DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

Rept. Bk. No. 80/44

LIMESTONE AND DOLOMITE DEPOSITS - PORT WAKEFIELD AREA. REPORT NO. 1 - REVIEW AND RECONNAISSANCE SAMPLING, HUNDRED OF KULPARA

(Electricity Trust of S.A.)

GEOLOGICAL SURVEY

By

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MINERAL RESOURCES SECTION

APRIL, 1980.

D.M. No. 627/79

CONTENTS

PLATES

DEPARTMENT OF MINES AND ENERGY
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(Electricity Trust of S.A.)

ABSTRACT

The Electricity Trust of South Australia require a source of high grade limestone or dolomite to be used in firing of coal from the Wakefield Coal Deposit.

A survey of available literature, supplemented by reconnaissance sampling, has established that Kulpara Limestone, a buff to light grey dolomite of Cambrian age, will meet the chemical specifications. Three potential quarry sites, each capable of yielding the required 20 million tonnes have been determined, two in the South Hummock Range and the third, north-west of Melton on northern Yorke Peninsula. The site near Melton is preferred.

Material suitable for a trial sample is available from the screenings stockpile at a quarry operated by Highways Department on section 360, hundred of Kulpara.

It is recommended that ETSA apply for an Exploration Licence over the Melton area to secure mineral tenure to Site 3 while the trial sample is being tested.

Further work in the form of detailed mapping and diamond drilling is required to prove reserves and quality of dolomite available for mining.

INTRODUCTION

On the 7th November 1979, the Electricity Trust of South Australia (ETSA) requested geological assistance in locating a source of high grade limestone or dolomite in the Port Wakefield area. Limestone or dolomite is required for firing with coal from the Wakefield Coal Deposit to remove salt, thereby reducing boiler fouling, and to fix sulphur given off during combustion of the coal.

ETSA envisage that approximately 20 million tonnes of carbonate rock will be required over the working life of the coal deposit, about 40 years. As a first stage, a sample of limestone of 50 to 100 tonnes considered to be representative of any long term supply, was required by March 1980 for test firing with a coal sample.

Limestone or dolomite selected had to meet the following specifications:-

1) The sample must be representative of a possible long term supply.
2) The deposit should be as close as possible to the Wakefield trial pit.
3) The sample must have the following chemical composition:-
   - : Calcium carbonate and magnesium carbonate combined to be greater than 90 per cent.
   - : Sulphur less than 1 per cent.
   - : Silicon (SiO_2) less than 5 per cent.
   - : Iron (Fe) less than 2 per cent.
   - : Sodium less than 1 per cent.
   - : Chlorine less than 1 per cent.
   - : Potassium less than 1 per cent.
4) When locating the deposit consideration to the impact of mining on the immediate environment is essential.

A literature survey established that Cambrian limestone and dolomite in the Hummock Range, east of Kulpara, would meet the specifications with regard to chemical composition and tonnage. A reconnaissance of the Kulpara area was made with S.J. Ewen

(Field Assistant) on the 8th and 9th November, 1979 to collect samples and to establish potential quarry sites.

Analytical results and recommendations regarding a trial sample were communicated to ETSA on the 13th December, 1979.

PREVIOUS INVESTIGATIONS

In the past 30 years, there have been a number of geological investigations of limestone and dolomite in the Port Wakefield area; these are summarised below.

Chemical analyses of dolomite from the Riverton-Clare district were recorded by Wilson (1952) following mapping of Adelaidean sediments in the area.

A description of Cambrian Kulpara Limestone is given by Wade (1952) in a brief report on the possible extension of a road metal quarry on section 230, hundred Kulpara in the South Hummock Range.

Regional sampling of carbonate outcrop in the Mount Lofty Ranges and Wakefield area is described by Forbes (1960). This work, together with results of previous investigations were combined by Johns (1963) in a summary of limestone, dolomite and magnesite resources in South Australia.

Kulpara limestone was diamond drilled, near Melton, in 1966 for road metal (Russ, 1968) and in the South Hummock Range, for metallurgical grade dolomite, in 1969 (Conor, 1970). The subsurface extent of Kulpara Limestone on northern Yorke Peninsula, originally mapped by Crawford (1965), has been more precisely defined by Aquitaine Australia Minerals Pty. Ltd. in the course of exploration for base metals (Lee, 1978).

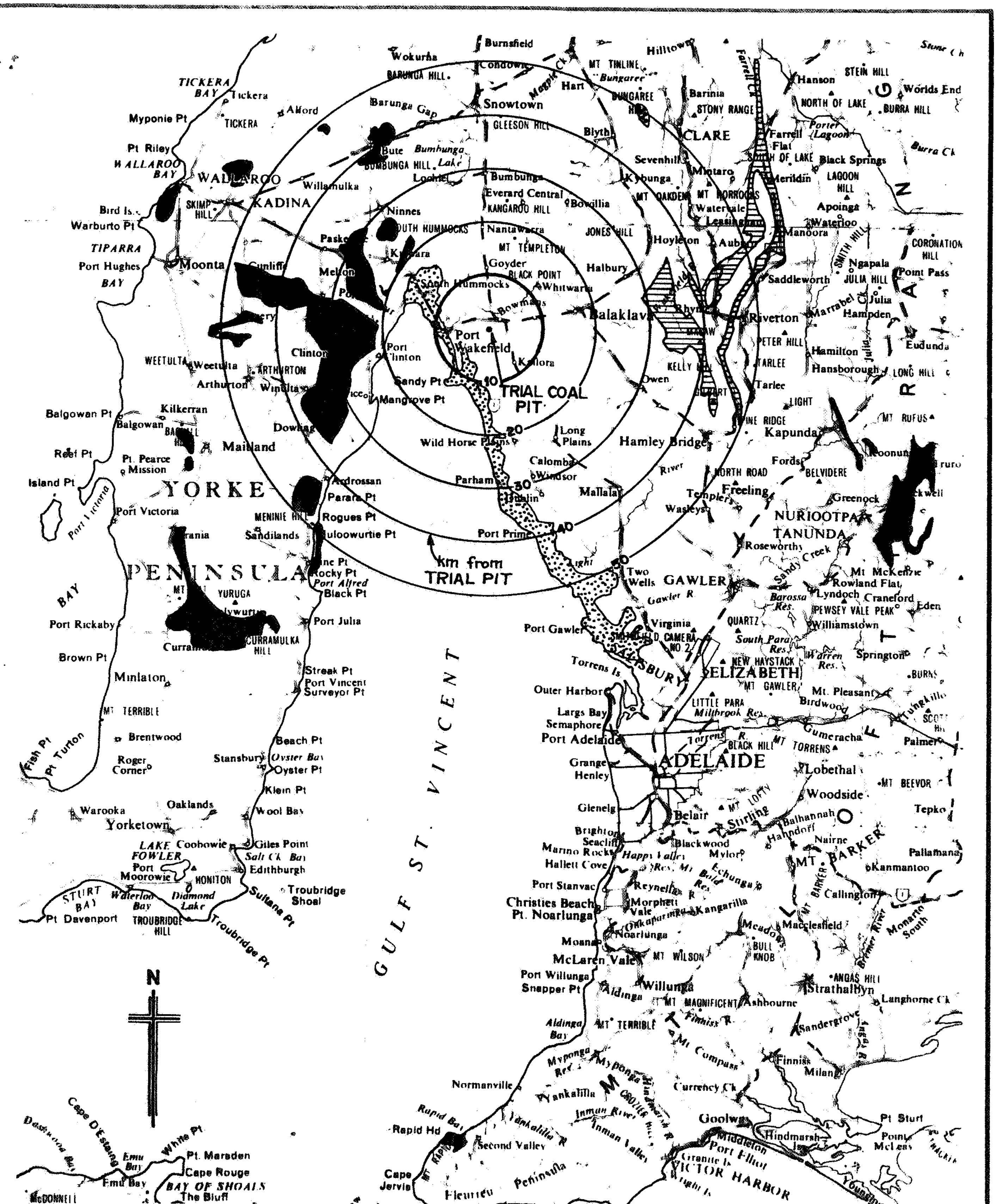
REGIONAL GEOLOGY

The area of interest was limited to a 50 km radius centred on ETSA's trial pit near Bowmans (Fig. 1). Geological coverage is provided at 1:250 000 scale by ADELAIDE, MAITLAND, and BURRA sheets, and WHYALLA (in preparation). Published 1:63 360 scale geological maps are available for Wallaroo, Wakefield, Clare and Kapunda.

Precambrian quartzite, tillite, shale and dolomite are present beneath thin Quaternary cover on northern Yorke Peninsula, and crop out along the Hummock Range, northwest of the trial pit, and the Mount Lofty Ranges to the east. Dolomitic units are generally thin and interbedded with shale and siltstone. The most prospective formation, Skillogalee Dolomite, is restricted to the area immediately east of Balaklava and the Mount Lofty Range between Clare and Riverton.

Cambrian limestone and dolomite, overlying Precambrian rocks, extend over a large area of central and northern Yorke Peninsula. Cambrian rocks are a proven source of high grade carbonate and are the main target of this investigation. Dolomite at Ardrossan is quarried for metallurgical flux by The BHP Co. Ltd. and Cambrian limestone from Penrice, near Angaston is used in the cement and chemical industries. These carbonate rocks are also a source of high quality bituminous sealing aggregate being quarried at Curramulka, and northwest of Melton.

Tertiary sand, clay, limestone and lignite occupy the St. Vincent Basin in the central portion of the area and are exposed in coastal cliffs along eastern Yorke Peninsula. At Klein Point, bryozoal limestone is quarried by Adelaide Brighton Cement Ltd. and shipped to Adelaide for cement manufacture. Equivalent Tertiary limestone is found as scattered outcrops on northern Yorke Peninsula but quality and quantity of material available, in the main, is untested.



LEGEND

QUATERNARY .... St. Kilda Formation

CAMBRIAN .... Parara Limestone and Kulpara Limestone & equivalents.

PRECAMBRIAN .... Skillogalee Dolomite

PRECAMBRIAN .... Blyth Dolomite

SCALE 1:1000 000

20 0 20 40

KILOMETRES

FIG. 1

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

WAKEFIELD COAL DEPOSIT—CARBONATE SOURCES

LOCALITY PLAN SHOWING E.T.S.A.'s TRIAL COAL PIT AND POTENTIAL CARBONATE SOURCES

COMPILED	J.K.	CDO	DATE
DRAWN	S.R.	SCALE 1:1000 000	
DATE	14/3/79	PLAN NUMBER	S14703
CHECKED			

1870

Widespread Quaternary cover includes fixed sand dunes, calcareous soils, nodular and sheet calcrete and modern beach deposits. Calcrete is common over much of Yorke Peninsula and north of Gulf St. Vincent. Material from the Kulpara - Wallaroo district has been burnt to produce lime and is used extensively by local councils for surfacing unsealed roads. Shellgrit in the form of dune and beach deposits of the St. Kilda Formation is widespread between Port Wakefield and Port Gawler.

Calcrete and shellgrit offer limited potential as sources of high purity calcium carbonate.

CARBONATE SOURCES

Precambrian

Dolomites within lower Burra Group sediments which crop out along the western Mount Lofty Ranges, east of Balaklava include Blyth Dolomite Beds (River Wakefield Sub Group), Skillogalee Dolomite and Auburn Dolomite. Mapping and sampling (Wilson, 1952) suggest high grade carbonate is available from the Skillogalee Dolomite. Cream coloured, fine to medium grained dense dolomite from this formation gave the following analyses;-

	Analyses %			
Location	$CaCO_3$	$MgCO_3$	SiO_2	Fe_2O_3 + Al_2O_3
Sections 508 and 506 Hd. Alma.	53.76	44.40	1.14	0.98
Section 65, Hd. Upper Wakefield.	50.86	41.46	6.20	1.22

The sample from section 65, hundred Upper Wakefield, is considered typical of Skillogalee Dolomite in the Clare area (Wilson, 1952). Silica content exceeds ETSA's specification and further work is not recommended.

Auburn Dolomite is siliceous; all samples collected by Wilson showing silica in excess of 12 per cent. No data is available for the Blyth Dolomite Beds which are exposed in a road cutting, 6.4 km east of Blyth. At this locality, a minimum of 60 - 120 m of fine to medium grained pale brown to dark grey dolomite and dolomite marble have been recorded (Forbes, 1964). However this dolomite outcrop is 50 km from the trial pit and no further work is warranted.

Cambrian

Carbonates of Cambrian age crop out along the southern Hummock Range, 20 km northwest of the trial pit. They comprise Kulpara Limestone, a light grey to buff, massive dolomite and dolomitic limestone and the overlying Parara Limestone, a blue-grey banded concretionary limestone with a clayey to silty matrix. Kulpara Limestone is also present beneath a thin Quaternary cover over a large area near Melton (see Fig. 2).

Previously, two traverses have been made across the Hummock Range outcrop, with carbonate samples collected at 30 m intervals (Forbes,1960). These results, supplemented by a further traverse to the north, and analyses of diamond drill core from Kulpara DDH1, were reported by Johns (1963). The location of the traverses is shown on Figure 2.

Field inspection and sampling of Parara Limestone along the Pt. Wakefield - Kadina road confirmed that high grade calcium carbonate is restricted to thin bands and concretions within a silty to clayey matrix (Plate 1). Analyses of sample A 3254/79 (Table 1) together with similar results from samples collected by Hiern in 1969, (Appendix A) indicate that, at this locality, Parara Limestone contains in excess of 20 per cent SiO_2.

In contrast, samples from the Kulpara Limestone show consistently high carbonate, with the ratio $CaCO_3$:$MgCO_3$ approximately

Plate 1: Parara Limestone - carbonate nodules in an argillaceous matrix. Slide No. 15117

1.2:1. Analyses of samples taken during this investigation are summarised in Table 1 from the full analytical report in Appendix A.

TABLE 1: Summary of chemical analyses of limestone and dolomite samples, Hd. Kulpara

Assay No.	$CaO + MgO + CO_2$ (%)	SiO_2%	Remarks
A 3248/79	96.2	2.30	Section 230 - sample from quarry floor.
A 3249/79	98.0	1.15	
A 3250/79	97.5	1.40	
A 3251/79	96.4	1.70	Section 360 - Highways quarry, screenings stockpile.
A 3252/79	97.0	1.7	Section 233 - surface sample.
A 3253/79	94.9	3.45	Section 235 - surface sample.
A 3254/79	66.75	21.9	Section 230 - Parara Limestone, roadside outcrop.
A 3255/79	94.7	3.45	Section 498 - outcrop in creek.

Tertiary

Bryozoal Port Vincent Limestone of Oligocene to Miocene age is exposed in coastal cliffs along eastern Yorke Peninsula between Port Julia and Edithburgh (Stuart, 1970). This formation is quarried at Klein Point by Adelaide Brighton Cement Ltd. where high grade, hard, pink limestone contains 95-96 per cent total carbonate with $MgCO_3$ not exceeding 2.5 per cent. Less consolidated limestone at the quarry contains 85-92 per cent total carbonate of which $MgCO_3$ makes up 2-2.5 per cent; iron, alumina, potash and

soda total less than 2.5 per cent, and silica comprises the balance (Johns, 1967).

The name Melton Limestone is used for limestone of equivalent age cropping out north of Melton and along the coast of northern Yorke Peninsula (Lindsay, 1970, Crawford, 1965). An exposure in a 9 m deep sink-hole, 2 km north of Melton, was described by Lindsay (1970), as a near-horizontal, distinctly-bedded bryozoal calcarenite to calcirudite, fawn to yellow or iron-stained red quartzose, highly porous, and compactly cemented or weathered and friable. Probable extent of Melton Limestone as shown on Figure 2 is based on Crawford's original field data recorded on aerial photograph. Chemical analyses are not available for Melton Limestone from this locality, but silica is likely to exceed 5 per cent, particularly in the lower part of the formation. Should dolomite prove unsuitable, and a source of limestone be required, then this unit may warrant further investigation.

Marginal marine equivalents of Port Vincent Limestone, described from coal bore I41, 5.5 km southeast of Port Wakefield, comprise only bands of bryozoal limestone and sandy dolomite, less than 1 m thick, within a sequence of fine sand and clay (Cooper, 1977).

Quaternary

Calcrete forms as part of the soil profile over much of Yorke Peninsula varying from nodular rubble to sheets of hard cemented limestone, which is locally ripped and crushed for road rubble. Massive sheet calcrete is equated with Ripon Calcrete of Middle Pleistocene age and is extensive in the Melton area (Valentine, 1979). Although irregularly distributed and probably less than 1 m thick, $CaCO_3$ content can be as high as 88.7 per cent (Johns, 1963, p. 54). Large tonnages of high grade material are, however, unlikely to be obtained without considerable wastage.

Overburden at a potential quarry site near Melton comprises 1-1.5 m of calcrete which should be tested against the specifications before being rejected as waste. Apart from this, no further work is warranted on calcrete.

Shellgrit of Holocene age, deposited on beaches and reworked into low dunes, comprises part of the St. Kilda Formation extending between Port Gawler and Port Wakefield. Reconnaissance auger drilling near Lorne, 10 km south of Port Wakefield, indicate reserves of 2.6 million tonnes, averaging 75 per cent $CaCO_3$, overlying possible Tertiary limestone (Mansfield, 1956). Much of the area tested is now reserved from the operation of parts IV-VIII of the Mining Act 1972-1978, being within 800 m of high water. Because of this, together with limited reserves, shellgrit is not considered to be a suitable source of high grade carbonate.

POTENTIAL QUARRY SITES

Three sites, within Kulpara Limestone, where reserves in excess of 20 million tonnes could be established, have been located (Fig. 2).

Site 1 - Large reserves of dolomite are indicated on part sections 229, 230 and 233, hundred Kulpara (Plate 2), north and west of a disused road metal quarry (Wade, 1952). The yellow to light grey dolomite dips 30° east. Contact with overlying Parara Limestone is along the eastern quarry face.

Samples A 3248/79 - A 3250/79, chippings from broken rock on the quarry floor, fall within ETSA's chemical specifications. Sufficient material for a trial sample is available but would require crushing.

Plate 2: View of Site 1, looking south. Parara Limestone crops out to the left of the quarry (centre) which is in Kulpara Limestone. Port Wakefield - Kadina road in Background.

Slide No. 15118

Plate 3: View across section 235, north of Site 1, showing Kulpara Limestone in the foreground of the South Hummocks - Warrindi Homestead centre.

Slide No. 15119

Composite sample A 3252/79 from dolomite outcrop on the roadside adjacent to section 233 confirms the persistence of high grade, carbonate rock north along strike.

Although the existing quarry is barely visible from the main Port Wakefield - Kadina road, a quarry of the size envisaged would be visible from both this road and the plains to the east and would require some form of screening.

Road transportation of quarry product could present a hazard on the busy Port Wakefield - Kadina road.

Suitable dolomite (A 3253/79) is available in section 235, north of Site 1, but the area is one of the more scenic parts of the Hummock Range (Plate 3) and quarrying of this dolomite can not be recommended.

Site 2 - This potential quarry site, in section 498 on the escarpment of the Hummock Range, has been previously investigated by drilling in 1946 and in 1969. Access is gained via a little used track southwards off the Port Wakefield - Kadina road, 400 m east of Kulpara.

The 1946 diamond drillhole sunk to 74 m by The Broken Hill Proprietory Company Ltd. was followed up, in 1969, by a angled diamond drill hole sunk to 180 m by the S.A. Department of Mines (geological log included in Appendix B). Reserves of 17 million tonnes of dolomite averaging 50.9 per cent $CaCO_3$, 44 per cent $MgCO_3$ with 3.2 per cent SiO_2 were indicated (Conor, 1970). Sample A 3255/79, collected across outcropping dolomite on the northern bank of a creek (plate 4), is consistent with Conor's results. The dolomite is very similar to that

Plate 4: View of Site 2, looking west. Sample A3254/79 was taken from Kulpara Limestone outcrop on the northern creek bank (right of centre).

Slide No. 15120

Plate 5: General view southeast from the northern boundary of section 498, on the access track on Site 2. Port Wakefield - Ardrossan road crosses plains in the distance.

Slide No. 15121

at Site 1 and also dips east at 30°.

Site 2 is only 500 m from the Wallaroo - Hamley Bridge, 1.60 m gauge railway which could be utilized for transportation.

The view from the access track on the northern boundary of section 498 (Plate 5) shows the deposit to be visible from the Port Wakefield - Ardrossan road. Visual impact of quarrying this site could be minimised by adopting a slot mining technique.

Dolomite of similar grade crops out between Sites 1 and 2 but all potential quarry sites are either visible from the Port Wakefield - Kadina road or close to Wilchatay Homestead. The log of Kulpara DDH 1, drilled in section 206, between Sites 1 and 2, is included in Appendix B.

Site 3 - Kulpara Limestone is present below a thin cover of red sandy clay and calcrete over a wide area around the township of Melton. The unit comprises the core of a north-south trending syncline with shallow dipping limbs. The area of subcrop shown on Figure 2 is based on geological and geophysical work by Aquitaine Australia Minerals Pty. Ltd. (Lee, 1978).

A quarry has been opened by the Highways Department in flat-bedded dolomite on section 360, hundred Kulpara, 2.7 km northwest of Melton.

Site 3 covers an area immediately south of this quarry on sections 360, 361 and 431. Access from Melton is gained along an unsealed road which crosses the railway, 750 m northwest of the town. The site comprises cultivated paddocks and areas of scrub with subdued topographic relief.

At the Highways Department quarry, buff to mottled grey and brown, fine grained, crystalline dolomite is overlain by less than 2 m of red sandy clay and sheet calcrete (Plate 6). The deposit was diamond drilled (KDD 1 - KDD 4) to 12.2 m by the Department of Mines in May, 1966; the base of the dolomite not being penetrated (Russ, 1966). Logs of these holes are included in Appendix B.

A large stockpile of screenings at the quarry was sampled (A 3251/79, Plate 7) and is within specification. This represents a readily available source for the trial sample.

TENURE

Mineral Tenure

Under Section 6 of the Mining Act, 1971-1978, limestone and dolomite are included in the definition of extractive minerals unless used for a prescribed purpose. A "prescribed purpose" as listed in regulation 6, Mining Regulations 1972 - 1979, means any or all of the following: chemical, cement, lime and glass manufacture, metallurgical flux, refractories, industrial fillers, foundries, fertilizers and agricultural uses. In the case of an extractive mineral, only the landowner can peg an extractive minerals claim. However in ETSA's case, the limestone is to be used in a manner similar to that for metallurgical flux which is therefore deemed to be a prescribed purpose. Hence, a suitable deposit can be pegged as a mineral claim and converted to a mineral lease.

Potential quarry Sites 1 and 2 are within Exploration Licence 577 held by North Broken Hill Limited. Under Section 80(2) of the Mining Act 1971-1978, permission of the licence holder

Plate 6: Highways Department Quarry, in flat-bedded Kulpara Limestone, section 360, Hd. Kulpara.

Slide No. 15122

Plate 7: Screenings stockpile at Highways Department Quarry. Sample A3251/79 being collected.

Slide No. 15123

must be obtained before a mineral claim can be registered. Potential Site 3 was within Exploration Licence 528, held by North Broken Hill Limited, which has been relinquished. Hence ETSA can secure mineral tenure to Site 3 by either pegging mineral claims, or applying for an Exploration Licence over the area. As the results of test firing the coal are unlikely to be known for some time, and further work is still required to define the ideal quarry site, it is considered that an Exploration Licence is the more appropriate form of mineral tenancy.

Land Tenure

Land tenure at the three potential quarry sites is summarised in Table 2. Sites 1 and 2 are held under freehold title whereas Site 3 is held by perpetual lease. Twenty one days notice of entry must be served on the respective landowners before any sites can be pegged.

At Sites 1 and 2, the landowner would be entitled to claim a royalty of 2.5 per cent of the assessed value of production whereas at Site 3, royalty is payable to the Crown. The landowner is entitled to compensation at all three sites.

TABLE 2: Current land tenure over potential quarry sites, Hd. Kulpara

Site	Section	Title	Holder
1	229 230 & 233	CT 3590/94 CT 3590/93 (freehold)	Kelvin Eric Rose and Rita Florence Rose (wife) TIC of Cuncliffe 5554.
2	498	CT 2180/23 (freehold)	Douglas Walter Tiver and Andrey Mary Tiver (wife) of Kulpara.
3	360 361 & 431	CL 118/21 CL 1803/146 (perpetual lease)	Brae Freebain MacDonald of Melton and Edwin Sander of 27 Alpha Road Prospect.

CONCLUSIONS AND RECOMMENDATIONS

High grade limestone or dolomite is required for use in combustion of coal from the Wakefield Coal Deposit. A survey of available data on carbonate sources within 50 km of the trial pit near Bowmans indicated that suitable material is available from Cambrian rock units on northern Yorke Peninsula.

Reconnaissance sampling has shown that Kulpara Limestone, a buff to light grey massive dolomite, meets the chemical specifications. Three potential quarry sites have been selected within this unit where indicated reserves are of the order of 20 million tonnes. Diamond drilling is required to prove tonnage and grade of dolomite available at each of the sites.

Of the three sites, it is recommended that further work be concentrated at Site 3, which has the following advantages over Sites 1 and 2.

: The area is less environmentally sensitive than sites in the Hummock Range.

: The site adjoins the Wallaroo - Hamley Bridge railway which can be used for transporting the quarry product.

: Topography and geology allow for simpler quarry design.

: Land tenure is perpetual lease as opposed to freehold at Sites 1 and 2.

: There is no mining tenement over the area.

: A representative trial sample is readily available from the stockpile at the Highways Department Quarry immediately north of the potential quarry site.

It is further recommended that

: ETSA approach Highways Department with regard to the purchase of 50 to 100 tonnes of screenings from the quarry stockpile.

: ETSA apply for an Exploration Licence over the Melton area to secure mineral tenure to Site 3 while the dolomite sample is being tested.

: Further work involving detailed mapping and diamond drilling await the results of combustion tests using the trial dolomite sample.

JLK:NK

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MINERAL RESOURCES

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APPENDIX A

Chemical analyses of Cambrian limestone and dolomite, hundred Kulpara.

Extracted from Amdel Report AC 2494/80 by D.K. Rowley

Samples submitted by J.L. Keeling 21st Nov. 1979.

ANALYSIS %

METHOD	SAMPLE NUMBER	*A 3248	A 3249	A 3250	A 3251	A 3252	A 3253	A 3254	A 3255
O1	Calcium Oxide CaO	29.4	30.0	30.5	30.0	29.7	29.2	35.7	28.6
Q1	Magnesium Oxide MgO	20.9	21.3	20.6	20.5	21.0	20.5	1.45	20.9
C5	Silica SiO_2	2.3	1.15	1.40	1.70	1.70	3.45	21.9	3.45
C5	Aluminium Oxide Al_2O_3	0.15	0.05	0.10	0.10	0.05	0.05	1.91	0.24
C4	Total Iron as Fe_2O_3	0.67	0.67	0.73	0.68	0.80	0.93	1.75	0.89
O1	Ferrous Oxide FeO	0.22	0.18	0.27	0.02	0.39	0.08	0.14	<0.02
C5	Sodium Oxide Na_2O	0.09	0.08	0.07	0.07	0.05	0.07	0.32	0.07
C5	Potassium Oxide K_2O	0.05	0.03	0.04	0.04	0.03	0.04	0.98	0.07
Calc	Carbon Dioxide CO_2	45.9	46.7	46.4	45.9	46.3	45.2	29.6	45.2
Q1	Chlorine Cl	0.028	0.034	0.032	0.022	0.023	0.040	0.006	0.020
E4	Sulphur tri-Oxide SO_3	0.01	<0.01	<0.01	<0.01	0.01	0.01	0.02	0.01

NOTE: CO_2 by calculation.

* For sample locations refer Figure 2.

Extracted from Amdel Report AN 1642/70

Samples submitted by M.N. Hiern 28th Oct., 1969

ANALYSIS
%

Sample Number	Acid Soluble Calcium as $CaCO_3$	Acid Soluble Magnesium as $MgCO_3$	Silica SiO_2
A 622/69	68.3	1.85	21.2
A 623/69	13.1	23.4	59.1
A 624/69	51.4	44.1	1.82

Comments

Sample A 622/69 - Parara Limestone nodules from road cutting adjacent to Sec. 230, Hd. Kulpara.

A 623/69 - Argillaceous matrix from road cutting adjacent to Sec. 230, Hd. Kulpara.

A 624/69 - 3 m dolomite bed from creek bank, Sec. 498, Hd. Kulpara.

APPENDIX B

Logs of diamond drillholes intersecting Kulpara Limestone

(drillhole samples are held at the Glenside Core Library)

DIAMOND DRILL LOG

Project: Kulpara Geochemical D.M. 1152/60

Bore : DDH 1 Bore Serial No. DD. 37/6

Plan Reference: S.2478

Hundred: Kulpara Section: 206 207

Driller: R. Munro

Bearing: 270° Depressed 60° Date Drilling Commenced 29/9/60

Date Drilling Commenced: Logged by R.K. Johns & B. Thomson

LOG

Depth From Ft.	in.	To Ft.	in.	Core Recovered Ft.	in.	
	0	3	6	3	6	Brown sandy clay soil with gravel.
3	6	4	10	1	3	F.g. pink-white quartzite sand stone, heavy mineral bands and cross bedding; bedding 70° to core.
4	10	10	0		6	Grey and buff dense dolomite.
10	0	14	6	1	0	f.g. grey sandstone
14	6	15	0		6	Brown clay.
15	0	20	0	4	0	Grey buff dolomite, massive to cellular some Fe Mn oxide staining on joints.
20	0	21	0	1	0	Brown clay.
20	0	50	6	20	0	Grey, buff dolomite, generally dense and broken. Some Fe Mn oxide staining on joints. Brown clay at - 20 - 21? Feet 37 - 37'6" ? 40 - 41' ?
50	6	152	0	45	0	Grey dolomite, traces Fe & Mn oxide staining. Brown sandy clays at 55 ft. 83'6" - 88' 96 ft. 126 - 131 ft. 148 - 151 ft.
152	0	190	0	27	0	Dense grey dolomite, with sandy and clay sections at 152' 154'-156' 161'3" 181 - 187' (bedding 80° to core @ 161')

190	0	137	4	88	0	Grey and buff f.g. dense dolomite brecciated in parts, 219' bedding 80° to core.
317	4	317	8	0	4	Heavily limonite stained dolomite.
317	8	331	6	8	0	Buff dolomite.
331	6	333	0	0	10	Limonite and goethite
333	0	335	4	0	9	Limonite and goethite
335	4	338	0	1	9	Yellow brown limonitic silt-stones (No effervescence with HCl) passing into leached shale.
338	0	340	6	0	1	Two fragments of quartz or quartzite.
340	6	342	6			Pink clay on leached shale.
342	6	344	6	0	3	Fragments of quartzite.
344	6	346	6	0	6	10 fragments of Fe stained and leached shale.
346	6	350	6	0	10	Fragments of Fe stained leached and weathered shale including several of arkose.
350	6	358	6	3	0	Arkose with quartz pebbles up to 1/8". and m.g. quartzite.
358	6	359	10	0	6	Clay shales.
359	10	388	0	10	6	Arkose and m.g. quartzite, hole ends in arkose. 375'3" - 379' clay 382'1" of limonitic arkose 384'½" quartz.

END OF HOLE

KULPARA GEOCHEMICAL BORE NO. 2 LOG

Project: KULPARA DOLOMITE — D.M. SR. 5/6/40

Bore No.: KULPARA GEOCHEMICAL BORE NO. 2 — Bore Serial No. DD.KD1 625/70

Hundred: KULPARA Section: 498 — Plan Reference No. 70-102

Co-ordinates: SEE PLAN NO. 70-102 — R.L. of collar: ARBITRARY DATUM 510.1 feet

Bearing 293° Depressed 60° — Driller: J. EVANS

Date Drilling commenced: 3rd Nov., 1969 — Drilling completed: 8th December, 1969.

Bore logged by: M.N. HIERN — Date: December, 1969

LOG

Depth From Ft.	in	To Ft.	in.	Description
0	0	3	9	Grey dolomite and calcrete.
3	9	10	0	Grey to blue grey dolomite. Core very broken at 9'00". Some yellow clay.
10	0	11	8	Pale grey dolomite with brown staining.
11	8	15	0	Pale to blue grey dolomite
15	0	23	1	Pale grey to off-white dolomite. Core very broken 20'6" - 23'1". Petrographic sample P 372/69 from 15'3".
23	1	24	8	Yellow brown and white dolomite. Yellow brown clay at 24'8".
24	8	28	8	Yellow brown and white dolomite with limonitic staining. Core intensely jointed. Dendritic markings.
28	8	31	9	Yellow brown and white fine-grainded dolomite
31	9	54	0	Light brown to buff dolomite. From 31'9" to 44'6" minor pitting. From 44'6" - 47'0" vughy and broken. From 47'6" - 54'0" the core is very broken.
54	0	59	0	Yellow brown clay.
59	0	63	1	Pale grey to buff dolomite, mainly fine grained. Faint banding 85° to core axis. Finely pitted. Petrographic sample P 373/69 from 62'.

63	1	63	4	Grey chert
63	4	132	6	Pale grey to buff dolomite. Brecciated in part with black manganese or iron pockets. Stained at intervals. Core very broken in places. Possible intra-formational breccia visible. Petro-graphic sample P 374/69 at 89'4".
132	6	137	0	Yellowish dolomite sand.
137	0	148	2	Pale grey dolomite broken and friable in part.
148	2	151	0	Grey to buff dolomite. Highly pitted and friable in part.
151	0	195	0	Pale grey to off-white dolomite, on the whole fine grained with some fine grained bands. Friable in places. Chert at 154'6".
195	0	228	0	Grey to blue grey dolomite. Limonite stained on joint faces, but not so broken as that part directly above. Petrographic sample P 375/69 from 197'.
228	0	229	2	White friable dolomite with limonite staining.
229	2	238	0	Off-white to pale grey very fine-grained dolomite. Core broken.
238	0	241	0	Blue grey dolomite.
241	0	270	0	Light grey to brown dolomite. Black streaks and pockets of manganese or iron oxide. Core broken and pitted in places. Petrographic sample P 376/69 from 245'.
270	0	274	9	Yellow brown dolomite. Brecciated and stained in part.
274	9	283	0	Red and black iron or manganese stained zone.
283	0	297	8	Deeply weathered yellow-brown claystone, 6" quartzite vein at 283'3".
297	8	299	5	White quartzite.
299	5	200	0	Friable conglomeratic grit.
300	0	302	0	Deeply weathered yellow-brown claystone. Greenish pocket at 300' possibly glauconitic.
302	0	329	6	White to grey arkosic quartzite. Some shale bands.
329	6	331	5	Unevenly weathered yellow-brown claystone and arkosic grit. (White to grey, coarse grained). Clay at 338'4".

338	4	395	8	Feldspathic quartzite, banded and in places cross-bedded. Planes marked by heavy minerals.

Dolomite Deposit - Section 360 Hundred Kulpara

Diamond Drillhole logs

Drilling commenced 20th April 1966, completed 2nd May 1966

Logged by:- P.J. Russ

Bore KDD 1

Depth from ft.	in	to ft.	in	Core Recovered ft.	in	Description
0	0	8	8	1	0	Kunkar. Medium hard, compact.
8	8	9	6	0	10	Dolomite. 8ft. 8in. to 11ft. 10in.
9	6	10	3	0	9	Buff to mottled grey and brown, fine
10	3	11	10	1	1	grained, crystalline, with minor
11	10	12	6	0	8	fractures, both vertical and horizontal
12	6	16	0	3	1	and numerous small solution cavities con-
16	0	20	2	4	0	taining yellow-brown sandy clay.
20	2	24	4	4	0	Clay 11ft. 10 in. to 12ft. mottled grey to pale brown.
24	4	27	4	2	6	
27	4	31	4	3	11	Dolomite 12 ft. to 40 ft.
31	4	35	6	4	0	As for 8 ft. 8 in. to 11ft. 10 in. but
35	6	37	10	2	4	with occasional solution cavities con-
						taining yellow-brown sandy clay up to ½ in. wide.
37	10	40	0	2	0	

Overall recovery 77 per cent
Recovery in dolomite 92 per cent.

Bore No. KDD 2

Depth from ft.	in	to ft.	in	Core Recovered ft.	in	ft.	in	ft.	in	Description
0	0	9	1	6	1	0	0	4	0	Clay, red, sandy.
9	1	13	4	5	1	4	0	5	0	Kunkar, hard, compact.
13	4	17	6	5	0	5	0-35		1	Dolomite, grey, fine grain-
17	6	21	8	5	0					ed crystalline, pitted with
21	8	25	9	5	0					tiny solution cavities filled with yellow-brown sandy clay.
25	9	30	0	4	6					Some minor jointing, occ-
30	0	34	2	4	0					asionally 2ft. apart, exists
34	2	38	4	4	0					
38	4	40	0	1	8					
						35	1-40		0	Dolomite, buff coloured fine grained crystalline and containing small sol- ution cavities filled with yellow-brown sandy clay.

Core recovery overall 92 per cent
Core recovery in dolomite 99 per cent

Bore No. KDD 3

Depth from ft.	in	to ft.	in	Core Recovered ft.	in	ft.	in	ft.	in	Description
0	0	8	8	7	6	0	0-	2	10	Clay, red, sandy.
8	8	12	8	3	6	2	10-	3	8	Kunkar, both hard compact and soft porous.
12	8	16	10	3	10	3	8-	18	3	Dolomite, buff coloured fine grained, crystalline, pitted with numerous solution cavities, filled with yellow-brown sandy clay. Kunkar seams at 4ft., 7ft., 9ft. 6in., 7ft. 3in.
16	10	20	4	3	6					
20	4	24	6	3	4					
24	6	28	8	4	0					
28	8	32	10	4	2					Core fractured from 3ft. 8in. to 8ft. 8in.
32	10	37	0	4	2					
37	0	40	0	3	0	18	3-	19	0	Dolomite brecciated, buff coloured fine grained crystalline angular dolomite fragments ½in. wide in non-crystalline yellow-brown dolomitic matrix.
						19	0-	21	0	Dolomite as for 3ft. 8in. to 18ft. 3in.
						21	0-	21	8	Dolomite brown, sandy, porous.
						21	8-	24	6	Dolomite as for 3ft. 8in to 18ft. 3in.
						24	6-	28	8	Dolomite as for 3ft. 8in. to 18ft. 3in., but with occasional grey mottling; core fractured.
						28	8-	40	0	Dolomite as for 3ft. 8in. to 18ft. 3in. but with occasional fracturing of the core

Recovery overall 92 per cent
Within dolomite 95 per cent

Bore No. KDD 4

Depth from ft.	in	to ft.	in	Core Recovered ft.	in	ft.	in	ft.	in	Description
0	0	11	0	2	10	0	0-	0	6	Kunkar compact, hard.
11	0	13	0	0	7	0	6-	10	4	Kunkar soft, white porous
13	0	13	8	0	8	10	4-	11	0	Clay, mottled grey and pale brown
13	8	17	8	4	0	11	0-	13	8	Dolomite buff coloured, fractured to ½in. fragments.
17	8	10	8	2	0					
19	8	22	8	2	9	13	8-	17	8	Dolomite buff coloured, fine grained crystalline pitted with small solution cavities. Occasional fractures.
22	8	26	8	3	9					
26	8	30	8	3	11					

30	8	34	8	4	0	17	8-23	0
34	8	36	8	2	0			
36	8	40	8	3	4	23	0-25	10
						25	10-27	1
						27	0-31	8
						31	8-40	0

Dolomite as for 13ft. 8in. to 17ft. 8 in. but grey in colour.

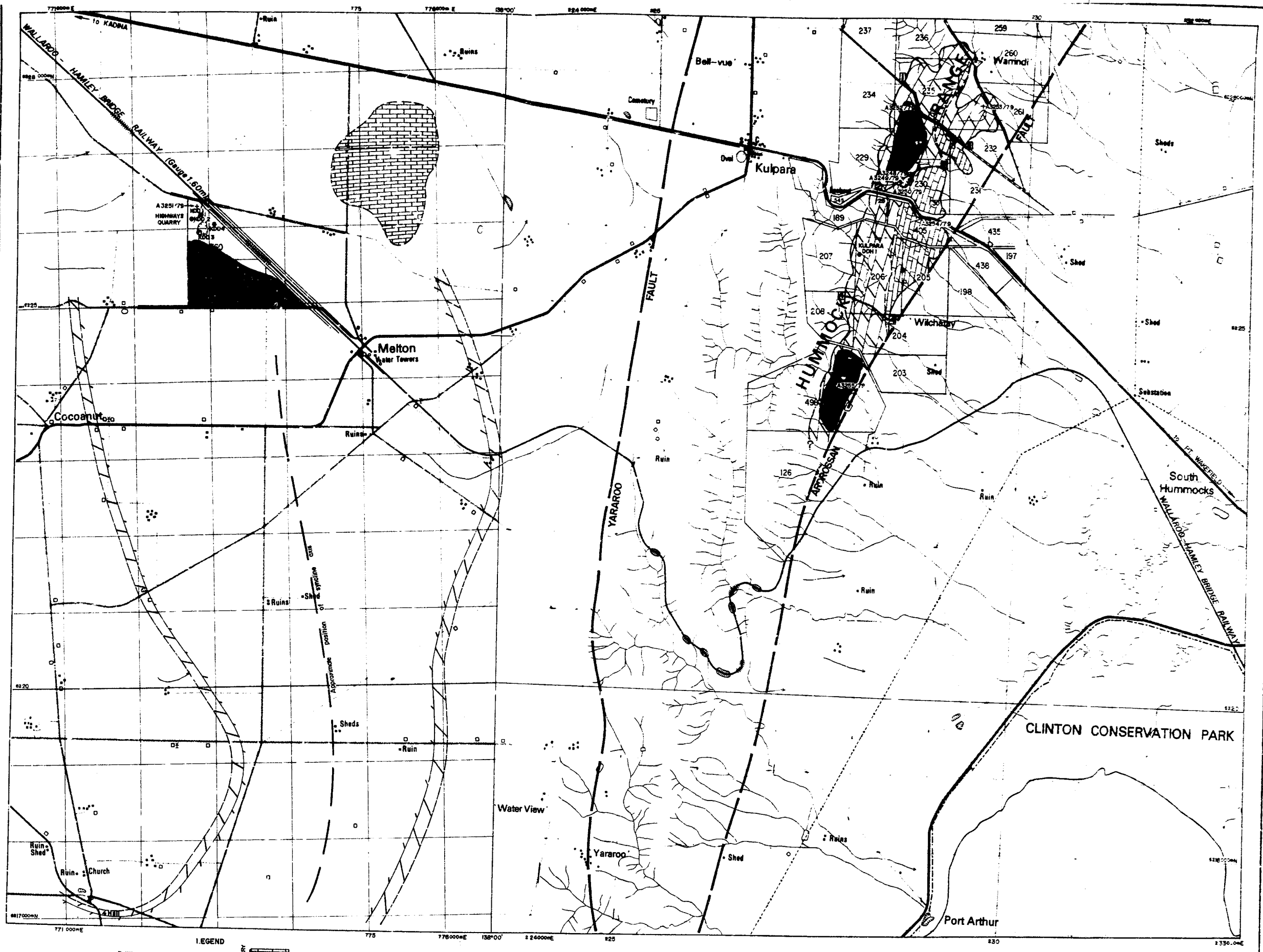
Dolomite as for 13ft. 8in. to 17ft. 8in.

Dolomite buff coloured, very porous with vughs up to ¼ in. partially filled with yellow-brown sandy clay.

Dolomite as for 13ft. to 17ft 8in.

Dolomite as for 13ft. 8in. to 17ft. 8in., but with numerous solution cavities and greater fracturing of core.

Core recovery overall 74 per cent.
Core recovery within dolomite 93 per cent.



LEGEND

- Drillhole
- A3248/79 Sample location
- Probable position of sample traverse (see R.K. Johns 1967, GSS 38)
- 124 / 203 Section boundary and number.
- Geological boundary

TERTIARY
- MELTON LIMESTONE

CAMBRIAN
- PARARA LIMESTONE
- KULPARA LIMESTONE

- Potential quarry site

SCALE 1:25 000

METRES 1000 0 2 KILOMETRES

FIG. 2

DEPARTMENT OF MINES AND ENERGY - SOUTH AUSTRALIA

WAKEFIELD COAL DEPOSIT - CARBONATE SOURCES

LIMESTONE & DOLOMITE DEPOSITS

HUNDRED OF KULPARA

	COMPILED J.K	DRN S.R	SCALE 1:25000	PLAN NUMBER
DIRECTOR GENERAL		CKD	DATE 12/3/80	80-196