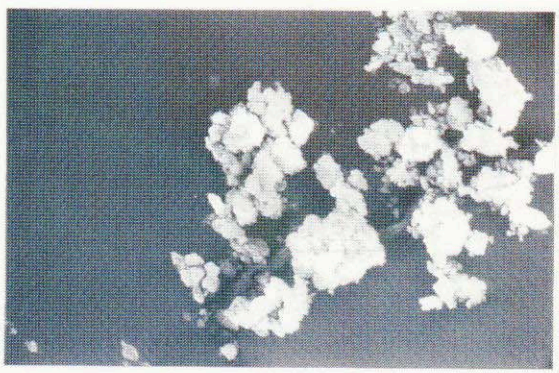


(e) Lilydale, Victoria. Partially recrystallised Early Devonian fossiliferous limestone. Neg. No. 31717.



(f) Marulan - New South Wales. Partially recrystallised Late Silurian limestone. Neg. No. 31718.

STANDARD REFLECTIVITY 80 %

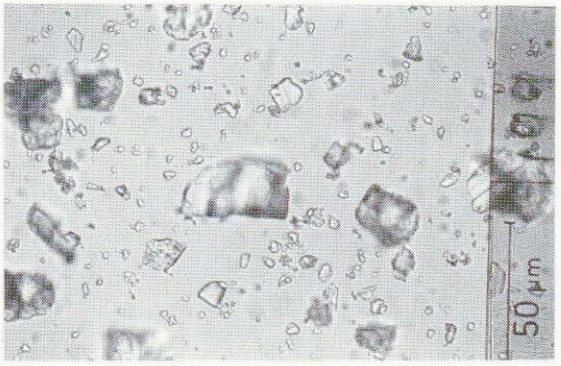


(g) Marte - South Australia. Gambier Limestone. Very slightly recrystallised. Tertiary fossiliferous limestone. Neg. No. 31719.

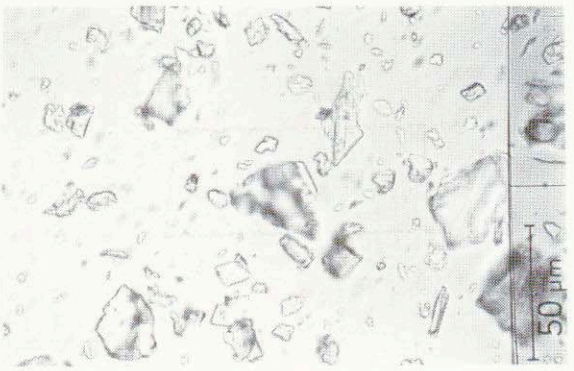
Because of very fine grain size (40% < 10 μm), difficulty was experienced in dispersing the powder uniformly on the mount.

PLATE 8

Optical micrographs of various Australian carbonate rocks used for whiting. All samples crushed so that 99% (wt) passes 53 μm (300#) sieve. With the exception of Gambier Limestone all samples have 90% (wt) coarser than 10 μm.

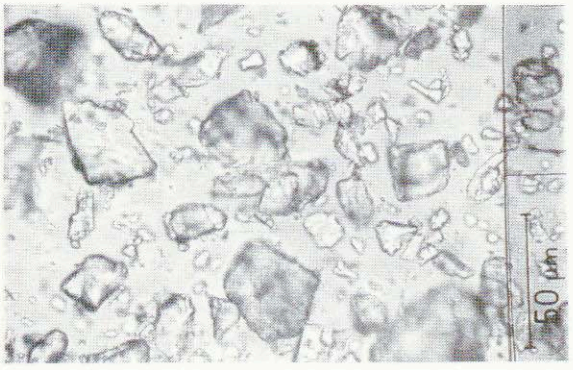


(a) Rockhampton (South Ulam)-Queensland. Coarse grained white marble. High angularity, transparent rhombohedrons. Neg. No. 31720.

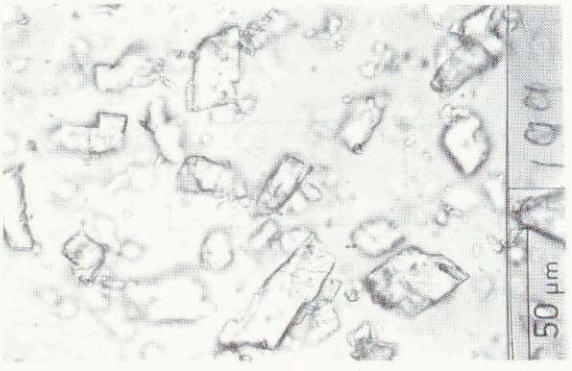


(b) Penrice - South Australia Coarse grained white Angaston Marble. Very high angularity, transparent rhombohedrons. Neg. No. 31721.

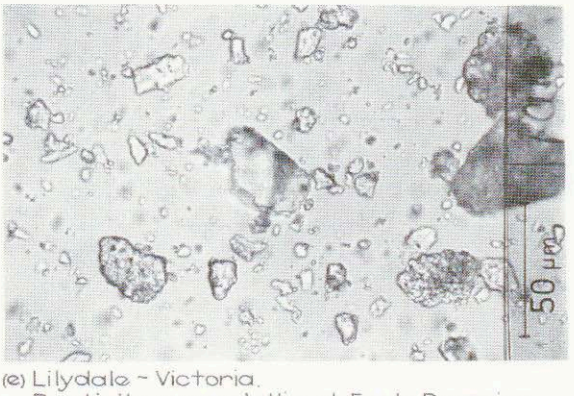
STANDARD REFLECTIVITY 90-95%



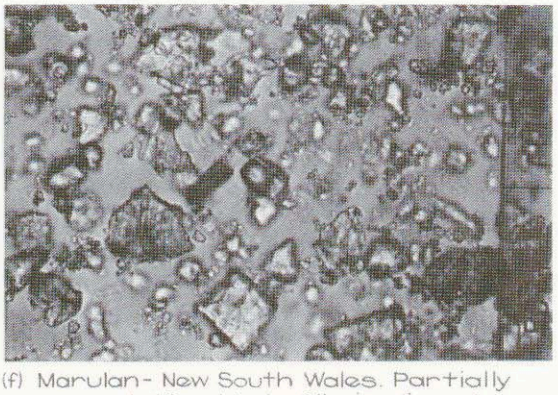
(c) Bathurst - New South Wales. White marble High proportion of coarse fraction, some impurities - moderate angularity, translucent rhombohedrons. Neg. No. 31722.



(d) Wombeyan - New South Wales. Coarse grained white marble. Very high angularity - transparent rhombohedrons. Neg. No. 31723.

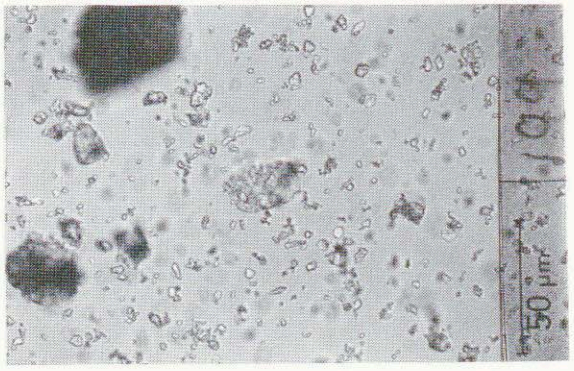


(e) Lilydale - Victoria. Partially recrystallized Early Devonian fossiliferous limestone. Some impurities, moderate angularity many sub-rounded calcite grains. Transparent - translucent grains. Neg. No. 31724.



(f) Marulan - New South Wales. Partially recrystallised Late Silurian limestone. High proportion of fine fraction, some impurities and staining on calcite. Moderate angularity - less well crystalline than (a) - (d). Translucent calcite grains. Neg. No. 31725.

STANDARD REFLECTIVITY 80%



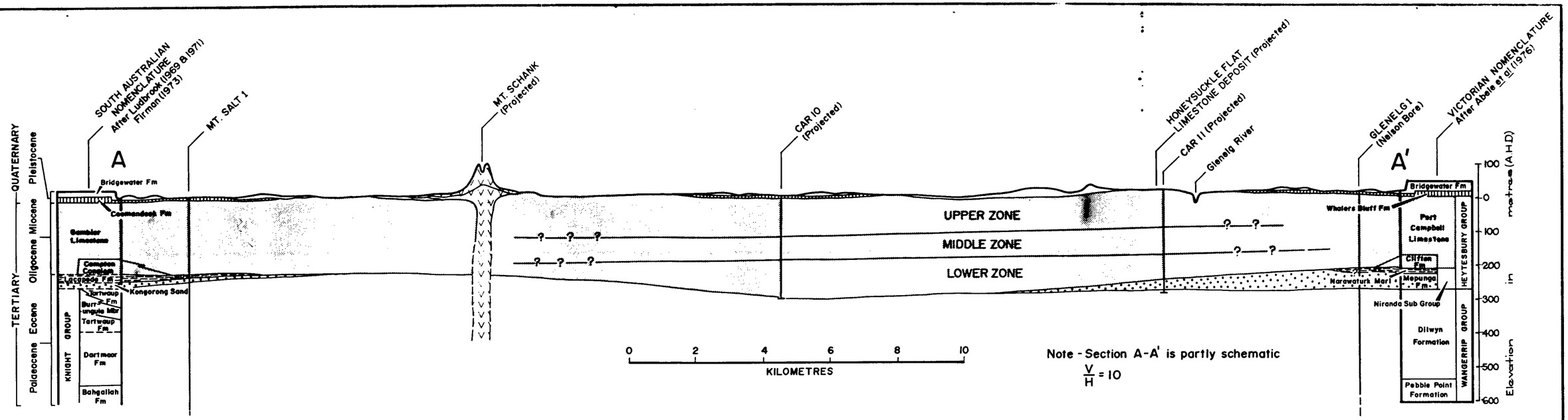
(g) Marte - South Australia Gambier Limestone. Very slightly recrystallised Tertiary fossiliferous limestone. Neg. No. 31726.

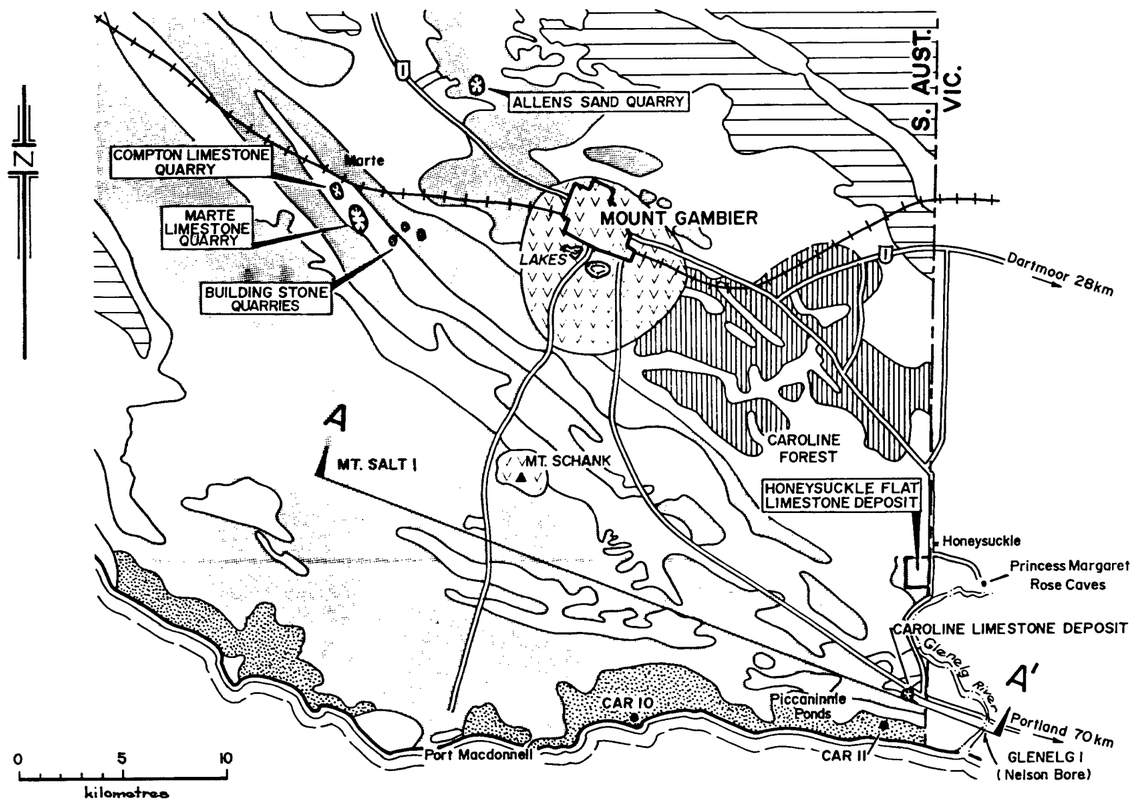
Very high proportion of fines (40% (wt) < 10 μm). Rounded - sub-rounded milky white calcite grains. Some impurities and iron stained calcite.

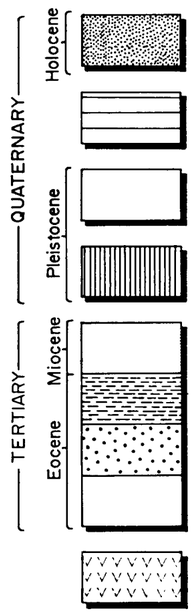
PLATE 9. Honeysuckle Flat Limestone Deposit - mining operations
Panoramic view southwest to northwest across pit (left) and cleared area with stockpiles (right). Grey stockpiles are discoloured, near surface limestone. Survey station IA on topsoil stockpile left foreground. WW00542 with windmill and tank centre background. Original eucalypt vegetation left background
2 March 1981 SLIDES NOS. 22601, 22602, 22603.

PLATE 10. Gambier Limestone from Honeysuckle Flat (left) and Marte. Note slight grey-brown tinge to Honeysuckle Flat limestone.

SLIDE NO. 35140







Carbonate sediments of coastal lagoons. Includes peat deposits at Port Macdonnell.

PADTHAWAY FORMATION : Lagoonal fine grained dolomite and clay.

BRIDGEWATER FORMATION : Calcarenite of stranded coastal dunes and beach deposits.

COOMANDOOK FORMATION : Sandy limestone and oyster beds.

GAMBIER LIMESTONE: Fossiliferous limestone, bryozoal limestone, marl, dolomite, flint beds. Compton Conglomerate near base.

LACAPEDE FORMATION: Brown carbonaceous silt and dark grey glauconitic fossiliferous sandy clay.

KONGORONG SAND : Brown limonitic, coarse quartz sand.

} Subsurface only.

TARTWAUP FORMATION : Sand and gravel. Burrungule Member : lignitic clay near top.

Basaltic pyroclastics and lava flows.

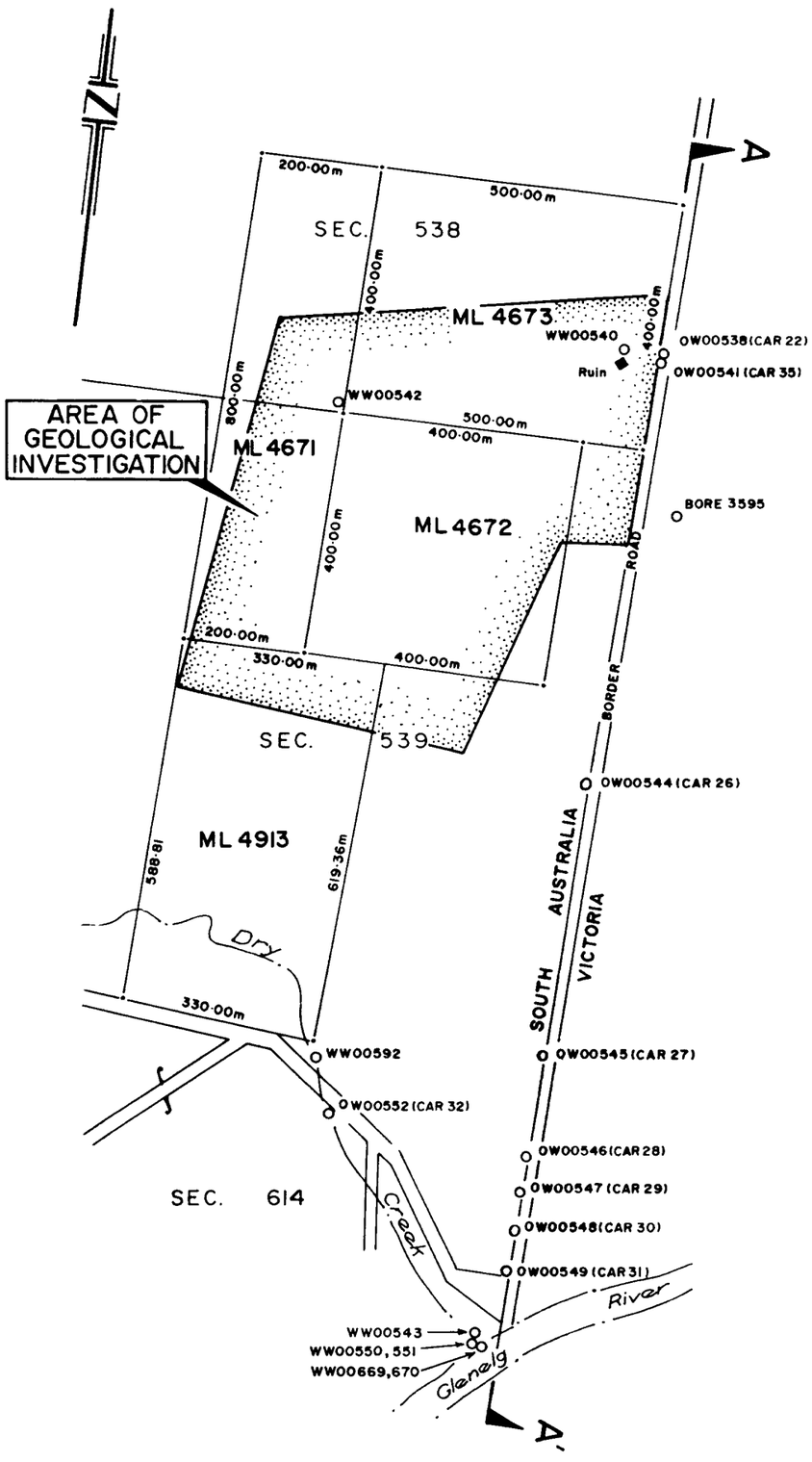
FIG. 1

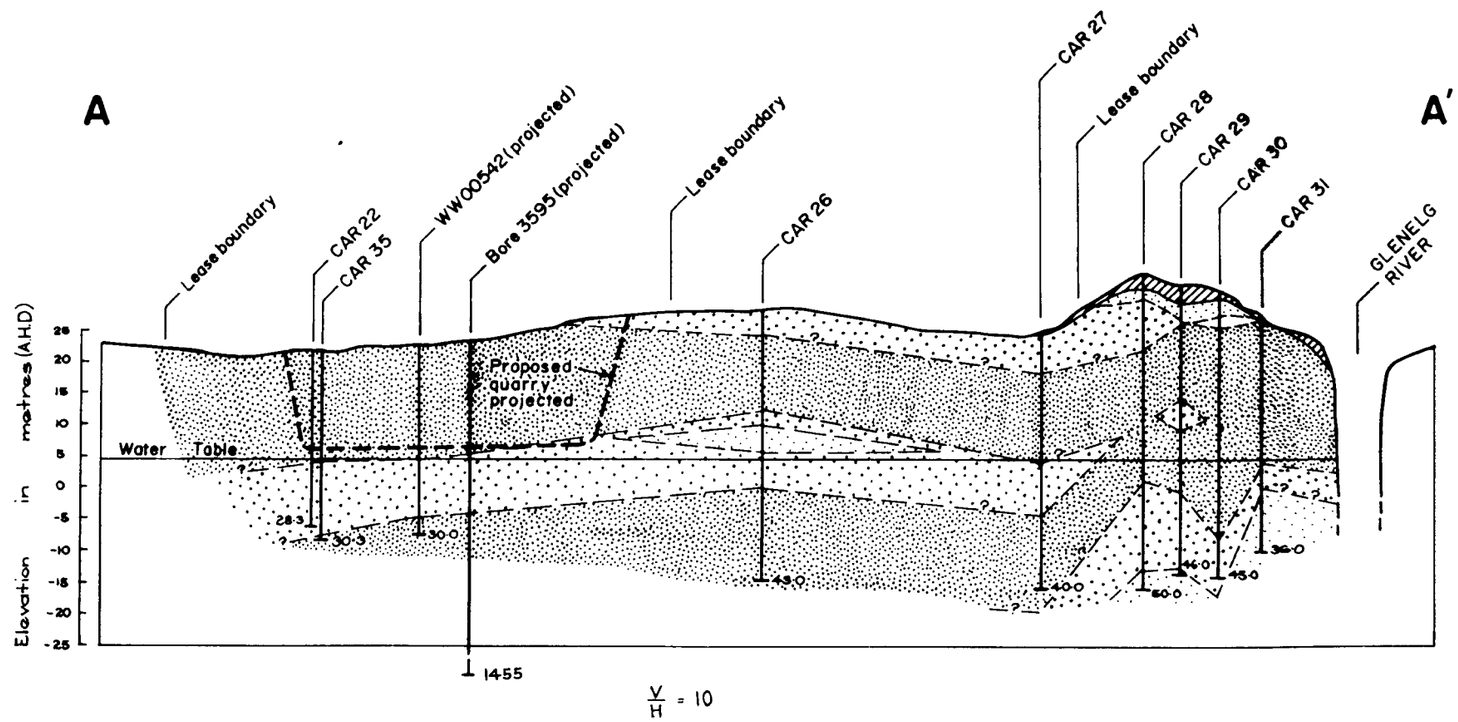
DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA

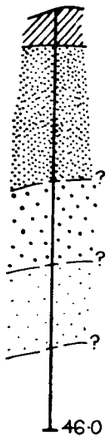
HONEYSUCKLE FLAT LIMESTONE DEPOSIT
LOCATION AND REGIONAL GEOLOGY

COMPILED L.C. Barnes	CDC 5.8.86 DATE
DRAWN J.W.	SCALE 1:250,000
DATE March '86	PLAN NUMBER 86-131
CHECKED	

3951







WW00544 — Bore Unit number.

CAR 26 — Observation bore number.

Surface soil and silt.

GAMBIER LIMESTONE : Friable to moderately well cemented polyzoal limestone. White to off-white.

Cream, pale yellow to buff.

Buff, yellow and orange staining.

TOTAL DEPTH

0 100 200 300 400 500 600 700 800
METRES

FIG.2

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

COMPILED L.C.Barnae — CDO — 5·8·86 DATE

DRAWN J.W.

SCALE 1:10,000

DATE March '86

CHECKED

PLAN NUMBER 86-132

HONEYSUCKLE FLAT LIMESTONE DEPOSIT
MINING TENEMENT AND WATER BORE LOCATION

3951

ZONE A1

ZONE A2

ZONE A3

ZONE B

ZONE C

TRIAL PIT NO. 1

TRIAL PIT NO. 2

Stn I 26·0

Stn II

Stn III

Stn IV

Bench Mark D.L.T.S. Victoria 654-1 22·101

Observation bore CAR. 22

Ruin

YELLOW LIMESTONE

YELLOW LIMESTONE

ROAD

BORDER

Stobie Pole

Stobie Pole

Windmill, tank and trough

DAL BM 2166 19·09

Area of sand cover 1-2m thick with numerous small depressions

A1 20·6
B1 19·7
C1 22·3
D1 22·6
E1 23·7
F1 22·9
A2 19·2
B2 21·8
C2 21·1
D2 22·0
E2 23·4
F2 23·7
A3 21·2
B3 21·0
C3 21·2
D3 23·6
E3 23·4
F3 24·2
A4 20·1
B4 20·0
C4 19·8
D4
E4 23·4
A5 21·2
B5 20·6
C5 19·9
D5 21·6
E5 22·4
A6 22·2
B6 21·0
C6 21·4
D6 20·5
E6 22·3
A7 22·3
B7 21·7
C7 21·2
D7 21·9
E7 23·6
X1 20·2
X2 22·7
X3 22·2
X4 23·3
X5 22·3
X6 22·6
X7 22·1
X8 18·6
X9
X10 2·3
X11 20·8
X12 21·6
X13 22·1
X14 21·5

0 40 80 120
METRES

NOTE : Stadia Survey by R.J. Harris. S.F.B. 589, 594, 595. Height datum : A.H.D.

FIG. 3

Pale red-brown aeolian sand.

Grey soil and alluvium.

GAMBIER LIMESTONE : Outcropping or subcropping grey weathering white limestone. Irregular discolouration by iron staining along joints. Thin grey soil cover.

Sinkhole or solution feature.

Shallow depression or area of solution holes.

Joint

C6 21·4 — Drillhole drilled by S.A.D.M.E. 1978 with collar elevation.

Drillhole drilled by Minerals Pty. Ltd. August 1977.

Lease boundary with corner post.

Stn.1 23·5 — Survey station with elevation.

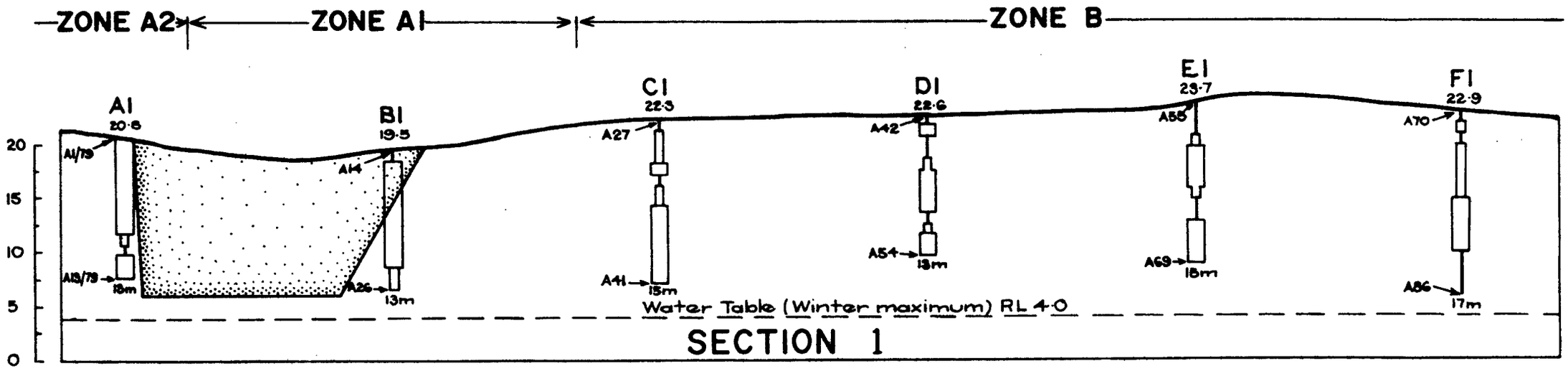
DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA

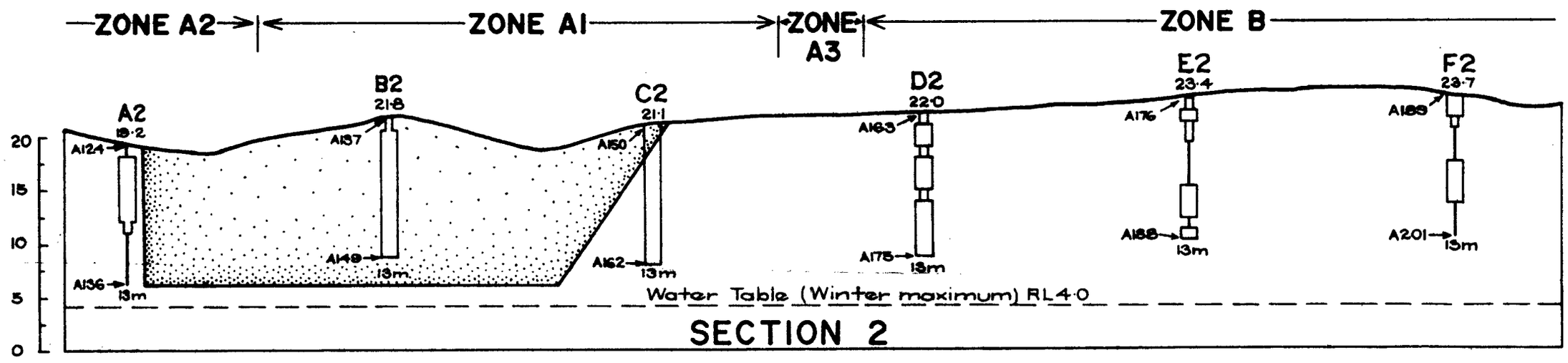
HONEYSUCKLE FLAT LIMESTONE DEPOSIT

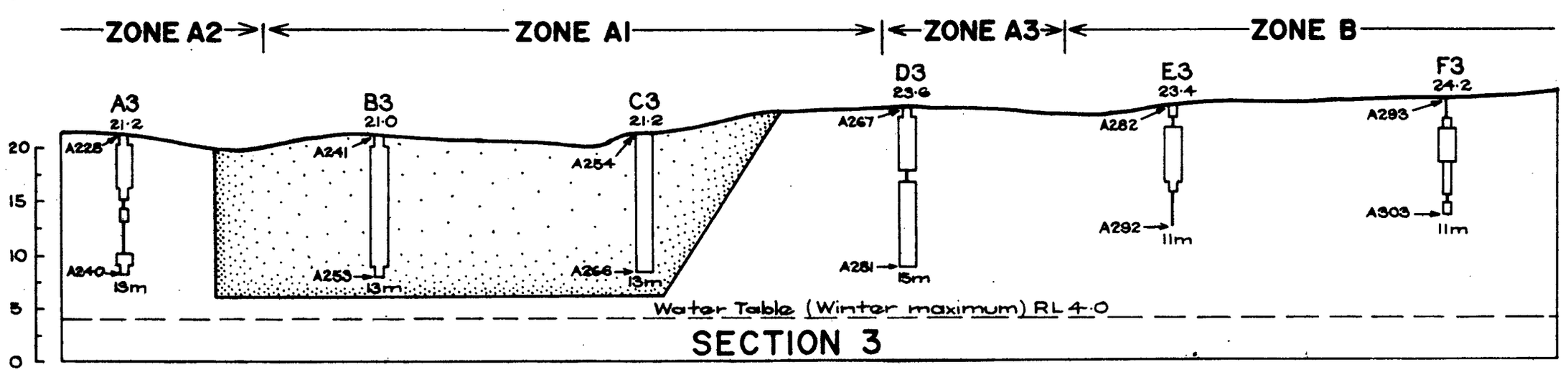
GEOLOGICAL PLAN

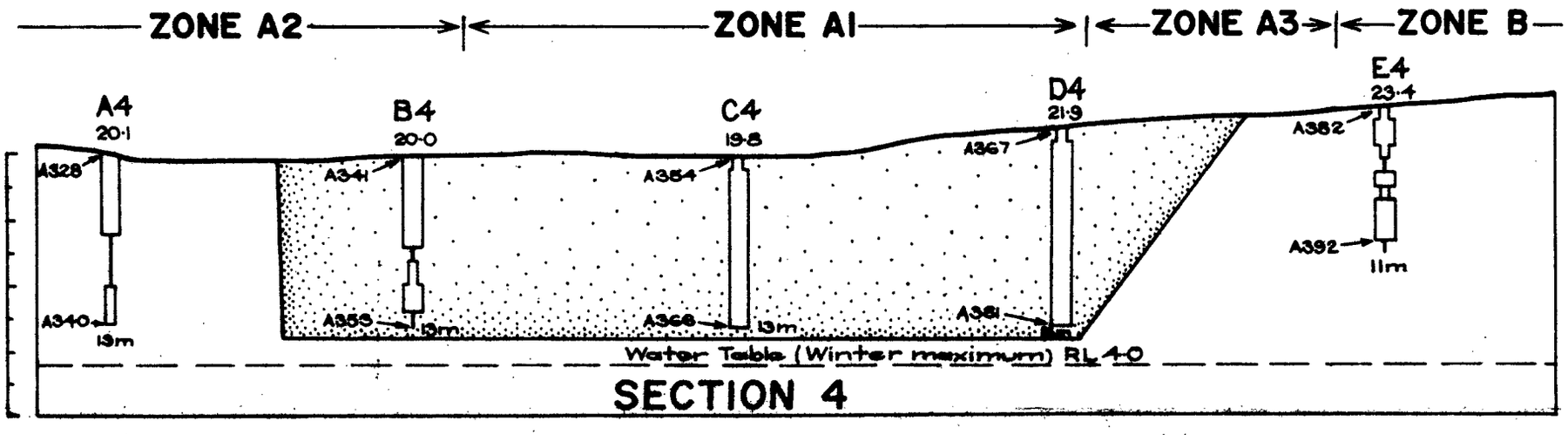
COMPILED L.C.Barnes
DRAWN J.W.
DATE March '86
CHECKED
C.D.O. 5·8·86 DATE
SCALE 1:2000
PLAN NUMBER 86-133

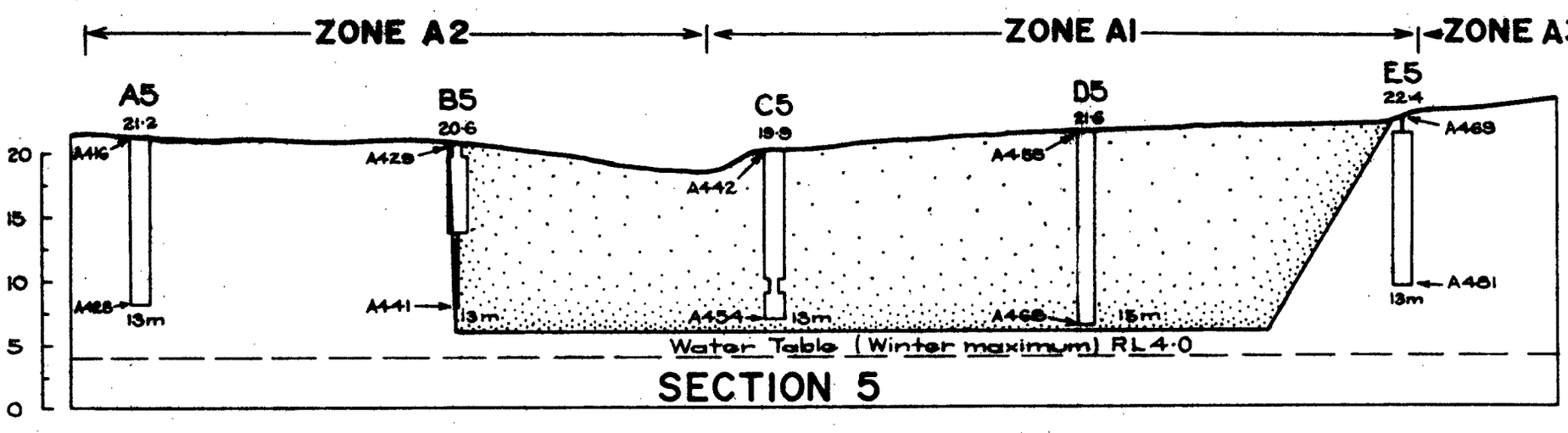
395/

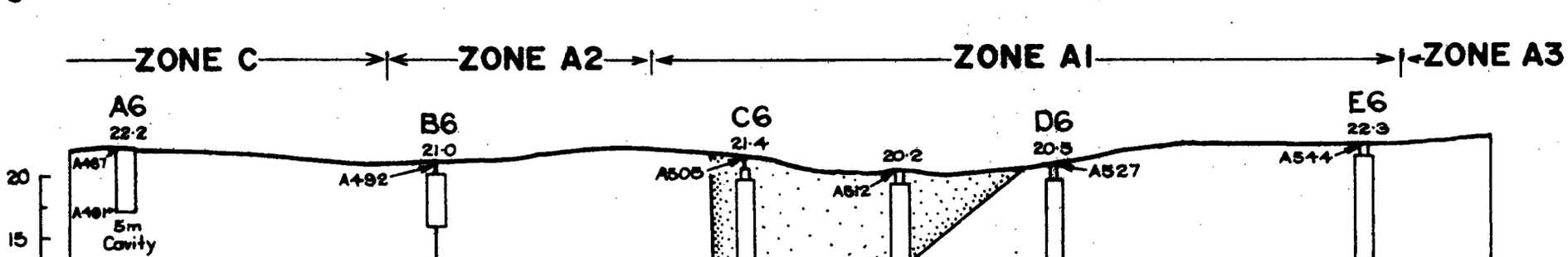


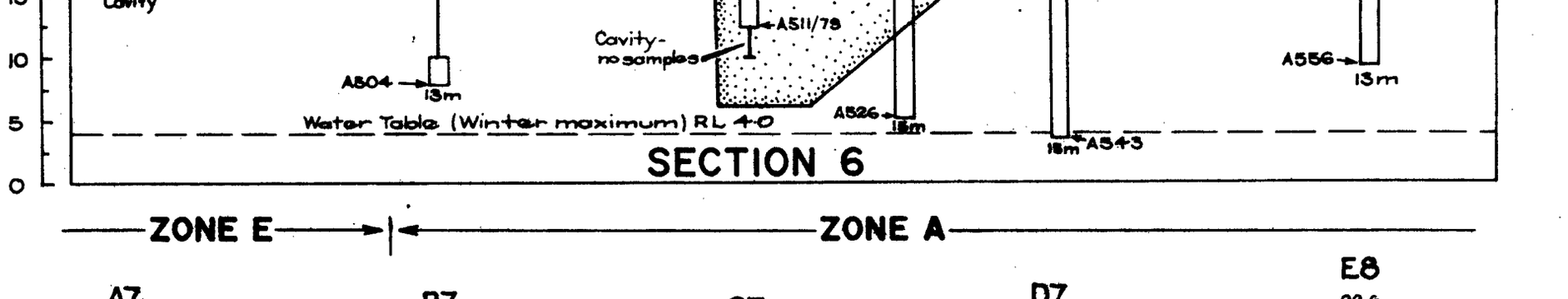












A7 Hole number.
22·3 Collar elevation.

A594/79 → Sample numbers. Samples taken at 1m intervals. To A602/79

LIMESTONE COLOUR

- White clean limestone, very minor yellow or orange staining - whiting grade.
- Very pale yellow limestone - traces of yellow/orange staining. Probable whiting grade
- Pale yellow to orange limestone. Badly stained - not whiting grade.

9m Total depth.

Proposed quarry outline.

0 20 40 60 80 100
METRES
V/H = 4

FIG. 4

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA

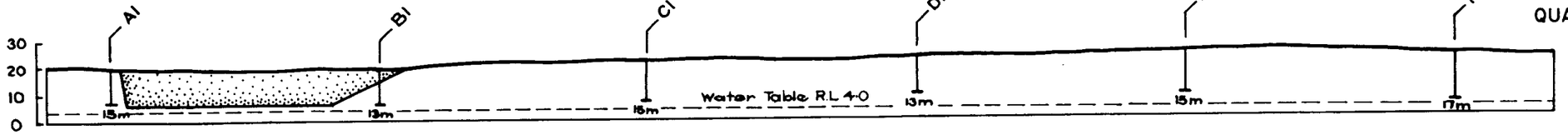
HONEYSUCKLE FLAT LIMESTONE DEPOSIT
CROSS SECTIONS AND DRILLHOLE DATA

COMPILED L.C. Barnes	C.D.O. 5 · 8 · 86 DATE
DRAWN J.W.	SCALE 1:2000
DATE March '86	PLAN NUMBER 86-134
CHECKED	

3951

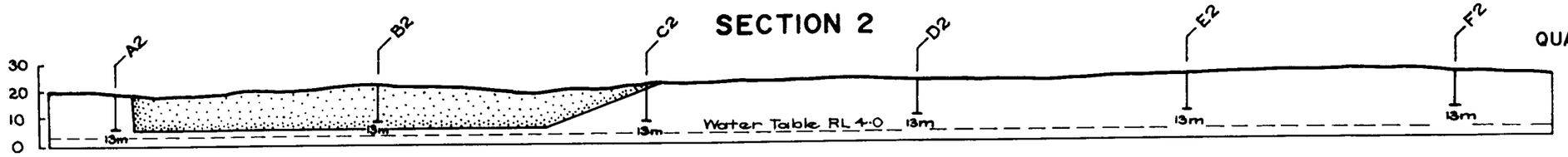
ELEVATION IN METRES (AHD)

SECTION 1



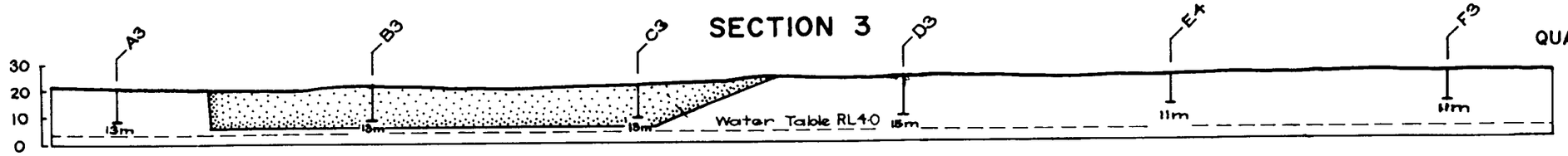
QUARRY AREA 1 = 1330 m²

SECTION 2



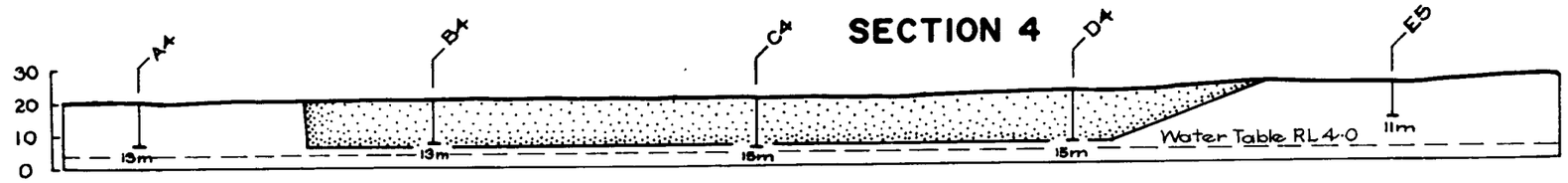
QUARRY AREA 2 = 2600 m²

SECTION 3



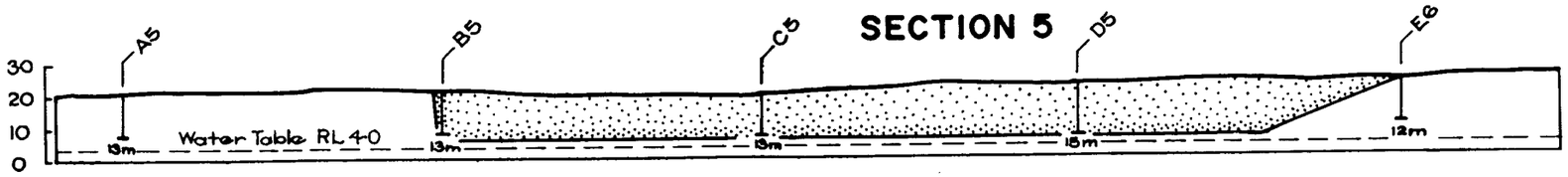
QUARRY AREA 3 = 2950 m²

SECTION 4



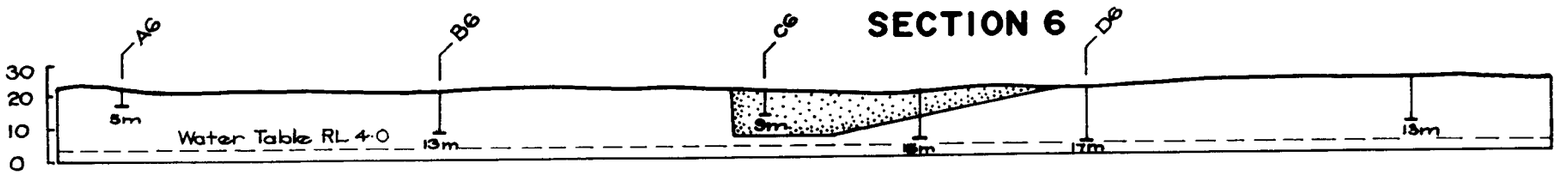
QUARRY AREA 4 = 4260 m²

SECTION 5



QUARRY AREA 5 = 4400 m²

SECTION 6



QUARRY AREA 6 = 1000 m²

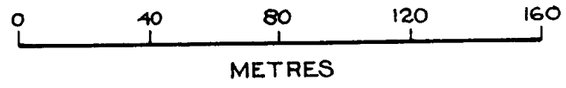


FIG. 5

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

HONEYSUCKLE FLAT LIMESTONE DEPOSIT
CROSS SECTIONS AND RESERVES CALCULATION

COMPILED L.C.Barnes	C.D.O. 5·8·86 DATE
DRAWN J.W	SCALE 1:2000
DATE March '86	PLAN NUMBER 86-135
CHECKED	

395/

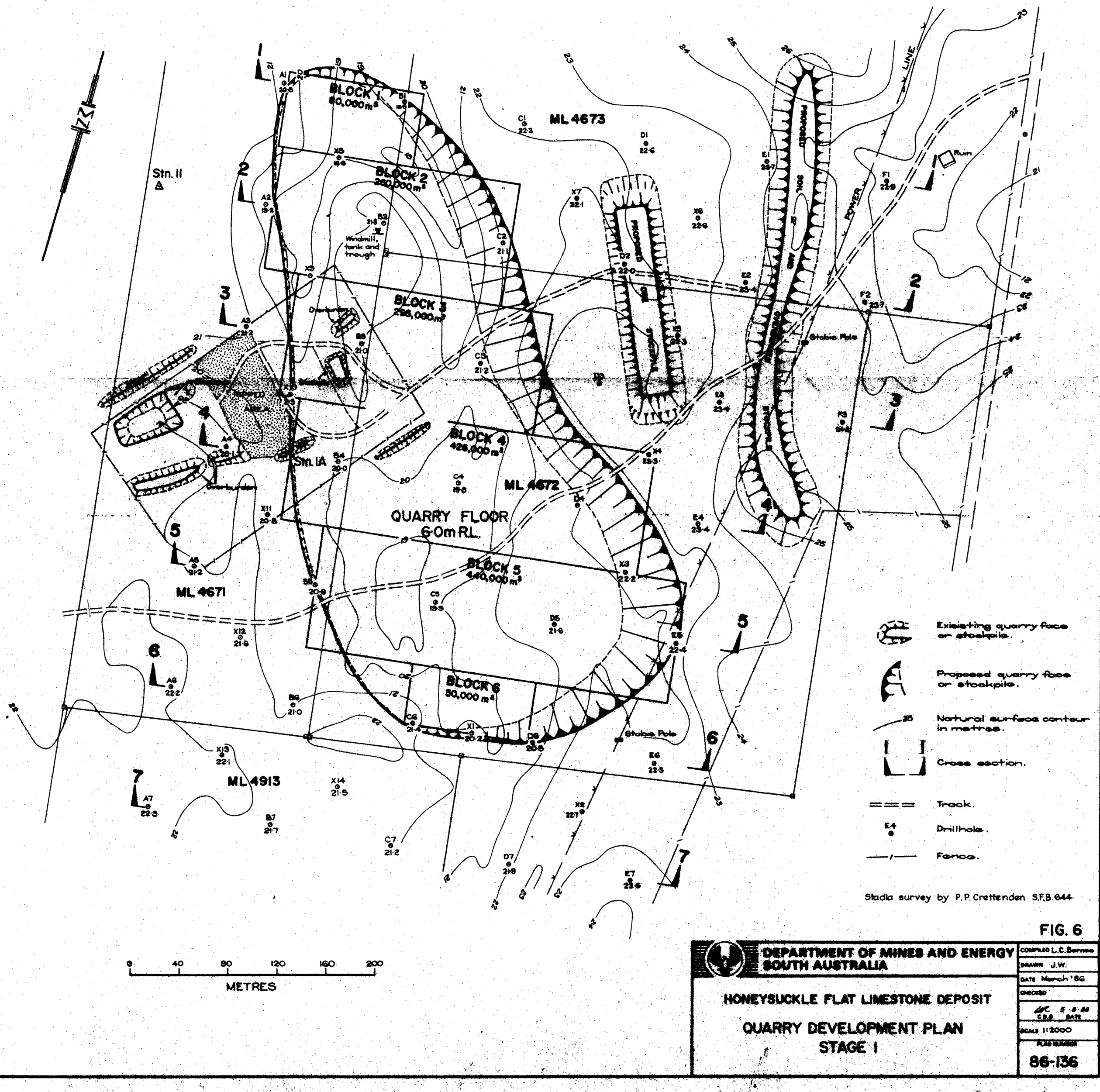


FIG. 6

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

COMPILED L.C. Barnes
DRAWN J.W.
DATE March '86
CHECKED
C.D.O. 5·6·86 DATE
SCALE 1:2000
PLAN NUMBER 86-136

HONEYSUCKLE FLAT LIMESTONE DEPOSIT

QUARRY DEVELOPMENT PLAN
STAGE 1

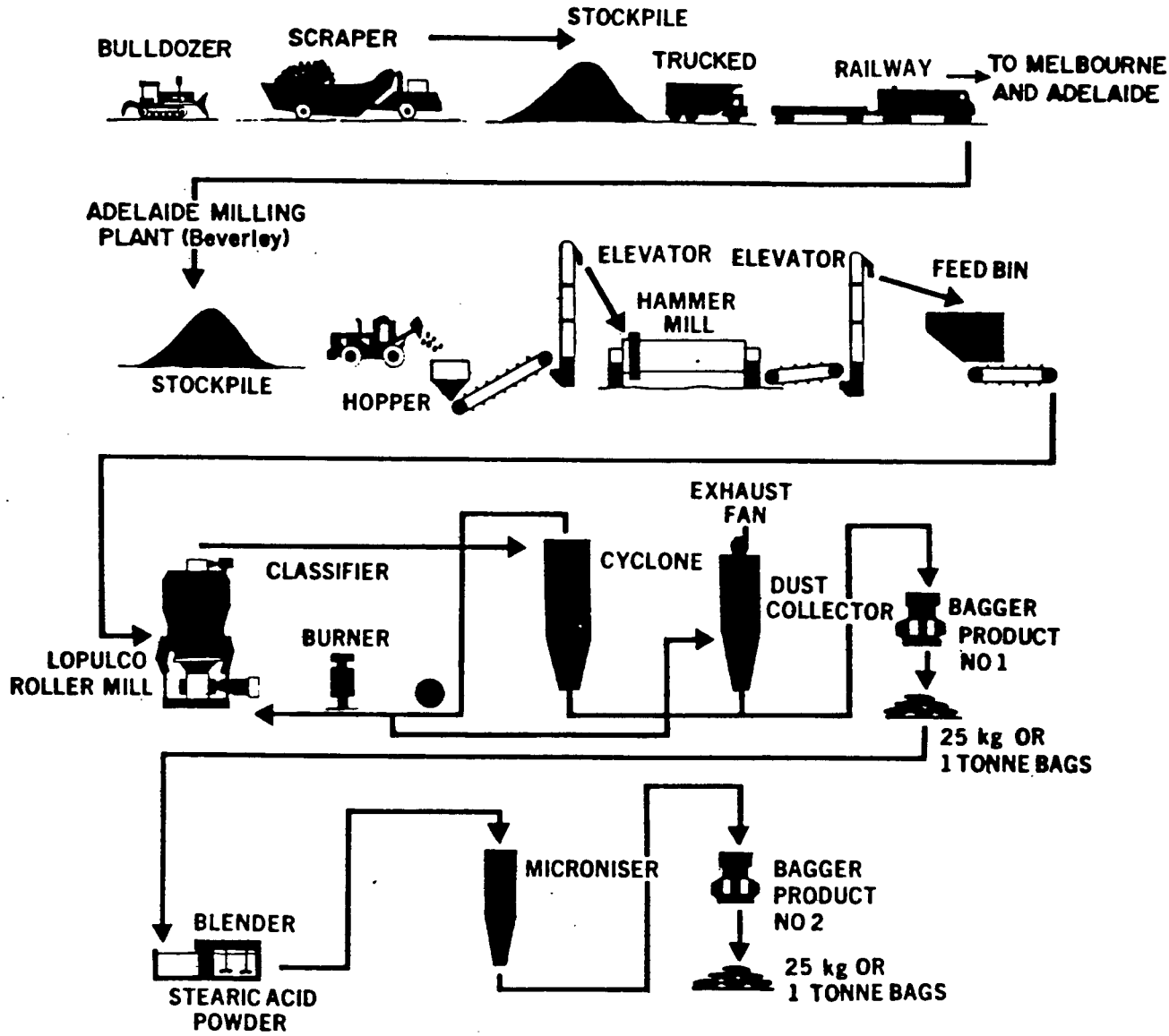


FIG. 7

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	COMPILED L.C. Barnes	C.D.O. DATE
	DRAWN J.W.	SCALE
MINING AND TREATMENT OF HONEYSUCKLE FLAT LIMESTONE	DATE March '86	PLAN NUMBER S18556
	CHECKED	