587001

EXPLORATION LICENCE EL 20/80 - LAUNCESTON

ANNUAL EXPLORATION REPORT

AND EXPLORATION PROGRESS REPORT FOR

THREE-MONTH PERIOD ENDED 22 FEBRUARY, 1983

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1.0 SUMMARY

Three brown coal deposits and one brown coal prospect, collectively called the Rosevale Coalfield, have been delineated north-east of Westbury. They are the Loatta, Pipers Lagoons, and Selbourne Deposits and the Hillcrest Prospect.

Exploratory drilling to date has identified 118 million tonnes (insitu) of indicated Class 1 and Class II brown coal reserves and small inferred reserves. The coal occurs in up to 9 brown coal seams ranging in thickness from 1.5 to 8.5 metres and at depths generally less than 60 metres. Substantial reserves of brown coal occur at depths from 10 to 30 metres. The reserves of the three deposits are shown in Table 1.

Analyses of core samples show the coal to be a moderately high ash, low sulphur brown coal. The average in situ quality of the brown coal reserves of the Loatta, Pipers Lagoons and Selbourne Deposits is presented in Table 1.

No exploratory drilling was conducted during the three-month period. The three brown coal deposits and one brown coal prospect have been further evaluated. The coal and non-coal resource potential of EL 20/80 was assessed and reported 1,385 km^2 of EL 20/80 was relinquished in February 1983.

A Preliminary Mining Study was completed during the Three Month Period.

TABLE 1

EL 20/80 LAUNCESTON

WEIGHTED AVERAGE IN SITU COAL RESERVES

(Indicated Class I & II)

AND COAL QUALITY OF INDIVIDUAL DEPOSITS

Deposit	Relative Density gm/cc	Total Moisture %	Volatile Matter %	Ash %	Fixed Carbon %	Specific Energy MJ/kg	Total Sulphur %	Indicated Reserves Tonnes x 10^6
Loatta	1.32	48.1	18.0	21.8	12.1	7.6	0.17	56
Pipers Lagoons	1.33	46.3	18.0	21.9	13.8	7.6	0.11	43
Selbourne	1.33	46.4	18.0	23.7	11.9	7.2	0.18	19
TOTAL/AVERAGE	1.33	47.2	18.0	22.1	12.7	7.5	0.13	118

2.0 INTRODUCTION

2.1 Scope of Report

This report documents the exploration and evaluation of the Rosevale Coal Field by CSR Limited during the twelve month period 22 February 1982 to 22 February 1983, and evaluation during the three-month period ended 22 February 1983.

2.2 Tenement Details

EL 20/80 covering an area of 2,339 km^2 was granted to AAR Limited, a wholly-owned CSR subsidiary, on 19 September 1980. The EL was progressively renewed until 22 February 1983.

In February 1983, title of EL 20/80 was transferred from AAR Limited to CSR Limited. A total of 1,385 km^2 was relinquished during February 1983. An application has been made for the renewal of EL 20/80 now covering an area of 954 km^2 for the six month period 22nd February 1983 to 22 August 1983.

2.3 Location and Access

The retained area of EL 20/80 Launceston extends northwards from Conara Junction to the southern suburbs of Launceston, and continues northwest of Longford and north of Westbury (Figures 1 and 4). It includes the towns of Cressy, Perth, Longford, Breadalbane and Carrick, and the villages of Rosevale, Westwood and Selbourne.

The relinquished areas include the Launceston, Bridgenorth, Birralee, Deloraine, Cressy and Campbell Town districts (refer to Figure 1). These areas are mainly located along the northern, western and southern boundaries of the EL. Two small areas occur along the eastern boundary of the EL.

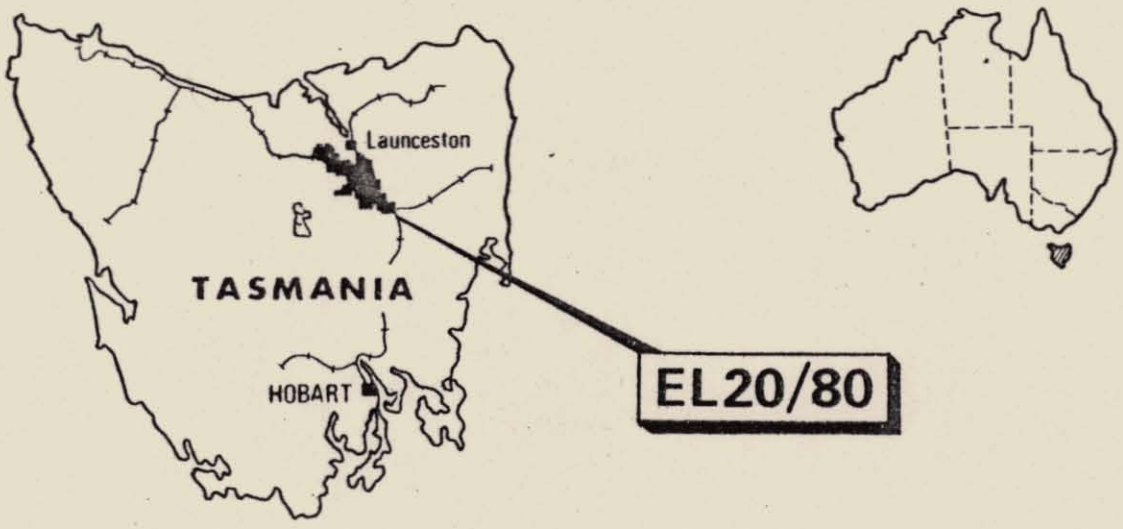
The relinquished areas are discussed in Ellis (1983).

2.4 Climate, Physiography and Land Use

The climate of the area is temperate. The annual average rainfall throughout the area ranges from approximately 500 to 1,000 mm and generally falls during the winter months, (Matthews, in press).

The Launceston Basin is flat to gently undulating. It is surrounded on all sides by much higher terrain, notably the Great Western Tiers to the west and Ben Lomond to the east.

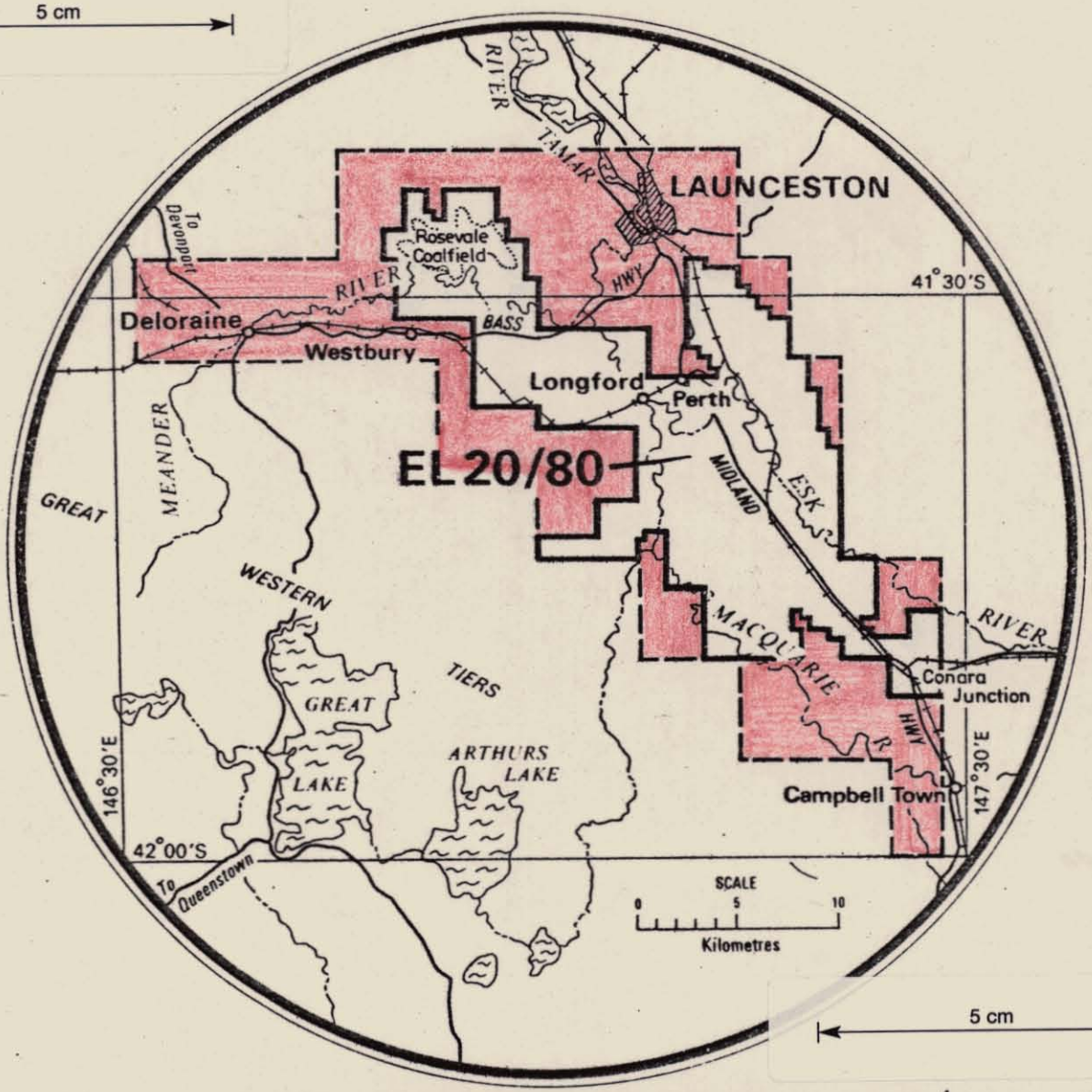
The major land use of EL 20/80 Launceston is farming, predominantly sheep and cattle grazing. The Carrick-Westbury area is notable for its large number of horse, cattle and sheep studs, and intense cultivation of peas, beans, opium poppy and cereal crops.



SCALE
0 50 100 150
Kilometres

Area relinquished
Area retained

5 cm



EXPLORATION LICENCE 20/80
TASMANIA

70020-8

FIGURE 1

3.0 GEOLOGY OF EL 20/80 LAUNCESTON

3.1 Regional Geological Setting of EL 20/80

Cambrian,Ordovician and Silurian strata are unconformably overlain by Permo-Triassic Parmeener Supergroup strata. Tertiary Launceston Beds, (Johnson, 1888) outcrop over approximately three-quarters of the licence area and unconformably overly Jurassic Dolerite and Parmeener Supergroup strata.

Parmeener Supergroup strata outcrop along the margins of the Launceston Basin and in a discontinuous central horst which is expressed in the Hummocky Hills and hills to the north of Perth which extend north-westerly to Carrick.

The stratigraphy of the Parmeener Supergroup and Launceston Basins of EL 20/80 is shown in Figure 2. The stratigraphic sequence has been compiled from the Launceston, Quamby, Longford and Frankford 1:63,600 Geological Atlas Series, and the Lake River 1:50,000 Geological Atlas and the respective accompanying explanatory notes.

3.2 Tertiary in Tasmania

Non-marine Tertiary sediments were deposited in north to north-west trending grabens initiated in the early Tertiary. Four major grabens are recognised in Tasmania, namely the Midlands Graben, the Derwent and Macquarie Harbour Grabens and the Oyster Bay Graben (Figure 3). Brown coal and carbonaceous horizons are recorded from within all grabens.

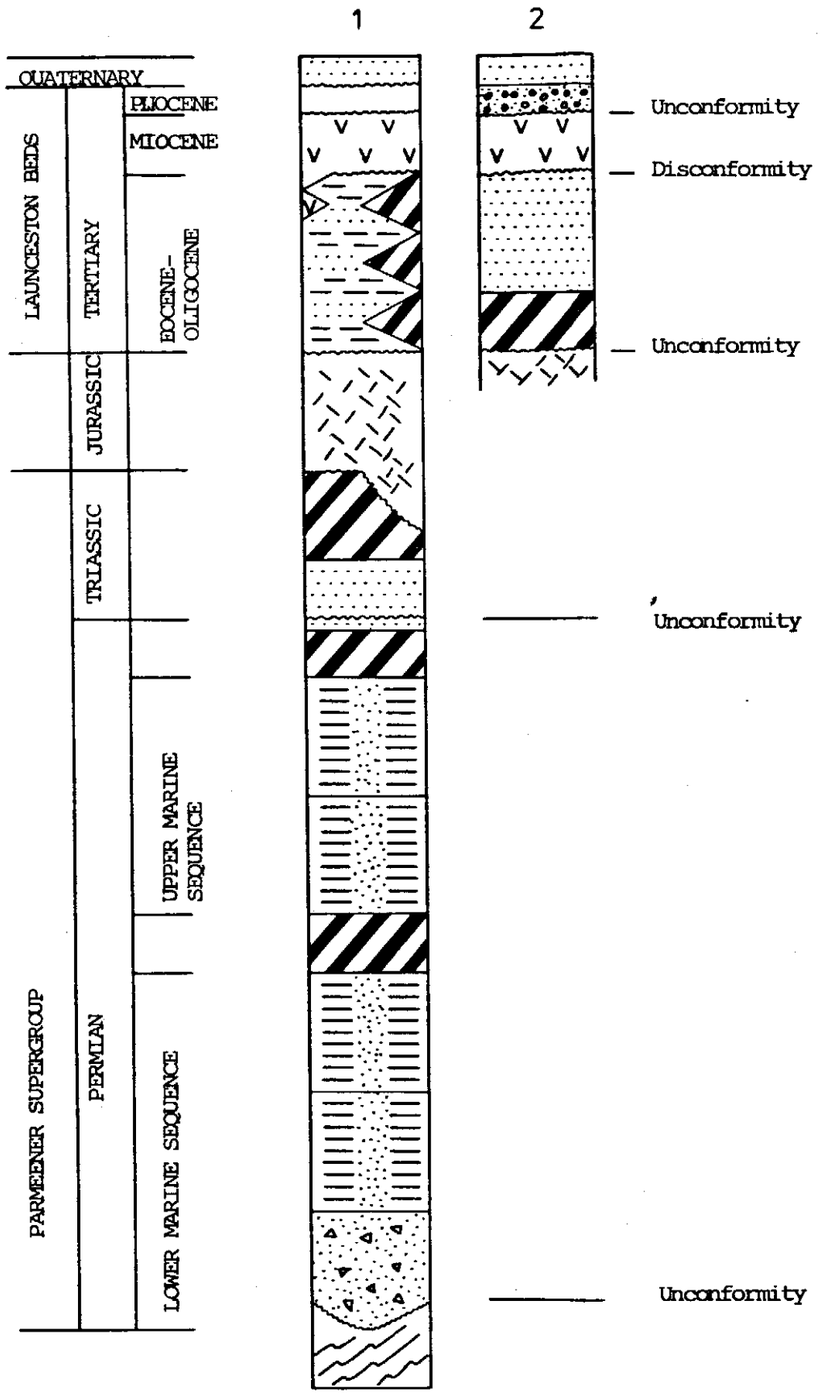
3.3 Tertiary In EL 20/80

EL 20/80 Launceston lies within the Midlands Graben. The Midlands Graben bifurcates on either side of the Hummocky Hills. The western or Cressy Graben, extends northwards to Port Sorrell and Devonport. The eastern or Tamar Graben continues to the ocean at the mouth of the Tamar River (refer Figure 3). The Launceston Basin refers to both the Cressy and Tamar Grabens.

The Tamar Graben extends southwards as far as the Ross area. Smaller horsts and grabens continue through the Midlands to the Hobart area. A deep but narrow graben between Richmond and Colebrook may be a southerly extension of the Cressy Graben.

Deposition of sediments commenced in the Palaeocene - Lower Eocene and continued until the Upper Oligocene (Matthews, 1974). Sediments are predominantly non-marine clays, silts, sands and gravels with minor marine or brackish environment influences.

The primary source of the inorganic sediments was the sandstones, siltstones and mudstones of the Parmeener Supergroup and the Jurassic dolerite.



Stratigraphic Name	Lithological Description	Prospective Area in EL 20/80	Thickness Range
	Alluvium		
Upper Zone	Gravel, boulder beds		
	Alkali - Olivine basalts		Up to 60m
Middle Zone		Loatta, Pipers Lagoons and Selbourne Deposits	0-1,000m
	Clay, Silt, Sand Brown Coal and Oil Shale		
Lower Zone		Breadalbane Lignite	
Dolerite Intrusion	Medium to course grained, tholeiitic dolerite		0-305m
Fingal or Newtown Coal Measures	Feldspathic Sandstone Black coal Seams	Longford Coal Field Norwich and Pateena Mines	0-200m
Knocklofty or Ross Sandstone	Quartzose Sandstone		60-100m
Cygnet Coal Measures Jackey Formation	Carbonaceous Sandstone and Shale with Plant Fragments.	thin coal seams	less than 45m
Bogan Gap Group	Predominantly unfossiliferous mudstone		up to 200m
Poatina Group	Fossiliferous Mudstone and Sandstone		40-100m
Mersey Coal Measures Liffey Group	Carbonaceous Quartz-Mica Sandstone and Shale, thin coal seams		30-49m
Golden Valley Group	Unfossiliferous erratic rich mudstone, shale limestone and sandstone		45-60m
Quamby Mudstone	Unfossiliferous, dark grey pyritic mudstone. Includes Tasmanite Oil Shales of Railton-Latrobe Area		75-120m
Stockers Tillite	Tillite and erratic rich mudstone		0-140m
Basement Silurian	Turbidite sequences, dominately shale and siltstone		
Ordovician	Siliceous conglomerate		
Cambrian	Turbidite sequences containing quartzite		
Precambrian	Quartzite		

Note: Column 2 after Johnson 1873 only applies to Stratigraphy of Launceston Area

Compiled from information contained in Mathews (1974).

CSR Limited Coal Division	EXPLORATION AND EVALUATION GROUP CSR	
DRAWING / DATE	STRATIGRAPHY OF THE PARMEENER SUPERGROUP AND LAUNCESTON BASIN IN EL 20/80	SCALE
DRAWN C.J. / Nov. '82		FIGURE 2
CHECKED		DRAWING No 70020 - 90
REVISED		

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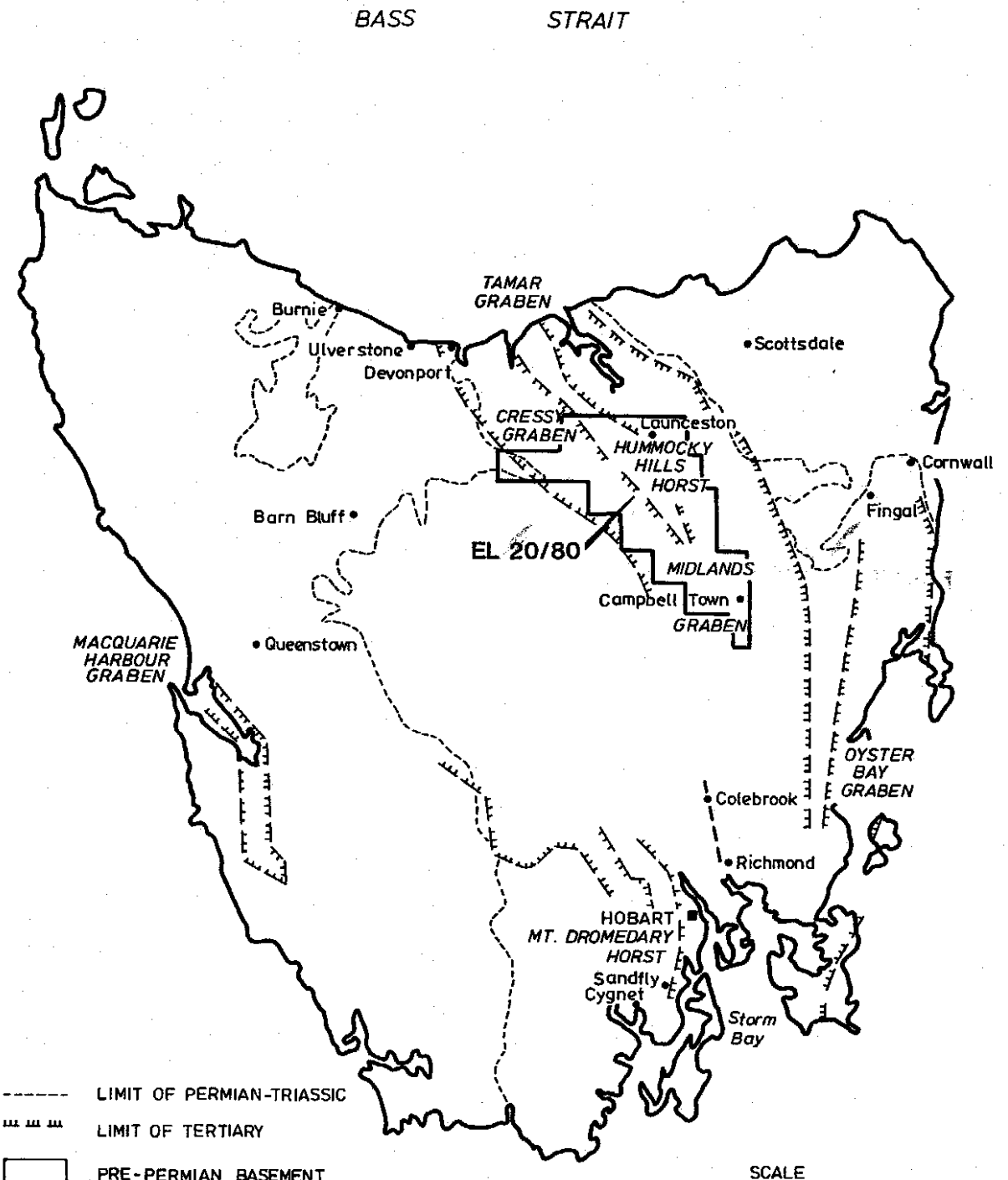


CSR Limited Coal Division — EXPLORATION AND EVALUATION GROUP		CSR
DRAWING / DATE DRAWN C.J. Dec. '82 CHECKED REVISED	COAL BASINS OF TASMANIA	SCALE AS SHOWN FIGURE 3 DRAWING No 70020 - 92

A basin wide correlation of Tertiary strata, in particular brown coal horizons, has not been published. A formal intrabasinal stratigraphic sequence has not been established for the Launceston Basin. The term Launceston Beds, as used by Johnson (1888), to describe the Tertiary strata of the Launceston Basin, is adopted.

Johnson (1873) arbitrarily divided the sediments of the Launceston area of the Launceston Basin into three zones, known as the lower, middle and upper zones. The Tertiary stratigraphy of EL 20/80 is summarised in Figure 2.

The lower zone lies unconformably upon Parmeener Supergroup strata on the West Tamar. This zone contains laminated strata, and numerous fossil leaves.

The middle zone is represented by cross bedded sands and clays, most probably deposited in a fluviatile environment. Middle zone strata outcrop at Windmill Hill in Launceston.

The upper zone is represented by low rounded hills and terraces flanking the present course of the Tamar River.

The pre-Tertiary and Tertiary regional geology of EL 20/80 has been outlined in previous exploration reports (Osborne, 1981; Ellis, 1982a, 1982b, 1982c, 1982d, 1982e and 1982f). Ellis, 1982d and 1982e are unpublished company reports detailing the prospectivity of the coal and non-coal resources of EL 20/80 and have been included as Appendices 1 and 2.

3.4 GEOLOGY OF THE ROSEVALE COAL FIELD

3.4.1 Introduction

The Loatta, Pipers Lagoons and Selbourne brown coal deposits, known collectively as the Rosevale Coal Field are situated 15 km west of Launceston and approximately 10 km north and north-east of Westbury, in the north of EL 20/80. The Rosevale brown Coal Field is located up to 6 km north of the Meander River. The Meander River flows along the southern boundary of the Selbourne Deposit.

The Pipers Lagoons and Loatta Deposits are two discrete and separate deposits. The Selbourne and Loatta Deposits may be connected through the Hillcrest Prospect, which presently contains inferred and potential reserves.

3.4.2 Geology of the Loatta, Pipers Lagoons and Selbourne Coal Deposits

Up to four major brown coal horizons, referred to as A, B, C and D have been intersected in the Loatta, Pipers Lagoons and Selbourne Deposits. Up to twelve individual seams have been intersected.

The three stratigraphically highest coal horizons, A, B and C comprise up to nine coal seams and have been used for reserve calculations. The structure and stratigraphy of coal seams in the three deposits is shown in simplified cross sections (Figures 6 to 11 inclusive).

Brown coal seams have been correlated using characteristic downhole geophysical log signatures and examination of cross sections (see Figure 12). Positive coal seam correlations can be made in the central areas of the coal deposits. Tentative coal seam correlations have been made near the margins of the Loatta and Selbourne Deposits.

The coal seams are generally flat lying, rarely exceeding a dip angle of 2^{o}, except along deposit margins, range in thickness from 1.5 to 8.5 metres and occur at depths from 4 to 75 metres. Most coal seams occur at depths ranging from 10 to 30 metres. Seams generally occur at depths greater than 60 metres close to the deposit margins, particularly in area of uncertain seam correlations.

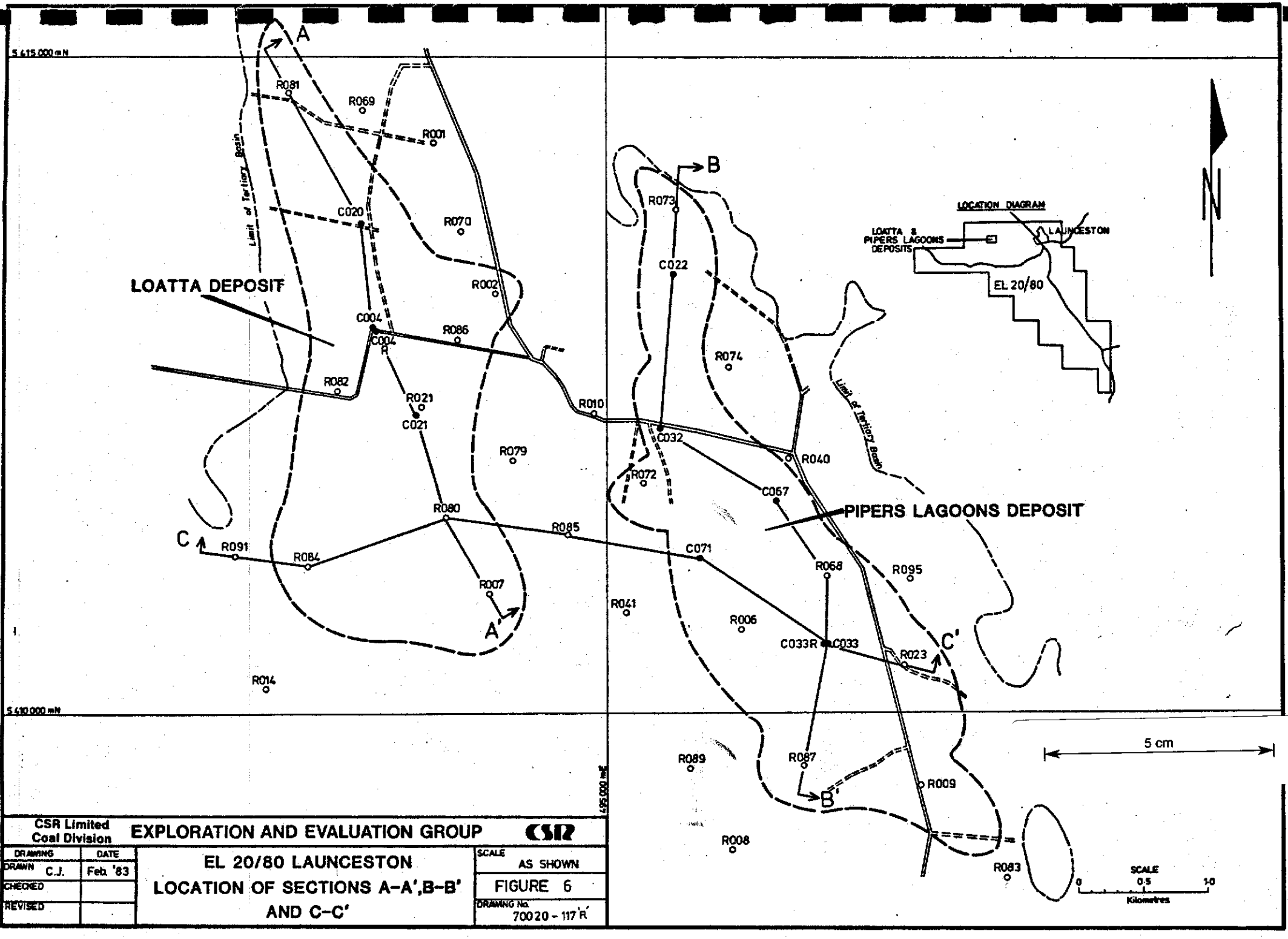
Cumulative overburden ratios of the Rosevale Coal Field generally range from 1.9:1 to 9.3:1. However, in the Selbourne Deposit, areas of inferred reserves have a cumulative overburden ratio of up to 35:1.

Coal seam isopachs, nomenclature, overburden and interburden ratios and structure contours were reported as Appendices 1, 2, 4 and 5 respectively in Ellis, (1982f).

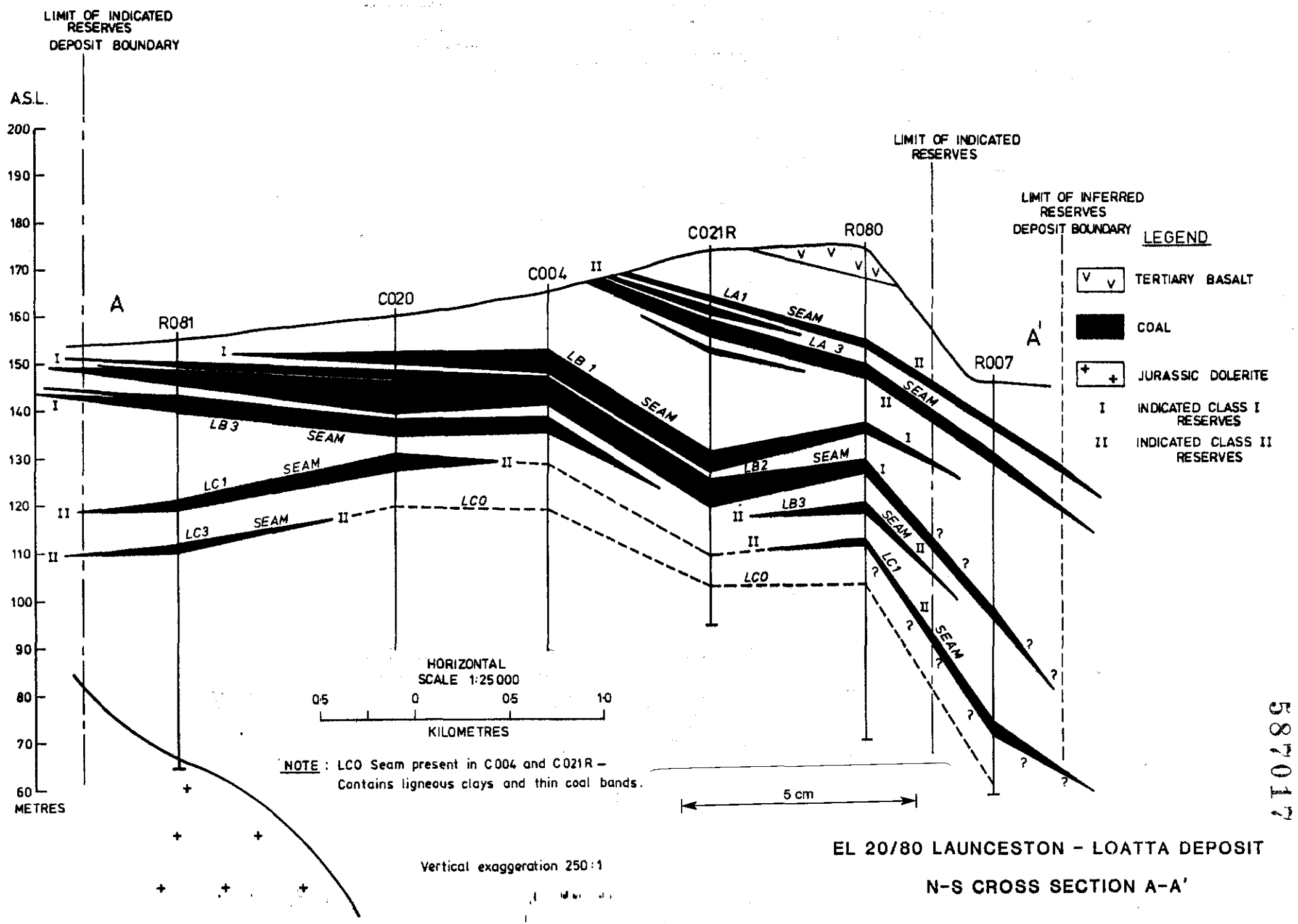
3.4.3 Geology of the Hillcrest Prospect

The Hillcrest Prospect is located southwest of the Loatta Deposit, and adjoins the Selbourne Deposit along its northern and eastern boundaries. Coal seams thicker than 1.5 metres have been intersected at depths ranging between 15 and 42 metres. The coal seams are possibly stratigraphic equivalents of the LAO and LBO seams of the Loatta Deposit.

The Hillcrest Prospect was reported to contain inferred reserves, in Ellis,(1982c). The area of the Hillcrest Prospect has been increased to include potential coal reserves,(refer to Figure 5).



CSR Limited Coal Division	EXPLORATION AND EVALUATION GROUP		
DRAWING	DATE	EL 20/80 LAUNCESTON	SCALE AS SHOWN
DRAWN C.J.	Feb. '83	LOCATION OF SECTIONS A–A', B–B' AND C–C'	FIGURE 6
CHECKED			DRAWING No. 7002 0 - 117 R
REVISED			

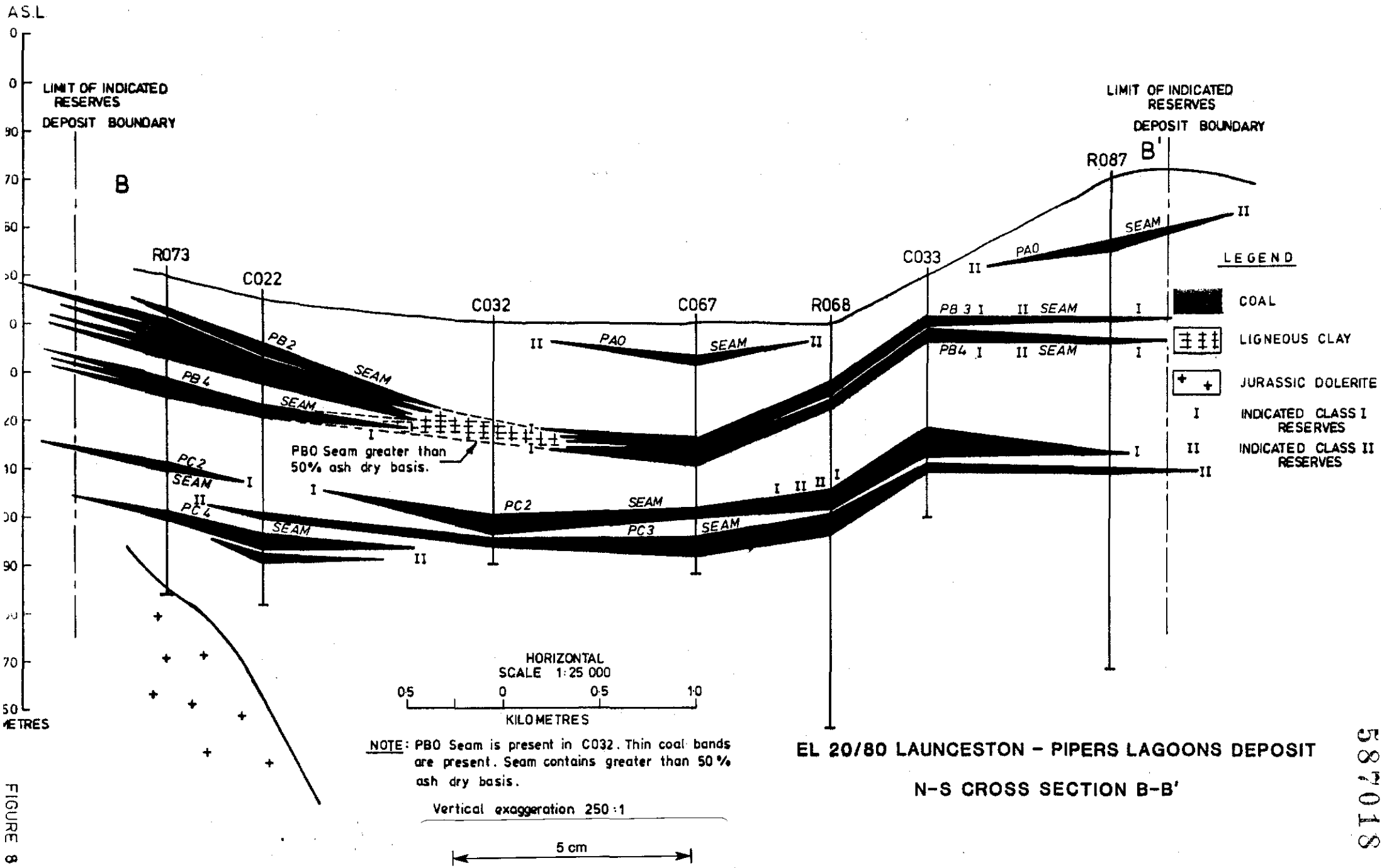


EL 20/80 LAUNCESTON – LOATTA DEPOSIT

N-S CROSS SECTION A-A'

DRAWING NO. 70020-67

FIGURE 7



EL 20/80 LAUNCESTON – PIPERS LAGOONS DEPOSIT

N–S CROSS SECTION B–B'

FIGURE 8

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DRAWING NO. 70020-68

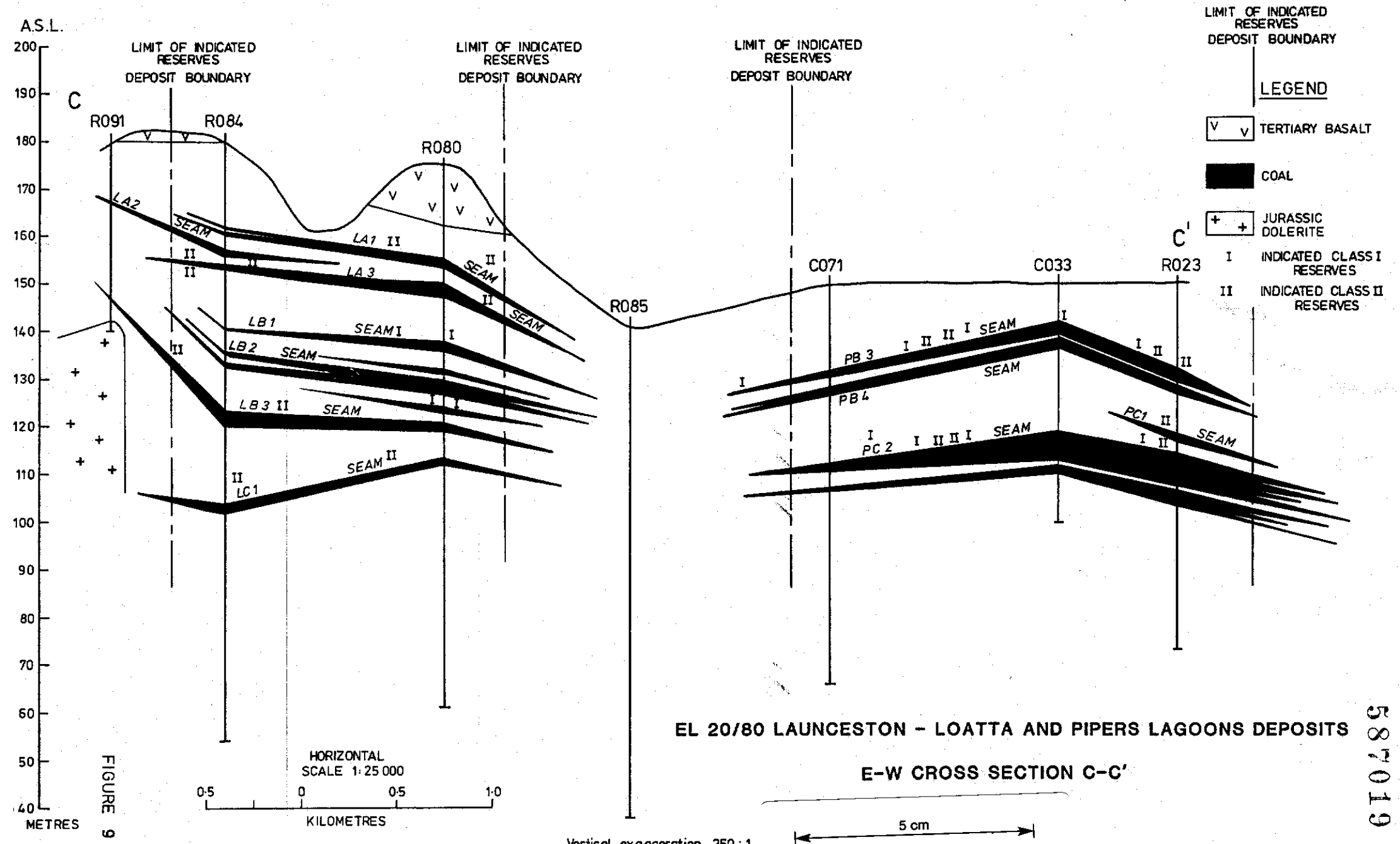

FIGURE 6

EL 20/80 LAUNCESTON – LOATTA AND PIPERS LAGOONS DEPOSITS

E-W CROSS SECTION C–C'

DRAWING NO. 70020-69

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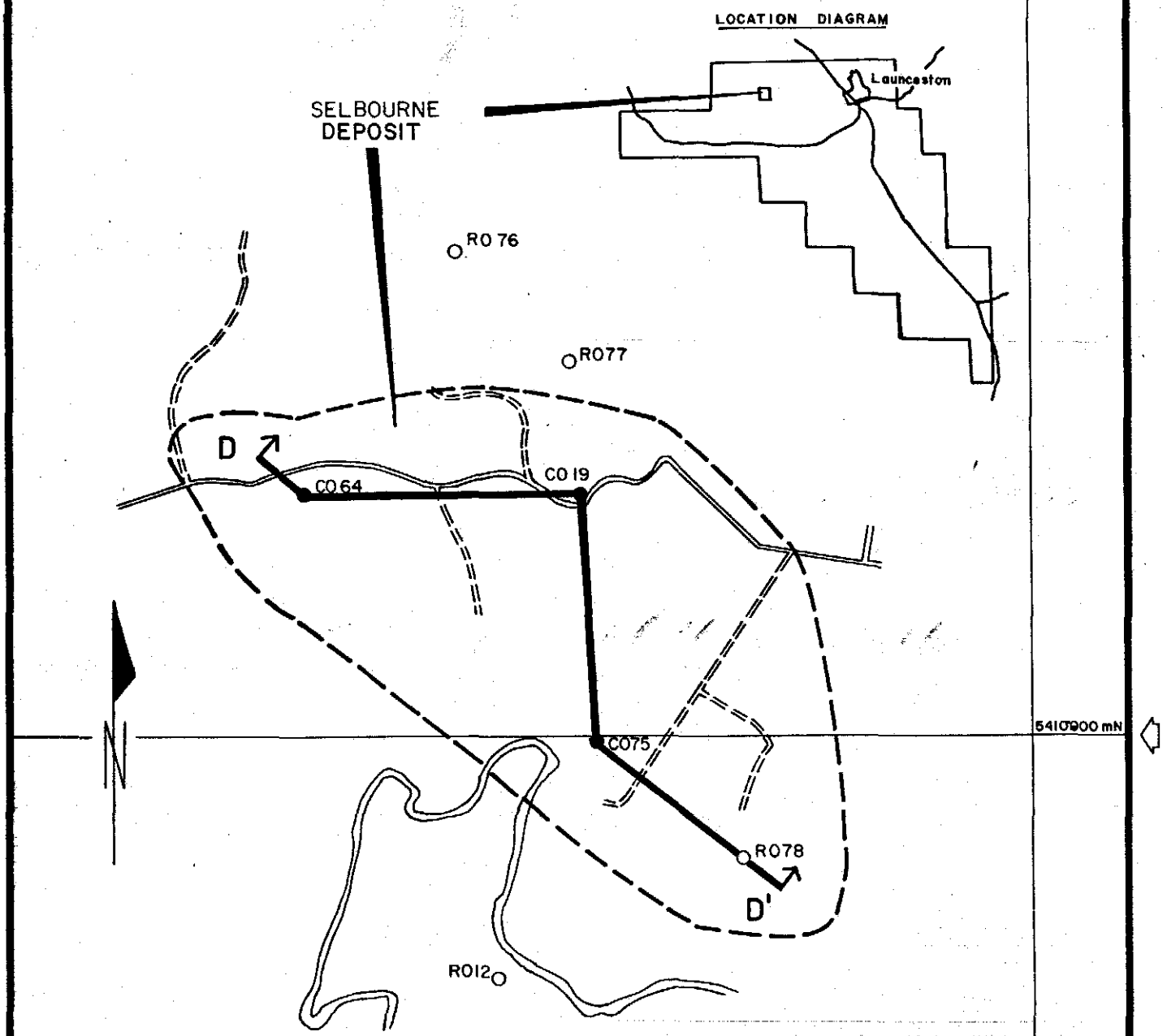
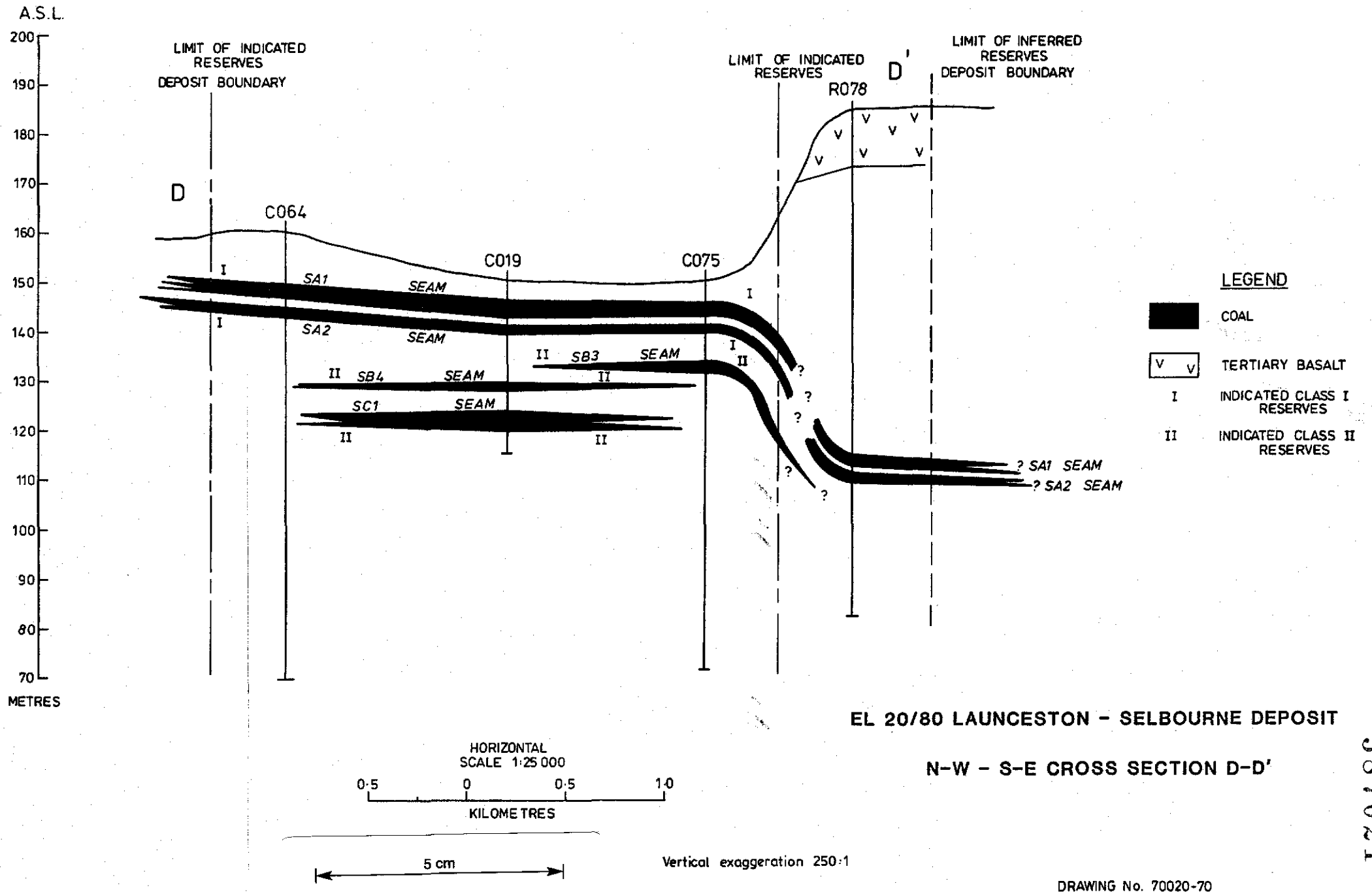


CSR Limited Coal Division	EXPLORATION AND EVALUATION GROUP	
DRAWING / DATE	EL 20/80 LAUNCESTON	SCALE 1 : 25 000
DRAWN Sept '82	SELBOURNE	FIGURE 10
CHECKED	LOCATION OF SECTION D-D'	DRAWING No 70020-66
REVISED		



EL 20/80 LAUNCESTON – SELBOURNE DEPOSIT

N-W – S-E CROSS SECTION D-D'

DRAWING No. 70020-70

FIGURE 11

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4.0 EXPLORATION AND GEOLOGICAL EVALUATION

4.1 Exploration and Evaluation September 1980 to February 1983

During 1981, AAR Limited conducted an exploration programme to investigate the occurrence of oil shale, primarily in the Carrick-Longford area. Their investigations showed that thin oil shales are present in the Tertiary sequence in the Carrick area and reach a maximum thickness of 10 metres, yielding 49 litres/tonne at zero moisture. AAR Limited intersected ligneous facies including brown coal of significant thicknesses in the Rosevale-Westwood area.

Two follow-up exploration programmes have been conducted by CSR Limited. One was in conjunction with AAR Limited in late 1981 to delineate the extent of brown coal and oil shale occurrences in the Rosevale-Westwood and Carrick-Longford areas respectively. The second exploratory drilling programme, in early 1982, provided further information on deposit boundaries and seam correlations within the prospects outlined in the 1981 programme.

Exploration for oil shale by AAR Limited and brown coal by CSR Limited within EL 20/80 Launceston during this period is discussed in Osborne (1981),and Ellis (1982a, b, c and f) respectively.

A summary of Exploration statistics is presented in Table 2.

TABLE 2

EL 20/80

SUMMARY OF EXPLORATION STATISTICS

Exploration Programme	Number of Holes				Metres Chipped	Metres Cored
	Total Holes	Drilled Rotary Chip	Cored	Wireline Logged		
March-April 1981	25	21	4	22	1,568	54.5
October-December 1981	42	35	7	41	2,373.5	218.8
March-April 1982	39	34	5	37	2,558	115.49
TOTALS	106	90	16	100	6,499.5	388.79

4.2 Exploration and Geological Evaluation During the Twelve Month Period February 1982 to February 1983

During the twelve month period the results of the October-December 1981 exploratory Drilling programme were assessed, and a second drilling programme was undertaken in March-April 1982.

The results of the October-December 1981 and March-April 1982 exploration programmes have been evaluated and assessed and were reported in Ellis,(1982a, b, c and f).

The coal and non-coal resource potential of EL 20/80 has been assessed and reported. These reports are included as Appendices 1 & 2.

All lithological data has been encoded onto the CSR Mine Planning System. The geological data bank has been updated so that computer modelling of the Rosevale Coal Field can proceed.

English logs of all CSR and AAR drillholes in EL 20/80 were reported as Appendix 6 to Ellis,(1982f).

Computer drawn graphic logs of all CSR and AAR drillholes in EL 20/80 were reported as Appendix 7 to Ellis,(1982f). Analytical data from the 1982 drilling programme is currently being encoded and will be reported when available.

4.3 Evaluation During the Three Month Period November 1982 to February 1983

4.3.1 Coal Sampling and Analysis

Brown coal samples were taken from 100 mm core cut during the October-December 1981 and March-April 1982 exploration programmes.

During the 1981 exploration programme selected representative samples were taken for moisture analysis and sealed in airtight PVC casing. All other samples from the 1981 exploration programme were sealed in PVC bags, and analysed for full proximate, total sulphur, relative density and specific energy.

All samples from the 1982 exploration programme were sealed in PVC bags and analysed for total moisture and ash. Selected working section composites were analysed for full proximate, total sulphur, relative density and specific energy.

108 coal and non-coal ply samples from the 1982 exploration programme were analysed for full proximate, relative density and specific energy, as part of the ongoing Stage I coal analysis (refer to Ellis, 1982b).

Two composite samples simulating mining sections from cored holes C004 and C020 in the Loatta Deposit are currently being tested for:-

- full proximate analysis
- relative density
- specific energy
- ultimate analysis
- total sulphur
- sodium
- chlorine
- ash analysis
- ash fusion temperatures in reducing and oxidizing atmosphere and photographic record
- hardgrove grindability index

The composite samples simulating mining sections comprise coal and non-coal parting, overburden and interburden material which is added to the coal as a mining dilution factor.

The simulated mining section composite from cored hole C020 is also being analysed for the following trace elements:-

- arsenic
- barium
- chromium
- lead
- mercury
- molybdenum
- selenium
- phosphorus

Five non-coal ply samples and two non-coal composites of overburden, interburden and parting material are being tested for:-

- full proximate
- relative density
- ash fusion temperature in oxidizing and reducing atmosphere with photographic record

The analytical results will be reported when they are available.

4.3.2 Ash Estimates from Geophysical Logs

An empirical relationship has been established between relative density obtained from geophysical logs and corresponding analysed coal core samples. This relationship has enabled the ash content of coal seams intersected in rotary chip holes to be made. Estimated ash contents of coal seams in the Loatta and Pipers Lagoons Deposits are shown in Figures 13 to 30 inclusive.

Analysed ash values, and empirically derived ash values show similar trends in the two brown coal deposits. In the Loatta Deposit, analysed and derived ash values increase towards the deposit margins. Both the analysed and derived ash values are lower in the central regions of the Loatta Deposit.

4.3.3 Sedimentary Analysis

A sedimentary analysis of the Rosevale Coal Field was commenced. The Loatta, Pipers Lagoons and Selbourne Deposits appear to be separated by areas of sand-rich sediments. The sands may represent fluviatile sediments associated with coal deposition, and hence may interfinger and lens out in the vicinity of the deposit boundaries.

Artesian groundwater conditions were revealed at nine locations in the Rosevale Coal Field from exploratory drilling, seven of which are associated with sand-rich fluviatile sediments. One of the aims of the sedimentary analysis is to map the distribution of sand-rich sediments and aquifers in relation to proposed open-cut areas.

Results of the sedimentary analysis will be reported when it is completed.

4.4 Future Exploration and Evaluation

4.4.1 Exploratory Drilling

An exploration drilling programme is proposed for 1983 or early 1984. Work will be directed at upgrading reserves of the Loatta and Pipers Lagoons Deposits to Measured Status and delineating the extend of seams within the Selbourne Deposit and Hillcrest Prospect. Further detail testing of core samples will be undertaken (see Section 4.4.2).

Exploration will be undertaken in other areas of the EL to identify further shallow occurrences of Tertiary brown coal and Parmeener Super Group black coal, which are outlined in Ellis, 1982d, (Appendix 1).

4.4.2 Coal Analysis and Laboratory Testing

It is proposed that future coal analysis will follow the general test proceedures outlined below.-

(i) Coal and non-coal plies from cored holes be analysed as shown in Schedule A.

(ii) All coal composites of ply samples to conform with proposed mining sections and be analysed as proposed in Schedule B.

(iii) Some of these composites be analysed in more detail, as proposed in Schedule C. These composites will include coal material with non-coal overburden, interburden and parting material added as a dilution factor.

Further analysis will be performed on parting, overburden and interburden material.

Schedule A - Ply Analysis

- Total moisture
- Relative density
- Proximate analysis
- Specific energy

Schedule B - Composite Analysis

- Proximate analysis
- Relative density
- Specific energy
- Sulphur
- Sodium
- Chlorine

Schedule C - Selected Composite Analysis

- Ultimate analysis
- Relative density
- Ash analysis
- Ash fusion temperature
- Hardgrove grindability index
- Trace element analysis
- Forms of sulphur

(iv) Combustion and utilization testing will involve small scale boiler testing such as at the S.E.C.V. Herman Research Laboratory.

4.4.3 Hydrogeology

Thirteen piezometers are installed at seven sites in the Rosevale Coal Field, (Ellis, 1982b). The Tasmanian Department of Mines Hydrology Section has monitored the piezometers at monthly intervals since installation, and six sets of readings have been received, and were reported in Ellis, (1982f).

The piezometric measurements do not show a consistent trend of rising or falling throughout the Rosevale Coal Field.

For instance, the water level in one piezometer may rise and the water level in another piezometer may fall during the same period. This indicates that water recharge rates are not constant throughout the Rosevale Coal Field. The findings of the piezometric study will be reported in detail when all results are available.

5.0 COAL RESOURCES

5.1 Brown Coal Reserves

118 Mt. in situ Class I and II Indicated Reserves and very small inferred reserves have been defined in the Loatta, Piper Lagoons and Selbourne Deposits, as previously reported (Ellis, 1982f). Very small inferred and potential reserves have been outlined in the Hillcrest Prospect. Coal reserves are tabulated in Table 3.

Reserve figures have been calculated using Geological Survey of Queensland Guidelines, after Mengel, 1977, and Australian Standard 2519-1982.

TABLE 3

EL 20/80 COAL RESERVES

Deposit or Prospect	Insitu Reserves - Million Tonnes				
	Indicated			Inferred	Potential Resources
	Class I	Class II	Total		
Loatta Deposit	33	23	56	Very Small	
Pipers Lagoons Deposit	23	20	43	-	
Selbourne Deposit	14	5	19	Very Small	
Hillcrest Prospect	-	-	-	Very Small	Very Small
TOTALS	70	48	118		

N.B. Very small inferred reserves are for those less than 20 mt.

Seam isopachs are presented as Figures 13 to 36 inclusive. Detailed reserve calculations are reported in Ellis, (1982f).

Reserves have been calculated for seams with a minimum 1.5 m thickness and a weighted average dry basis quality of less than 50% ash. Ply samples greater than 50 cm thick, and containing greater than 50% ash, have been excluded from reserve calculations where the weighted average seam quality is greater than 50% ash.

An RD of 1.2 has been used for brown coal where no laboratory determinations are available. Where analyses are available, the weighted average RD for each specific seam was used in calculating reserves.

In areas of the Loatta and Selbourne Deposits where seam correlations are uncertain, Inferred Reserves have been calculated (refer to Figures 6 to 11 inclusive). Reserves of the Hillcrest Prospect are classified as Inferred and Potential because the spacing between drill holes exceeds 0.5 km to 1 km. A drillhole spacing between 0.5 km to 1 km is considered to be the upper confidence level of geological observations for the style of brown coal deposit found in EL20/80.

5.2 Brown Coal Quality

The brown coal of the Launceston Basin is a typical brown coal with a high insitu moisture content. It has a low specific energy, a moderately high ash and a low sulphur content.

The weighted average insitu coal quality of the Loatta, Pipers Lagoons and Selbourne Deposits is summarised in Table 1. The weighted average in situ quality of individual seams is presented in Table 4. Further weighted average quality of individual seams is presented in Ellis, (1982f).

TABLE 4

EL20/80 LAUNCESTON

WEIGHTED AVERAGE INSITU QUALITY

OF INDIVIDUAL SEAMS

SEAM	RELATIVE DENSITY gm/cc	TOTAL MOISTURE %	VOLATILE MATTER %	ASH %	FIXED CARBON %	SPECIFIC ENERGY MJ/kg	TOTAL SULPHUR %	INSITU RESERVES TONNES x 10^6
LA1	1.30	48.70	18.26	21.44	11.60	7.40	0.11	2.56
LA2	1.30	46.20	22.0	16.22	15.58	9.44	0.16	2.35
LA3	1.27	51.35	17.85	18.36	12.44	7.85	0.12	6.80
LB1	1.33	45.55	19.67	21.72	13.06	8.71	0.20	8.19
LB2	1.32	48.87	16.88	23.31	10.94	6.84	0.17	18.07
LB3	1.30	48.59	18.57	19.82	13.02	7.97	0.17	10.19
LC1	1.35	45.65	17.52	25.98	10.85	6.95	0.18	6.83
PA0	1.33	48.13	15.62	25.62	10.83	6.30	0.17	2.48
PB2	1.33	46.25	18.63	23.77	11.25	7.47	0.15	2.75
PB3	1.30	47.49	19.19	20.9	12.42	8.20	0.12	8.91
PB4	1.32	46.26	17.04	18.44	18.26	7.38	0.09	8.39
PC2	1.33	46.24	14.67	21.40	17.69	6.19	0.07	5.77
PC3	1.33	45.82	18.59	22.45	13.14	8.12	0.10	5.24
PC4	1.36	44.07	20.15	24.91	10.87	8.05	0.13	7.66
SA1	1.31	48.20	17.53	22.50	11.77	7.06	0.19	9.57
SA2	1.39	42.24	18.58	27.46	11.72	7.23	0.19	4.18
SB4	1.33	47.4	17.35	24.0	11.25	7.07	0.16	2.77
SC1	1.32	45.5	19.62	21.02	13.86	8.25	0.15	2.18

The in situ brown coal quality of the Launceston Basin, Latrobe Valley, and a Murry Basin deposit is compared in Table 5.

TABLE 5

IN SITU QUALITY OF SOME TERTIARY BROWN COALS

Brown Coal Area/Deposit	Total Moisture %	Volatile Matter %	Ash %	Specific Energy MJ/kg	Total Sulphur %
Launceston Basin (Range)	42.- 51	16-22	16-27	6.3-9.4	0.07-0.19
(Ave)	47	18	22	7.5	0.15
Yallourn (Latrobe Valley)	60-70	16-19	0.5-1.5	6-9	0.2-0.5
Sedan (Murray Basin)	59	18	7.8	9.1	2.2

Launceston Basin coal has a lower total moisture and sulphur content, but a significantly higher ash content than the Yallourn and Sedan Deposits. The specific energy of Launceston Basin coal is lower than Sedan coal, but similar to Yallourn coal.

Reserves have been calculated from coal seams containing up to 50% dry basis ash. By calculating reserves for seams containing up to 40% dry basis ash, the reported average coal quality will improve. It is estimated that 90 Mt of coal is present within the three deposits with an average ash of 20% and a specific energy of 8MJ/kg (in situ). However, the proposed mining study and future exploration will indicate the effect that quality cut-offs will have on total mineable reserves.

6.0 PRELIMINARY MINING STUDY

6.1 Introduction

A Preliminary Mining Study, based on a 240 MW development (2 x 120 MW units) and a 320 MW development (4 x 80 MW units), has been completed.

The Preliminary Mining Study details a mine plan for the Loatta Deposit in the Rosevale Coal Field. The mine plan presented is conceptual, in line with the limited geological and quality information available. Currently indicated reserves of 118 million tonnes have been outlined - however, further geological and engineering evaluation work needs to be undertaken to establish measured reserves, carry out small scale combustion testing, assess geotechnical and ground water conditions, establish infrastructure costs and assess environmental aspects.

The Preliminary Mining Study indicates that the most suitable coal supply arrangement is to mine the Loatta deposit and if additional coal is required, to transfer operations to the Pipers Lagoon deposit. However, it is considered that sufficient reserves exist in the Loatta deposit to fuel a 240 MW power station over a nominal thirty year life.

6.2 Mining Method

The mining method adopted in the Preliminary Mining Study, Bucket Wheel Excavator (BWE) loading onto conveyors, was determined by examining the nature of the deposit, including the need for selective mining, the geotechnical factors involved, and the need for continuity and reliability of coal supply.

6.3 Power Station Considerations as basis for Mining Study

A conceptual power station size of 240 MW (2 x 120 MW) was initially selected for this study as being suitable for the Tasmanian grid. Coal requirements were estimated for such a power station to total 53 million tonnes over a project life of 30 years and peak at 2.33 million tonnes/annum. Although a 2 x 120 MW station size was chosen for the initial study, it was found that a 4 x 80 MW burning schedule resulted in a better utilization of available bucket wheel and conveying equipment. The reserves requirements for four 80 MW units would be approximately 72 million tonnes over a 30 year period, which would exhaust the Loatta Deposit by Year 24, mining would then transfer to the Piper's Lagoon deposit.

Location of a power station would be dependent upon a detailed siting study. However, assuming satisfactory resolution of the various site and environmental considerations, a mine site station would be the most economic. Water supply, power station ash and stack emissions would be major considerations.

There do not appear to be any environmental considerations which would prevent a mine and power station development in the area. The coal has a very low sulphur level, indicating that sulphur dioxide emissions would not be significant.

6.4 Future Exploration and Evaluation

Future geological exploration and evaluation has been discussed in Section 4.4. of this report.

Future exploration work will concentrate initially on firming up seam boundaries within the Loatta deposit, upgrading the coal reserves to the measured category and assessing the variability of coal quality within it.

Geotechnical studies will examine the impact of groundwater conditions on mining and determine the composition and strength of the overburden and floor strata and its stability for final mine.

The Preliminary Mining Study will be appended with the next three-monthly Exploration Porgress Report.

7.0 REFERENCES

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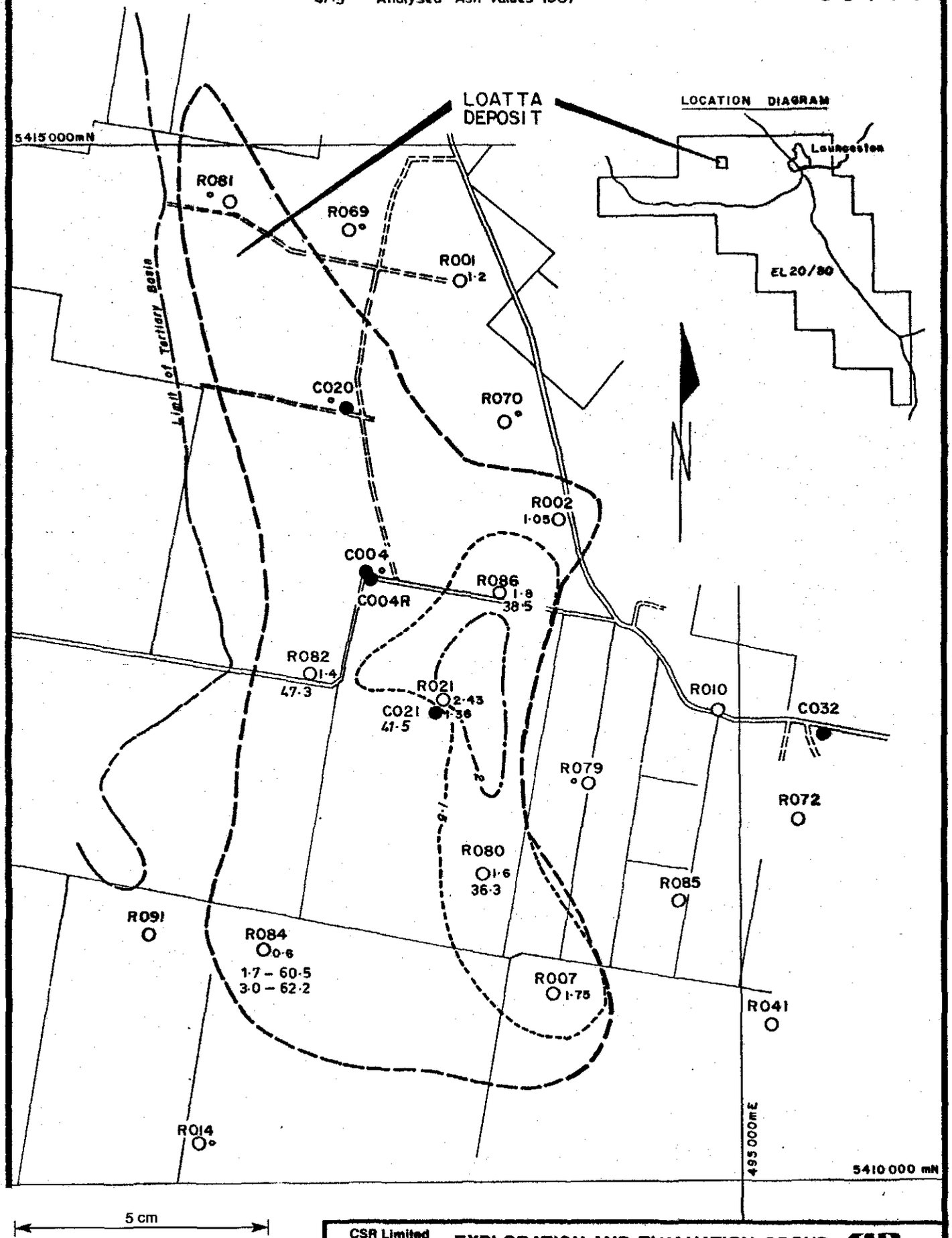
P. Ellis, Geologist, Coal
Exploration and Evaluation Group,
CSR Energy Division.

38·5 Derived Ash Values from Geophysis (DB) + thickness if changed
41·5 Analysed Ash Values (DB)

587036



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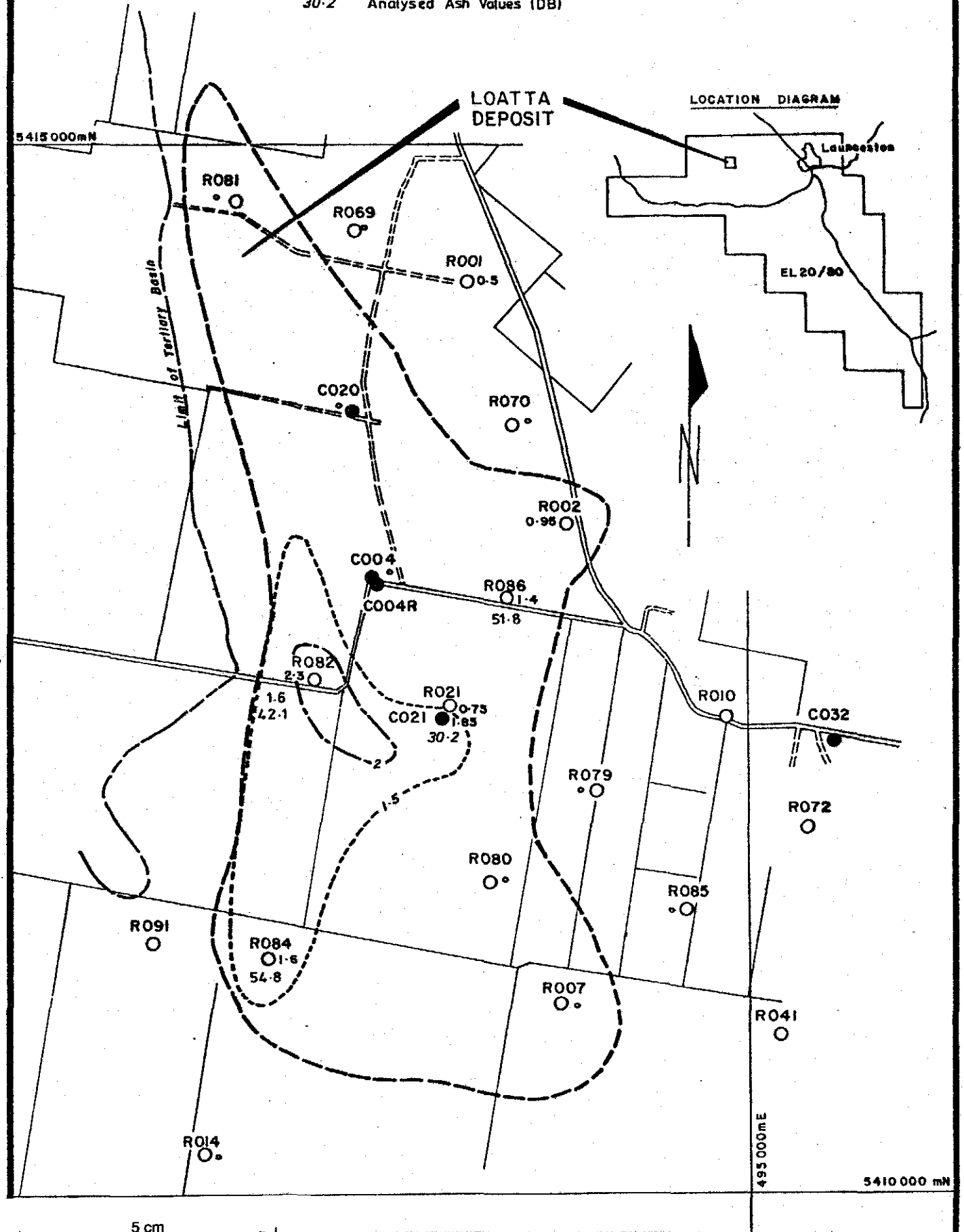
CSR Limited Coal Division — EXPLORATION AND EVALUATION GROUP CSR		
DRAWING / DATE	EL 20/80 LAUNCESTON LOATTA LAI SEAM ISOPACHS	SCALE 1 : 25000
DRAWN Aug '82		FIGURE 13
CHECKED		
REVISED C.J. March '83		DRAWING No 70020 - 48

587037

51·8 Derived Ash Values from Geophysis (DB) + thickness if changed.

30·2 Analysed Ash Values (DB)



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Kilometres

CSR Limited Coal Division	EXPLORATION AND EVALUATION GROUP CSR		
DRAWING / DATE	EL 20/80 LAUNCESTON LOATTA LA2 SEAM ISOPACHS		SCALE 1 : 25 000
DRAWN Aug '82			FIGURE 14
CHECKED			DRAWING No 70020 - 49
REVISED C.J. March '83			

587038

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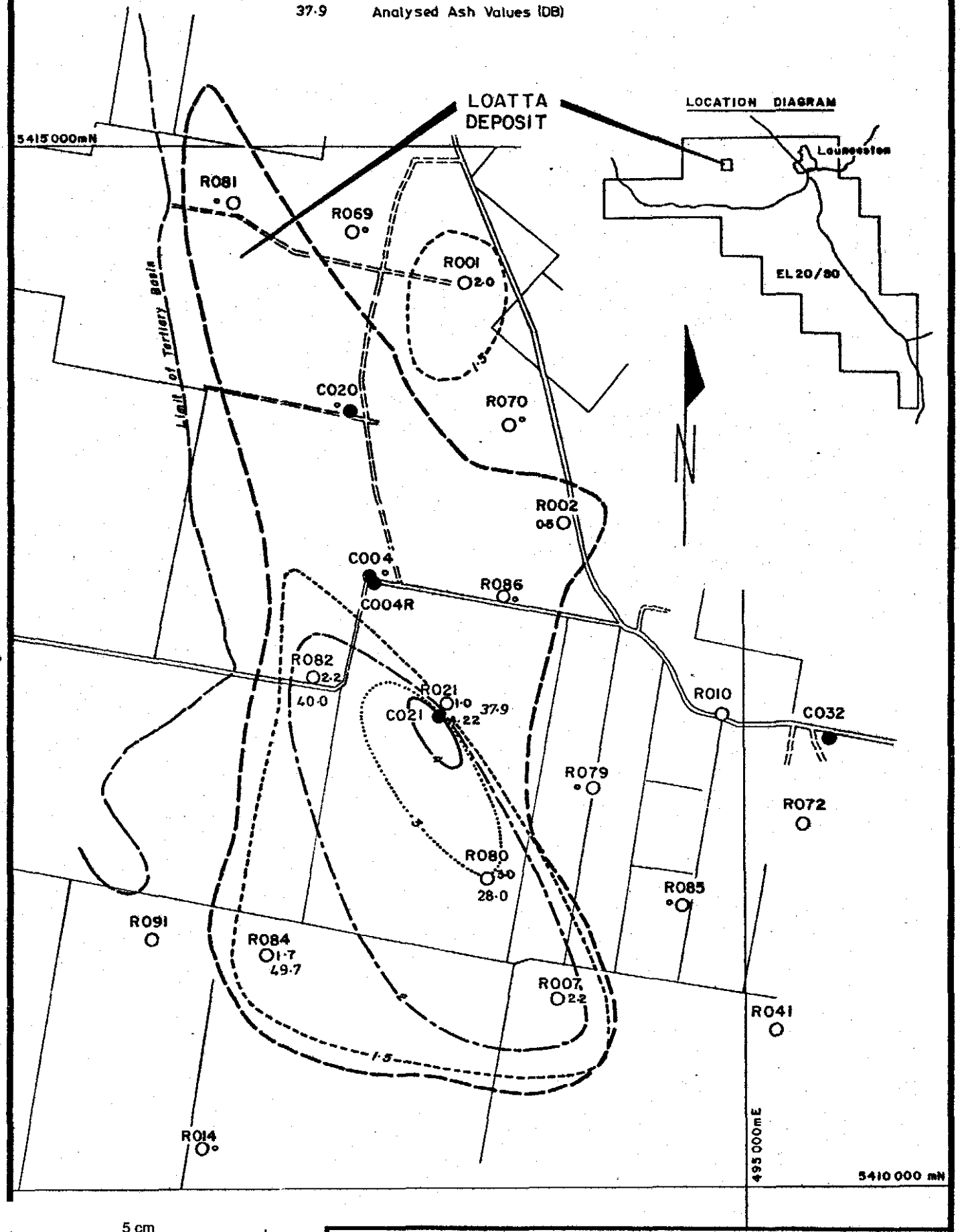
37·9 Analysed Ash Values (DB)



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CSR Limited Coal Division	EXPLORATION AND EVALUATION GROUP CSR	
DRAWING / DATE	EL 20/80 LAUNCESTON	SCALE 1 : 25 000
DRAWN Aug '82	LOATTA	FIGURE 15
CHECKED	LA3 SEAM ISOPACHS	DRAWING No 70020-50
REVISED C J March '83		

587039

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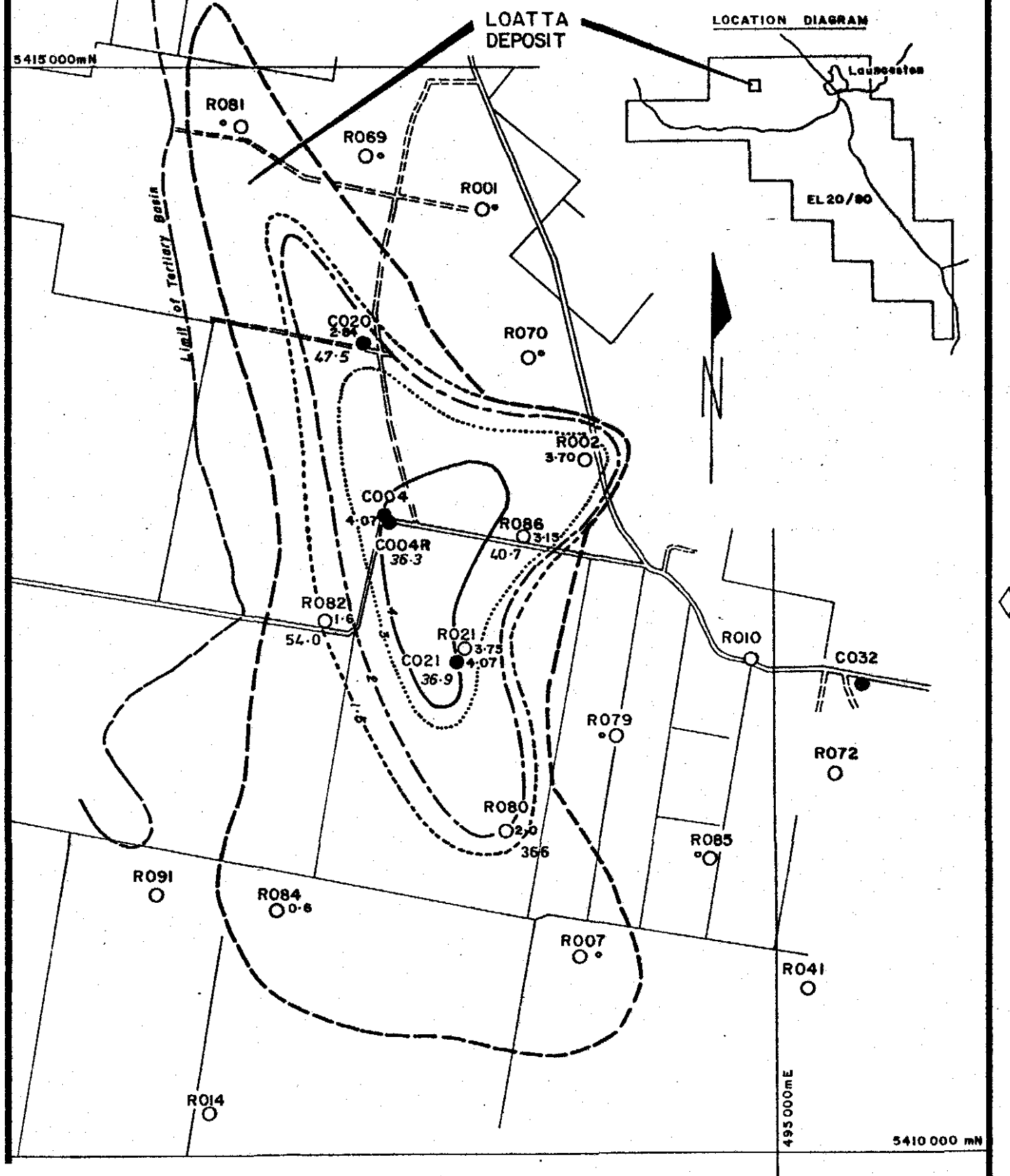
36·6 Analysed Ash Values (DB)



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Kilometres

CSR Limited Coal Division	EXPLORATION AND EVALUATION GROUP CSR	
DRAWING / DATE	EL 20/80 LAUNCESTON	SCALE 1 : 25 000
DRAWN Aug '82	LOATTA	FIGURE 16
CHECKED	LBI SEAM ISOPACHS	DRAWING No 70020-51
REVISED C.J. March '83		

587040

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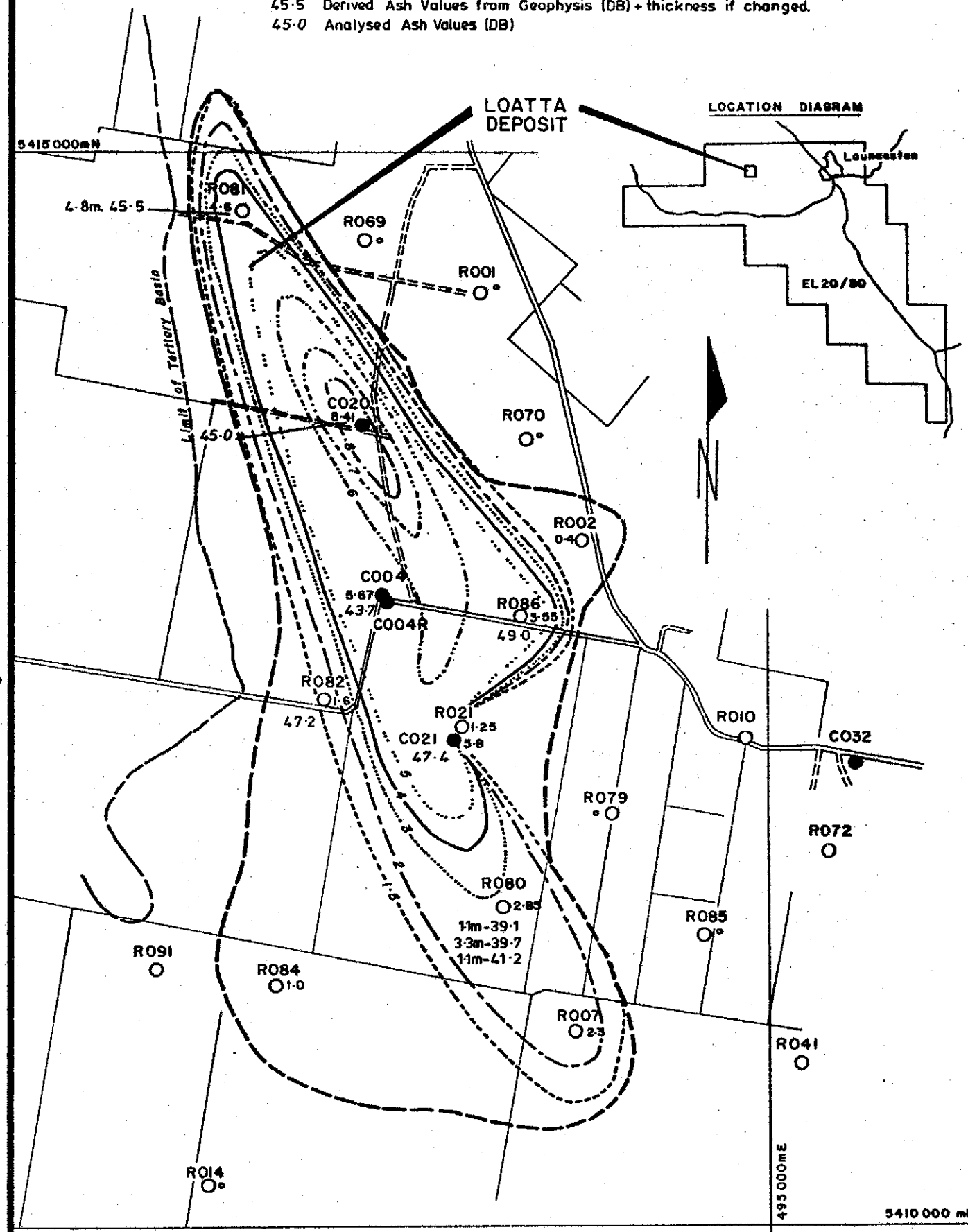
45·0 Analysed Ash Values (DB)



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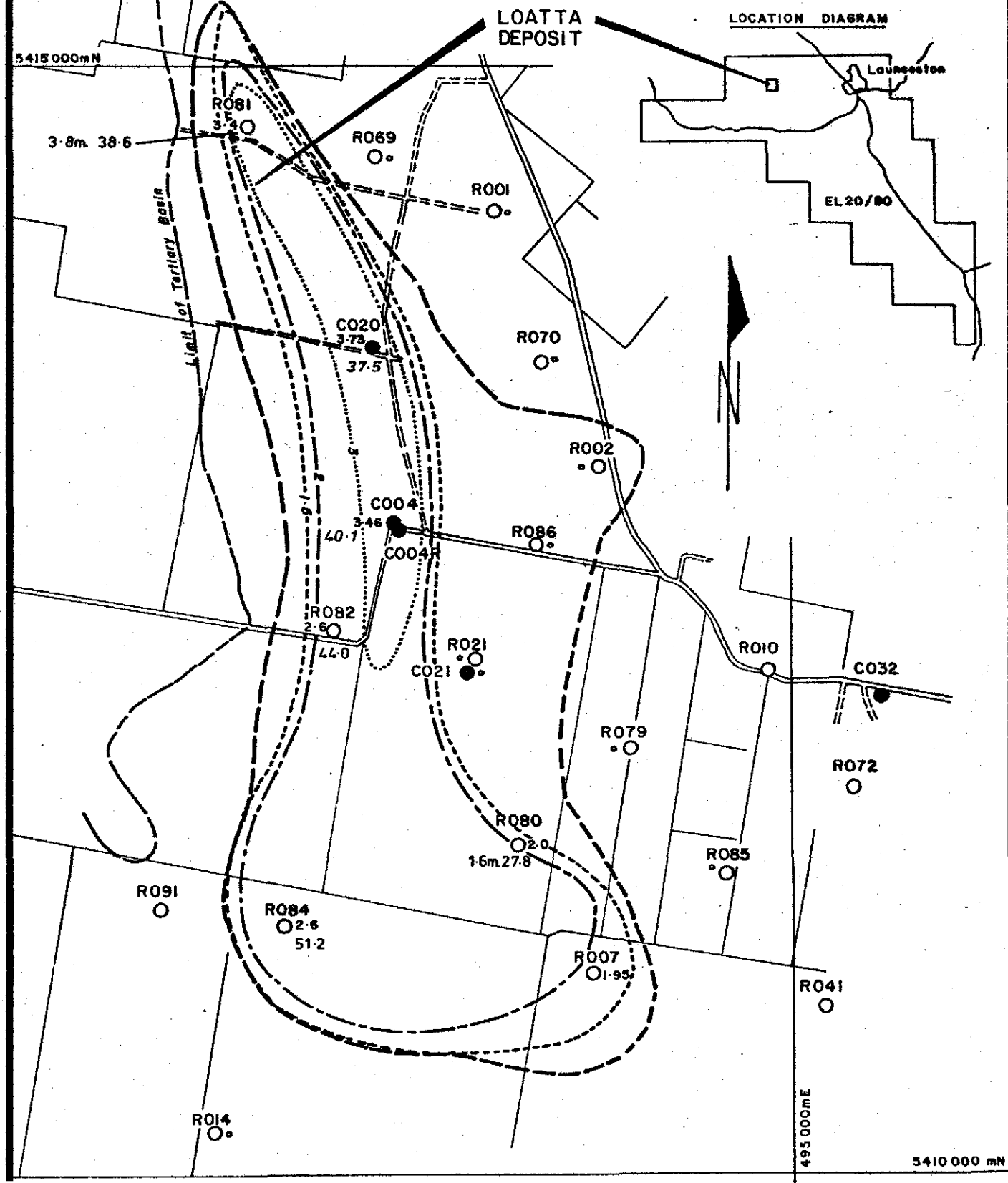
CSR Limited Coal Division	EXPLORATION AND EVALUATION GROUP CSR	
DRAWING / DATE	EL 20/80 LAUNCESTON LOATTA LB2 SEAM ISOPACHS	SCALE 1 : 25 000
DRAWN Aug '82		FIGURE 17
CHECKED		DRAWING No 70020-32
REVISED C.J. March '83		

587041

51·2 Derived Ash Values from Geophysis (DB) + thickness if changed.

37·5 Analysed Ash Values (DB)



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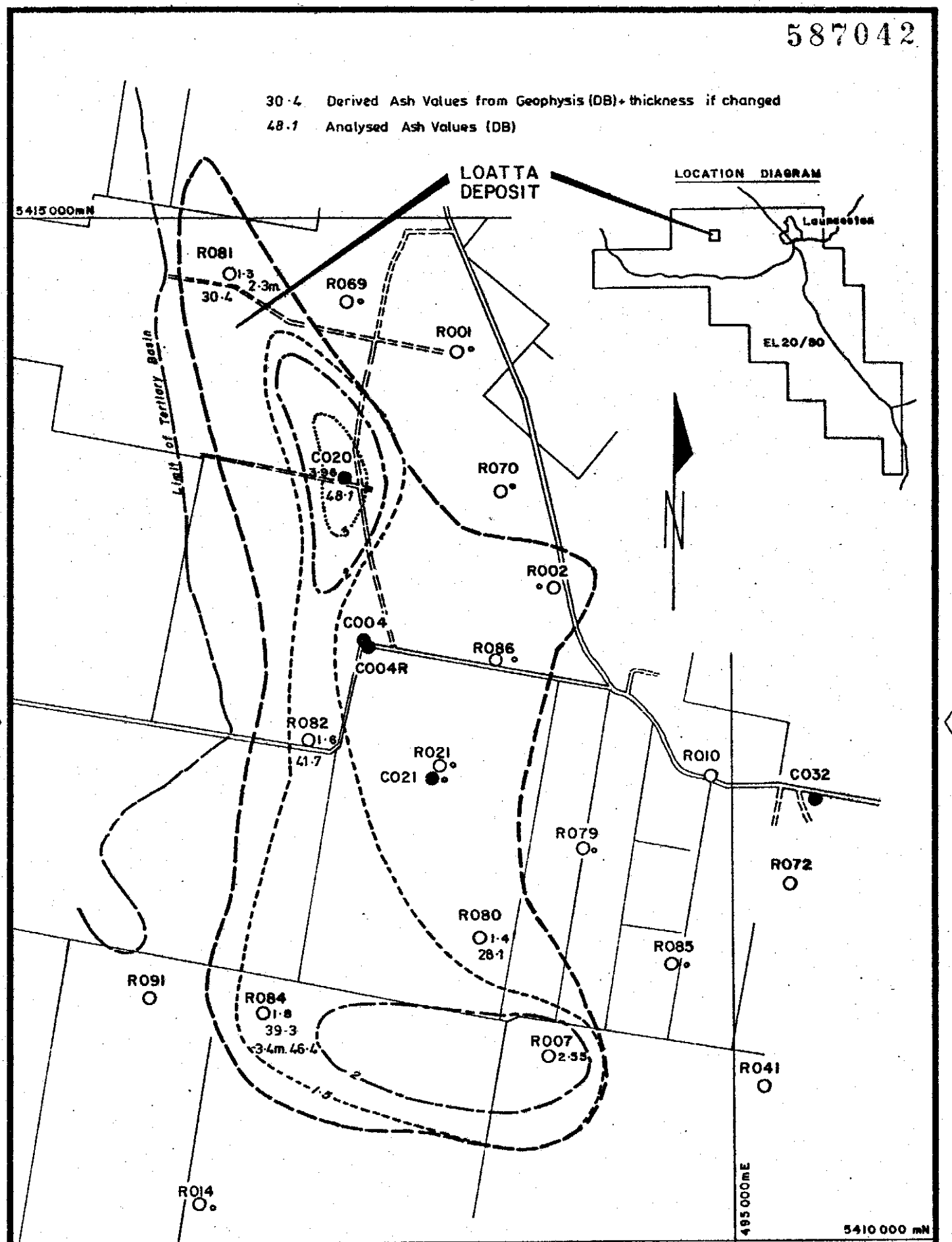
Kilometres

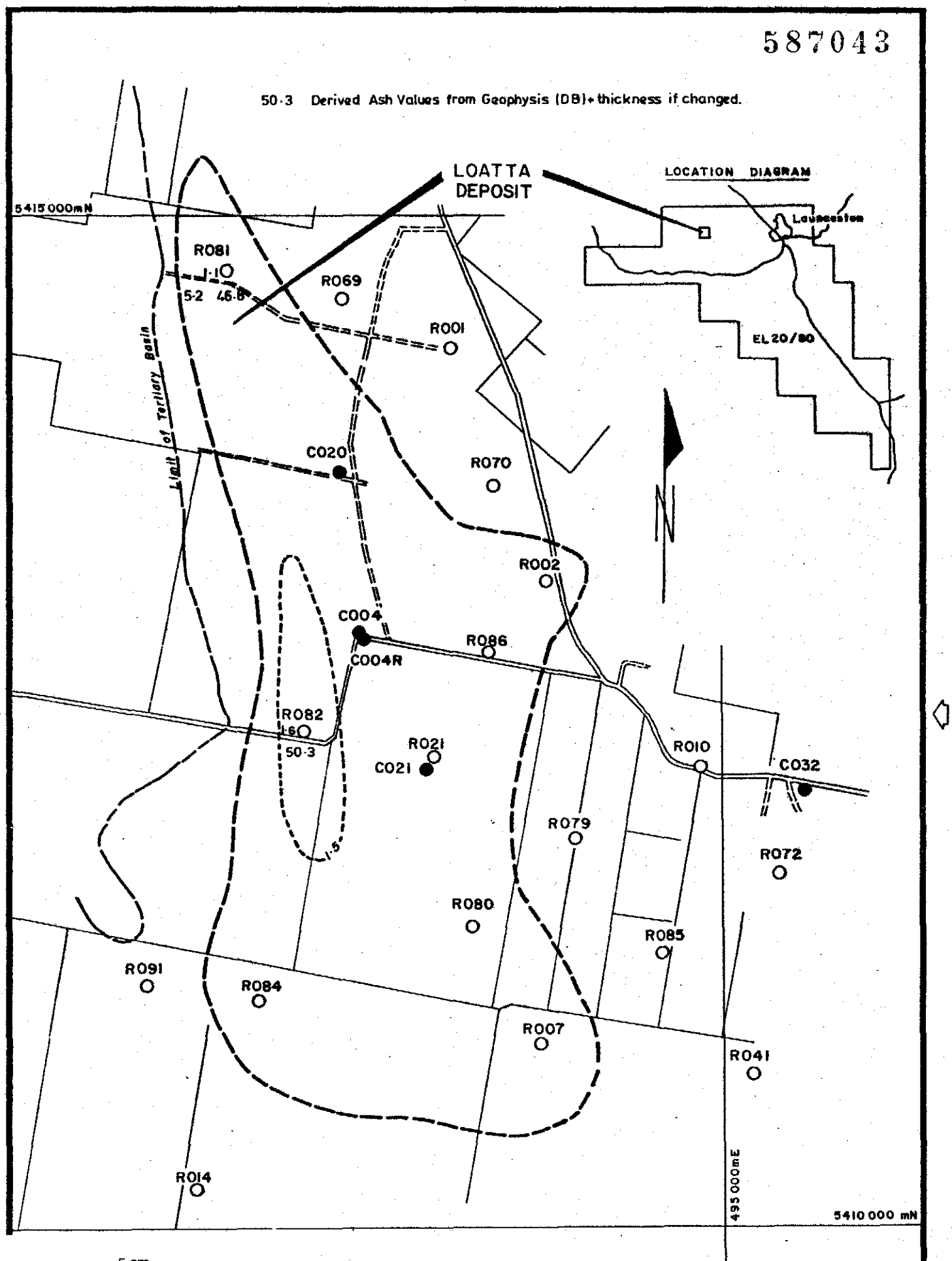
CSR Limited Coal Division	EXPLORATION AND EVALUATION GROUP CSR	
DRAWING / DATE	EL 20/80 LAUNCESTON	SCALE 1 : 25000
DRAWN Aug '82	LOATTA	FIGURE 18
CHECKED	LB3 SEAM ISOPACHS	DRAWING No 70020 - 53
REVISED C.J. March '83		

587042



CSR Limited Coal Division — EXPLORATION AND EVALUATION GROUP CSR		
DRAWING / DATE	EL 20/80 LAUNCESTON	SCALE 1 : 25 000
DRAWN Aug '82	LOATTA	FIGURE 19
CHECKED	LCI SEAM ISOPACHS	DRAWING No 70020 - 54
REVISED C J March '83		

587043



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Scale 1:25000

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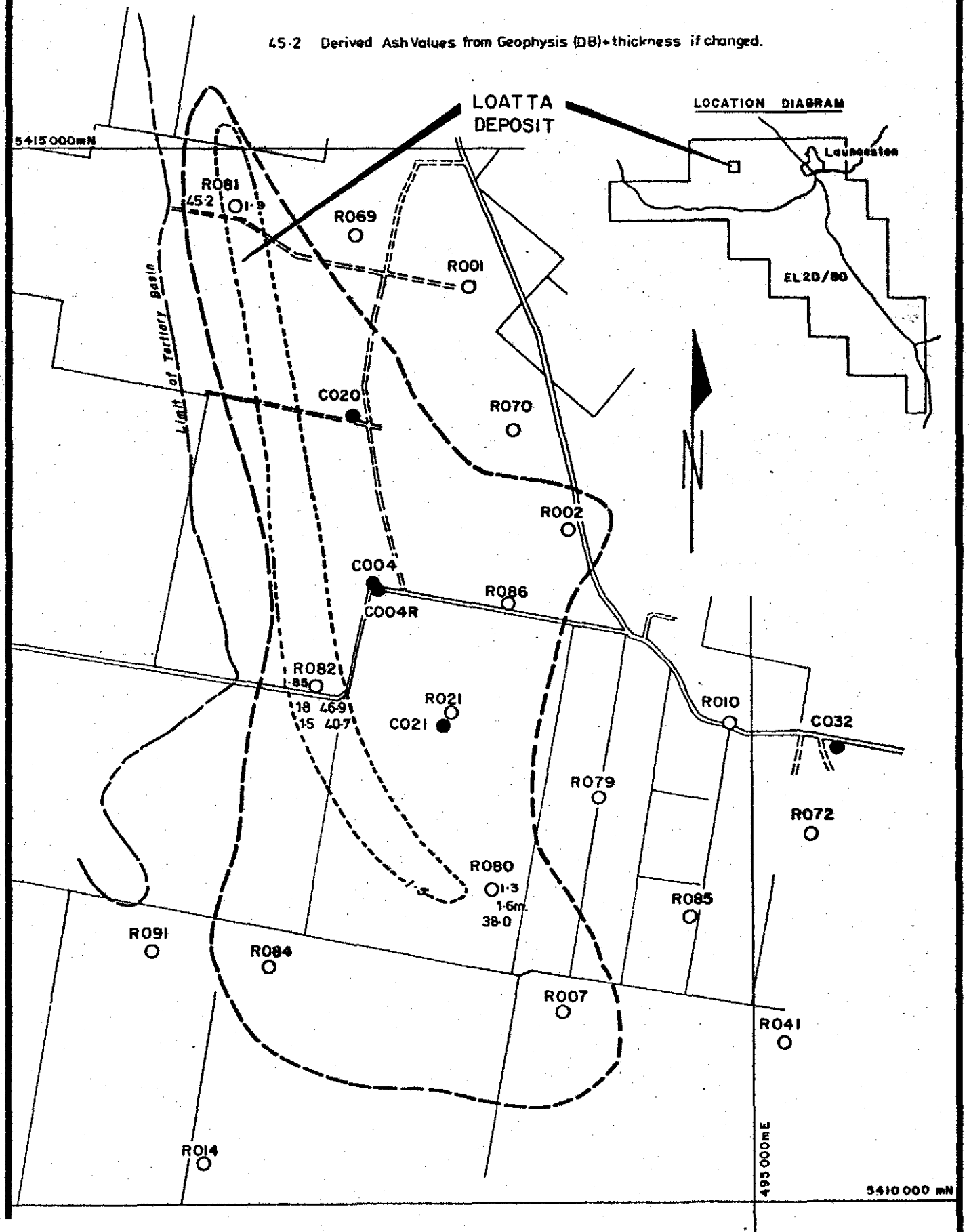
Kilometres

CSR Limited Coal Division	EXPLORATION AND EVALUATION GROUP CSR		
DRAWING / DATE	EL 20/80 LAUNCESTON	SCALE 1 : 25000	
DRAWN Aug '82	LOATTA	FIGURE 20	
CHECKED	LC2 SEAM ISOPACHS		
REVISED C J March '83		DRAWING No 70020-55	

587044



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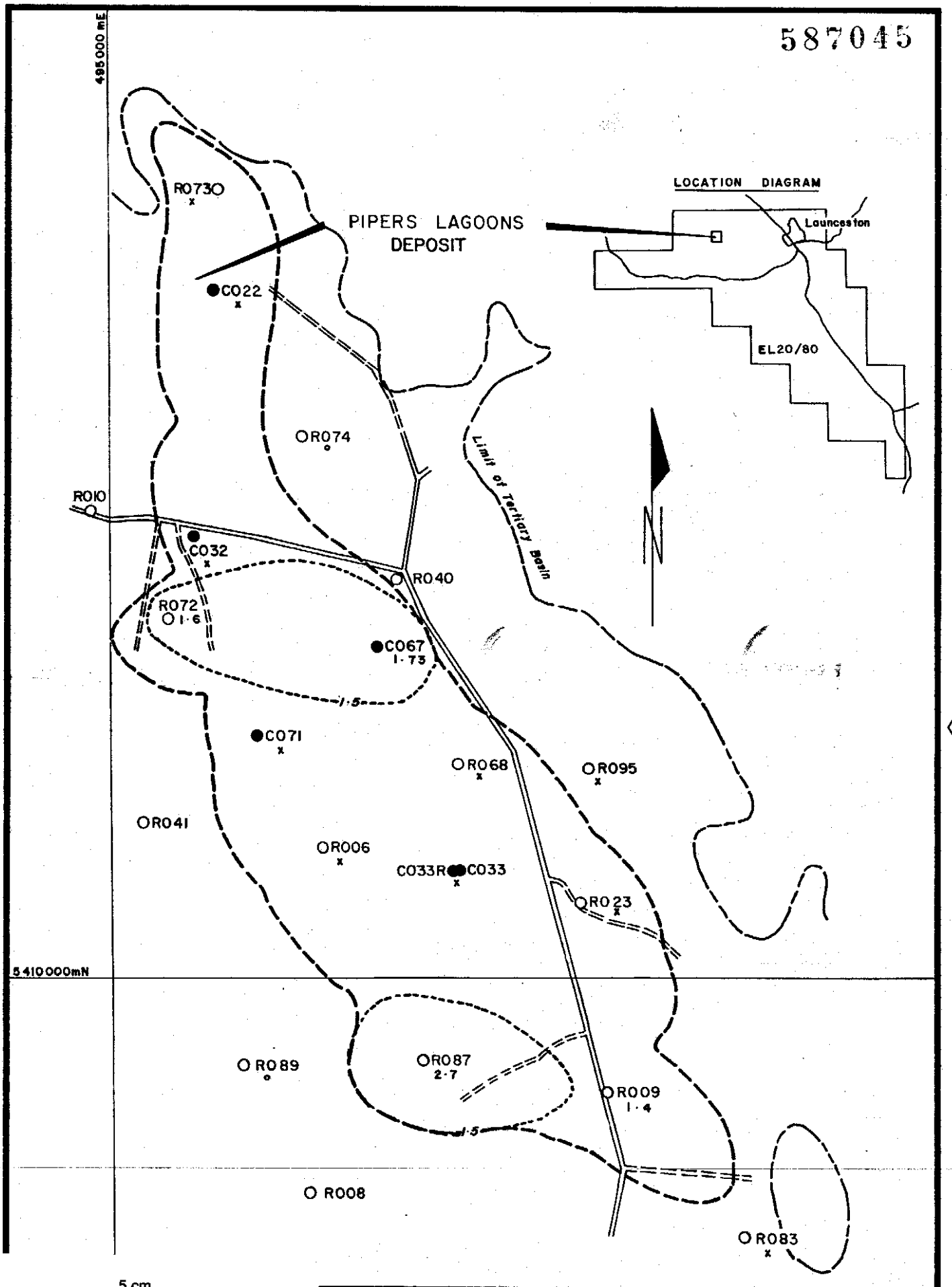
Kilometres

CSR Limited Coal Division	EXPLORATION AND EVALUATION GROUP CSR		
DRAWING / DATE	EL 20/80 LAUNCESTON LOATTA LC3 SEAM ISOPACHS	SCALE 1 : 25 000	
DRAWN Aug '82		FIGURE 21	
CHECKED		DRAWING No 70020 - 56	
REVISED C J March '83			

587045



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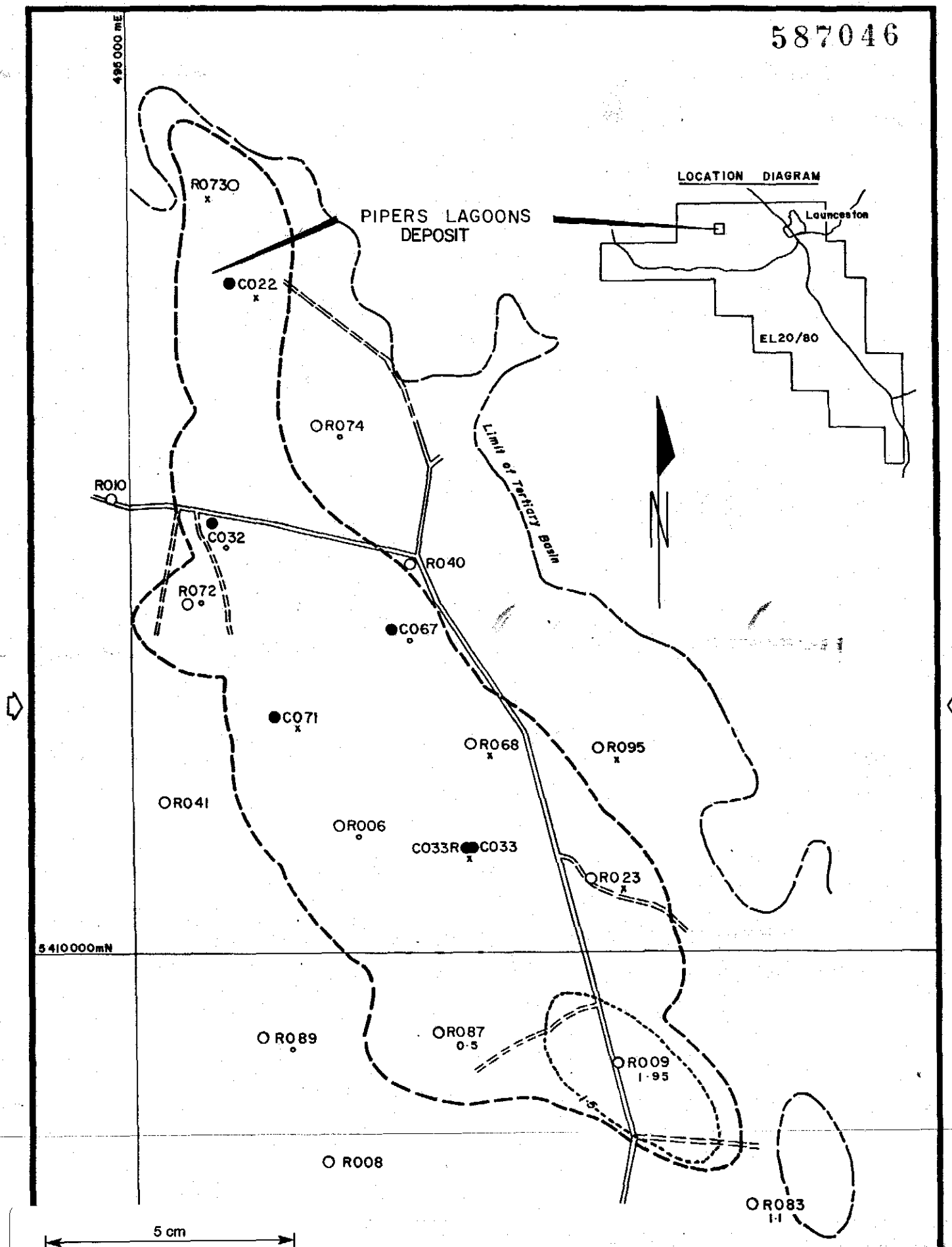
Kilometres

CSR Limited Coal Division — EXPLORATION AND EVALUATION GROUP CSR		
DRAWING / DATE	EL 20/80 LAUNCESTON PIPERS LAGOONS PAO SEAM ISOPACHS	SCALE 1 : 25 000
DRAWN B.H. Aug '82		FIGURE 22
CHECKED		
REVISED		DRAWING No 70020-38

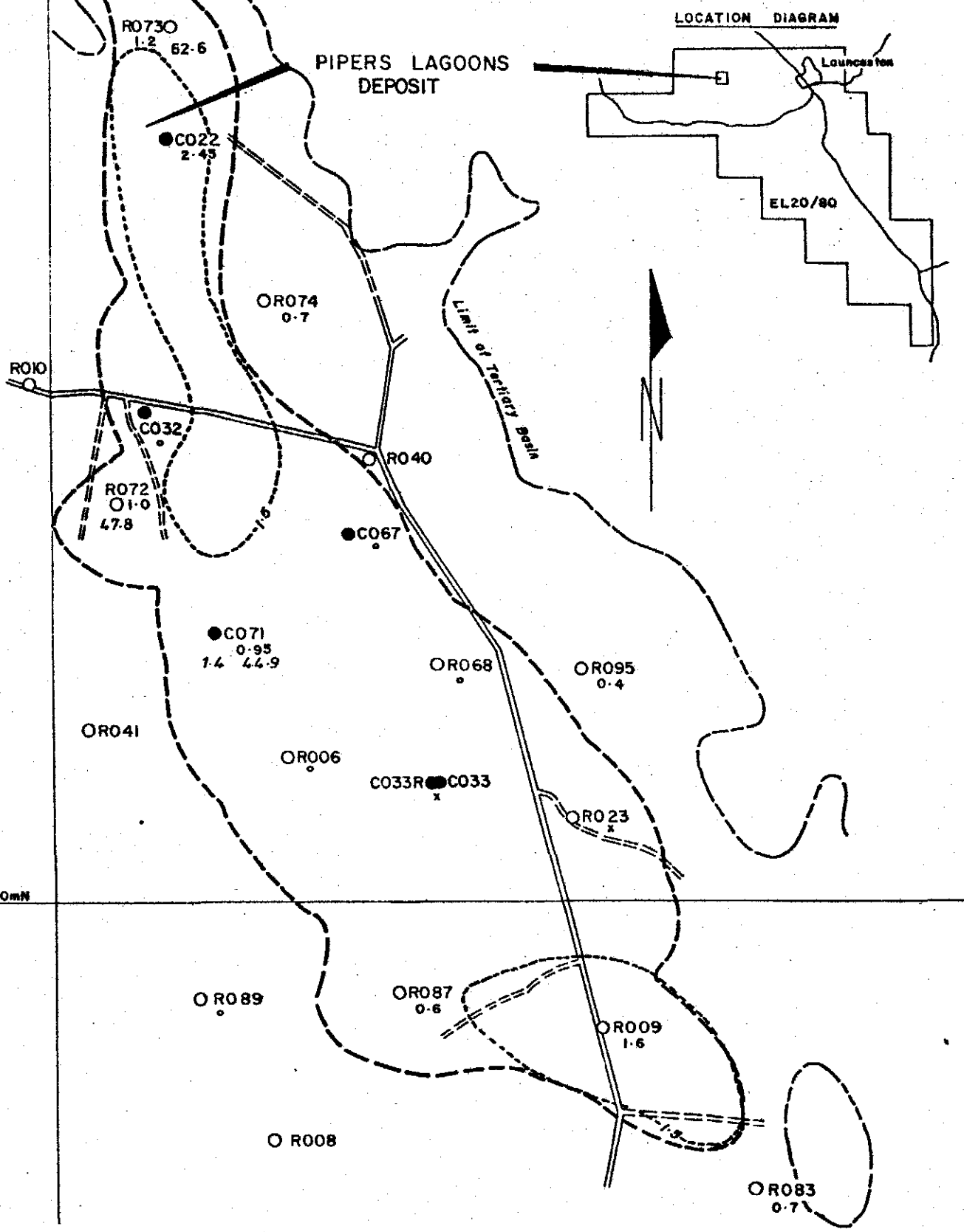
587046



CSR Limited Coal Division	EXPLORATION AND EVALUATION GROUP	
DRAWING / DATE	EL 20/80 LAUNCESTON PIPERS LAGOONS PBI SEAM ISOPACHS	SCALE 1 : 25 000
DRAWN B.H. Aug '82		FIGURE 23
CHECKED		DRAWING No 70020-39
REVISED		

62·6 Derived Ash Values from Geophysis (DB) + thickness if changed.

44·9 Analysed Ash Values (DB)



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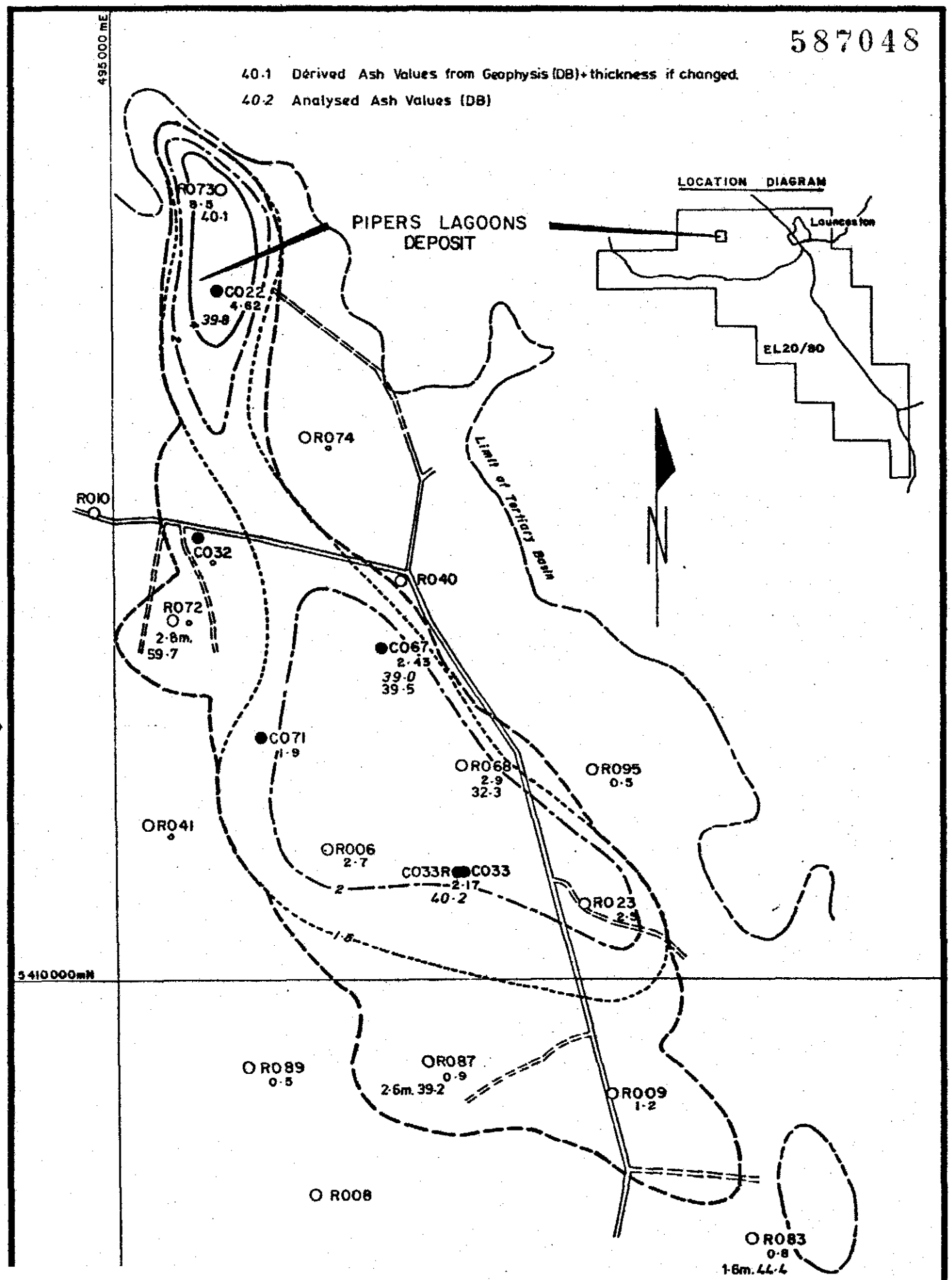
Kilometres

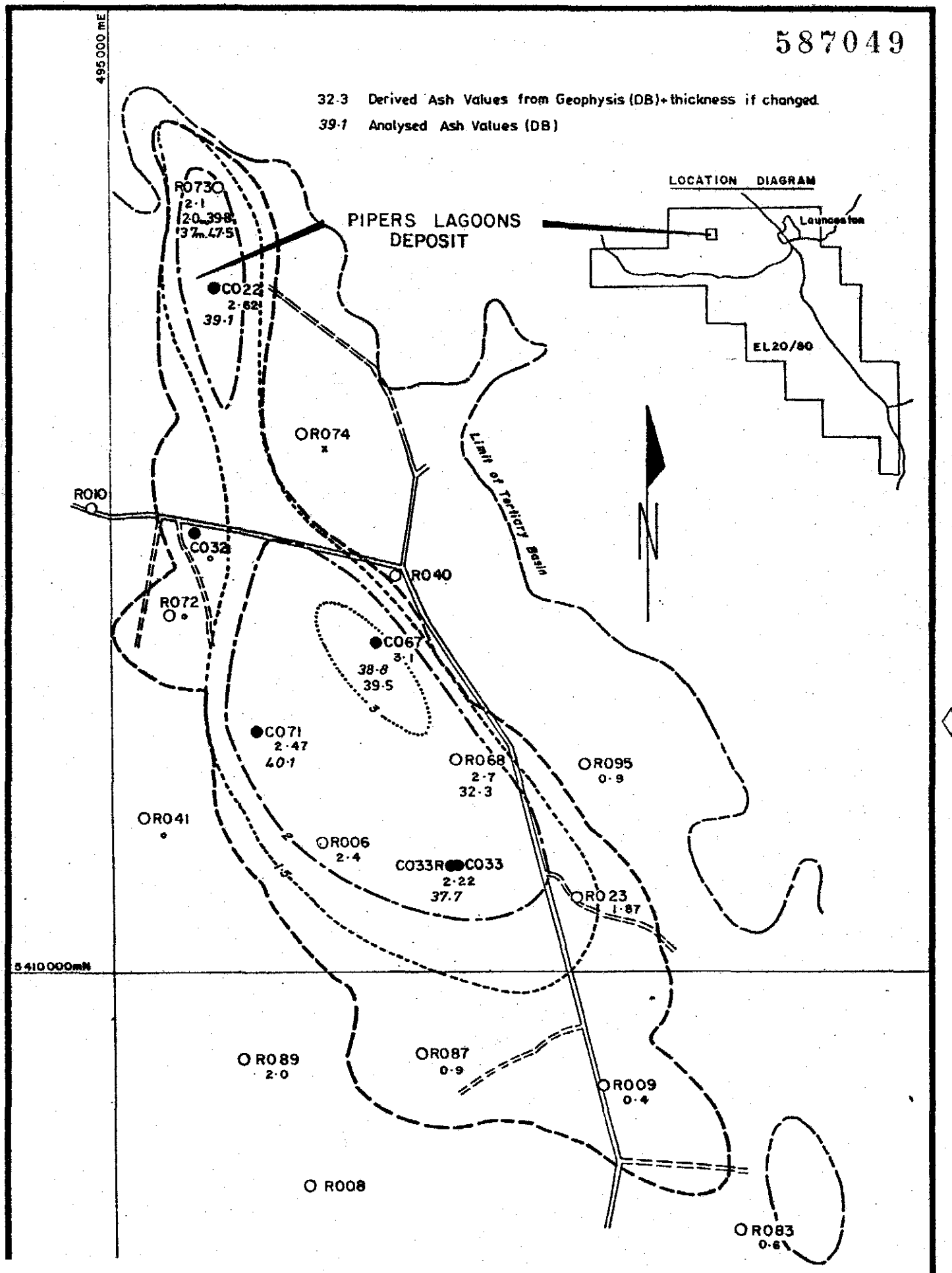
CSR Limited Coal Division — EXPLORATION AND EVALUATION GROUP		
DRAWING / DATE	EL 20/80 LAUNCESTON PIPERS LAGOONS PB2 SEAM ISOPACHS	SCALE 1 : 25 000
DRAWN B.H. Aug '82		FIGURE 24
CHECKED		DRAWING No 70020-40
REVISED C.J. March '83		

587048



CSR Limited Coal Division	EXPLORATION AND EVALUATION GROUP CSR		
DRAWING / DATE	EL 20/80 LAUNCESTON PIPERS LAGOONS PB3 SEAM ISOPACHS	SCALE 1 : 25 000	
DRAWN B.H. Aug '82		FIGURE 25	
CHECKED		DRAWING No 70020 - 41	
REVISED C J March '83			

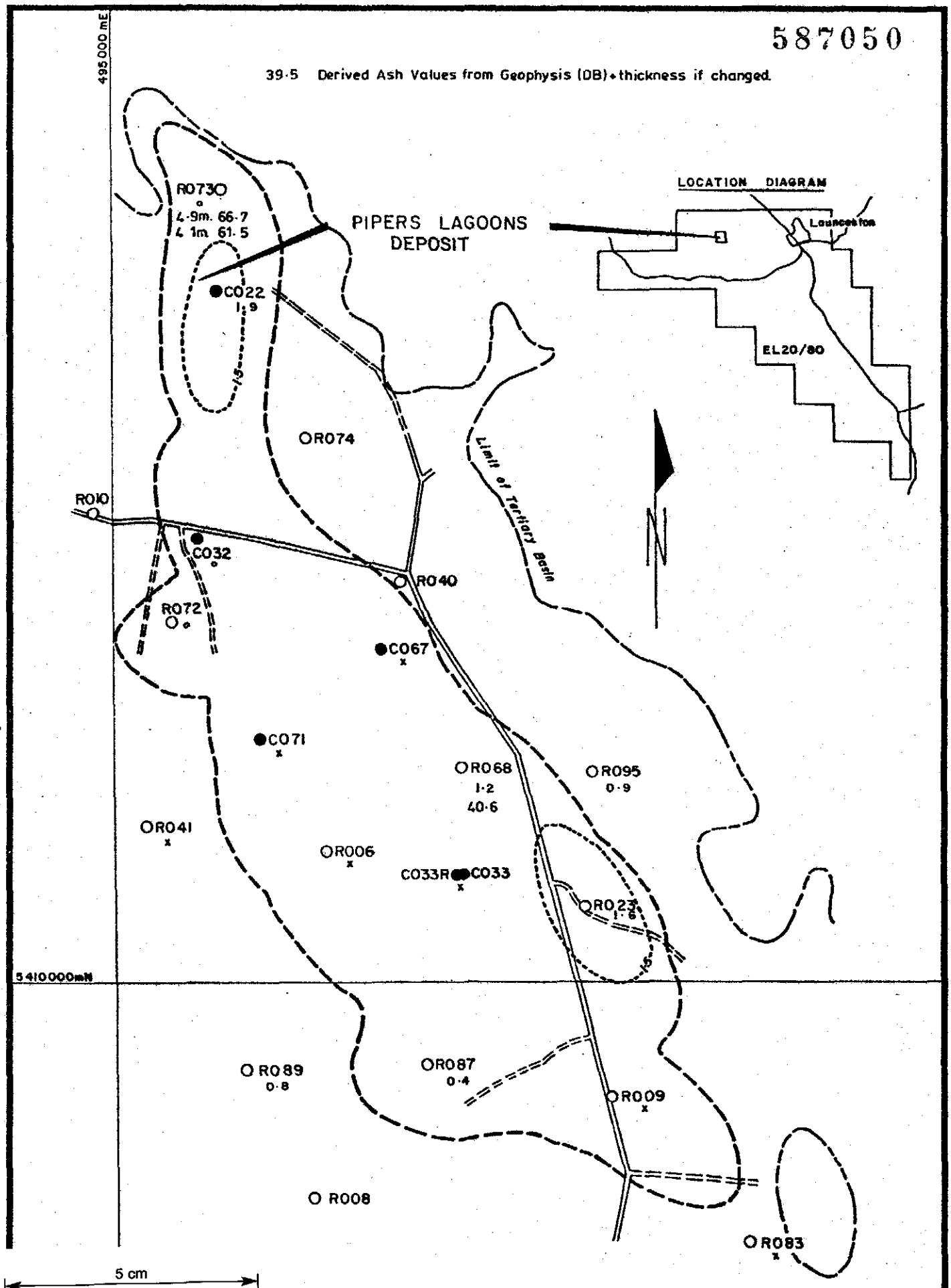
587049



CSR Limited Coal Division — EXPLORATION AND EVALUATION GROUP CSR		
DRAWING / DATE	EL 20/80 LAUNCESTON PIPERS LAGOONS PB4 SEAM ISOPACHS	SCALE 1 : 25 000
DRAWN B.H. Aug '82		FIGURE 26
CHECKED		DRAWING No 70020 - 42
REVISED C.J. March '83		

587050

39·5 Derived Ash Values from Geophysis (DB)+thickness if changed

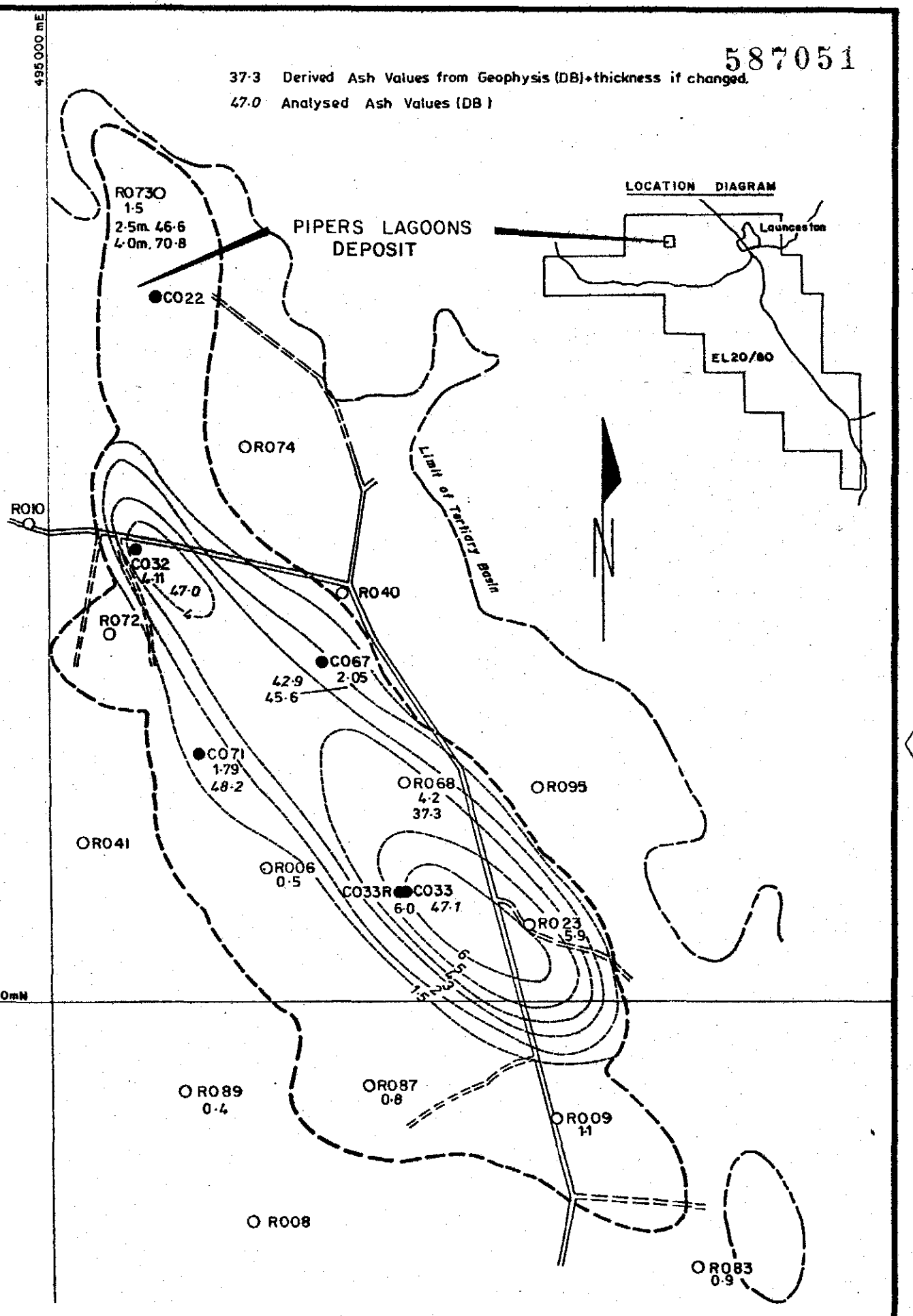


CSR Limited Coal Division	EXPLORATION AND EVALUATION GROUP CSR	
DRAWING / DATE	EL 20/80 LAUNCESTON PIPERS LAGOONS PCI SEAM ISOPACHS	SCALE 1 : 25000
DRAWN B.H. Aug '82		FIGURE 27
CHECKED		DRAWING No 70020-43
REVISED C.J March '83		

587051

37·3 Derived Ash Values from Geophysis (DB)+thickness if changed.

47·0 Analysed Ash Values (DB)



5 cm

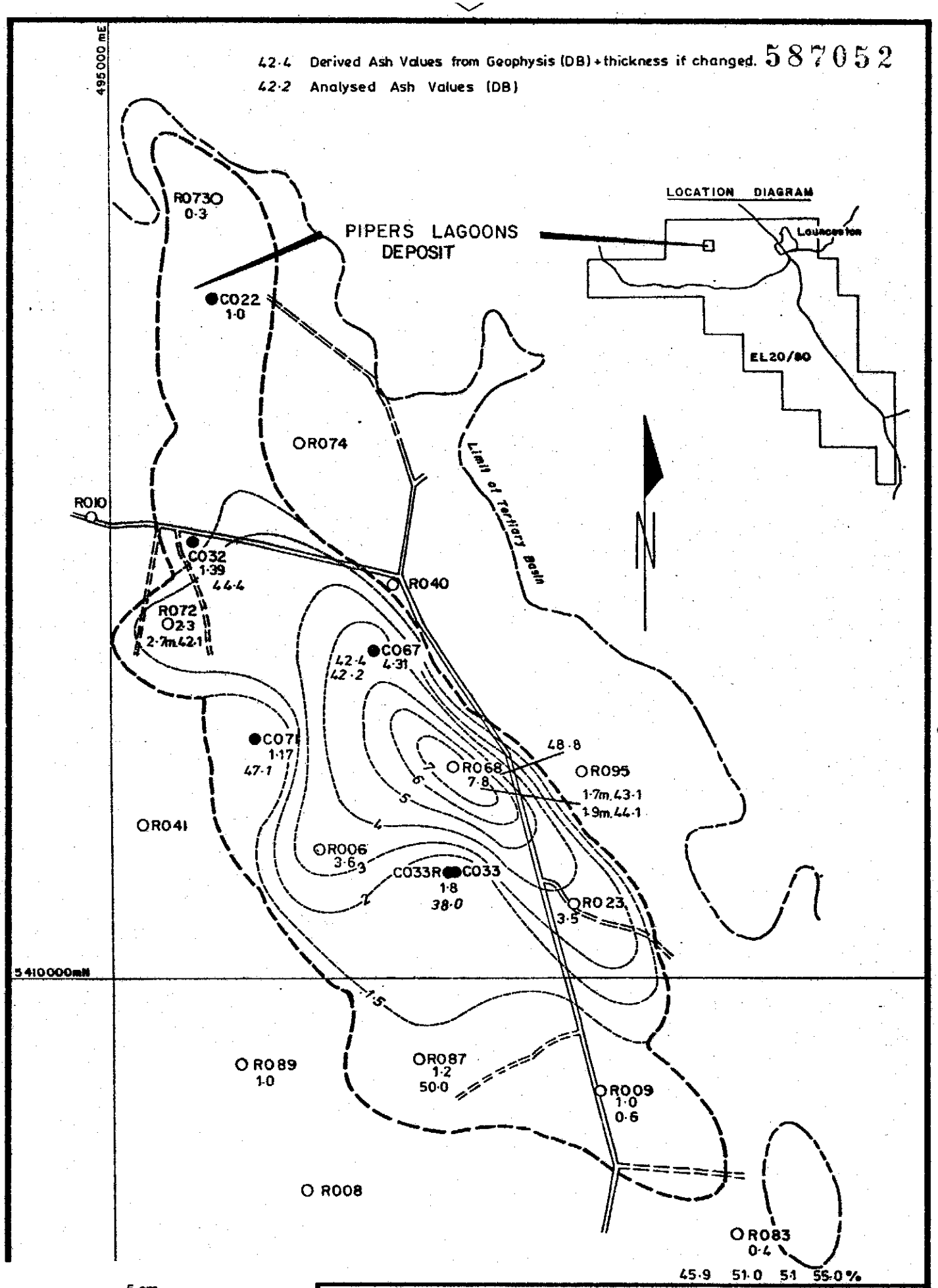
0 Scale 1:25000 1·0

Kilometres

CSR Limited Coal Division	EXPLORATION AND EVALUATION GROUP CSR	
DRAWING / DATE	EL 20/80 LAUNCESTON	SCALE 1 : 25 000
DRAWN B.H. Aug '82	PIPERS LAGOONS	FIGURE 28
CHECKED	PC2 SEAM ISOPACHS	DRAWING No 70020-44
REVISED C. J. March '83		

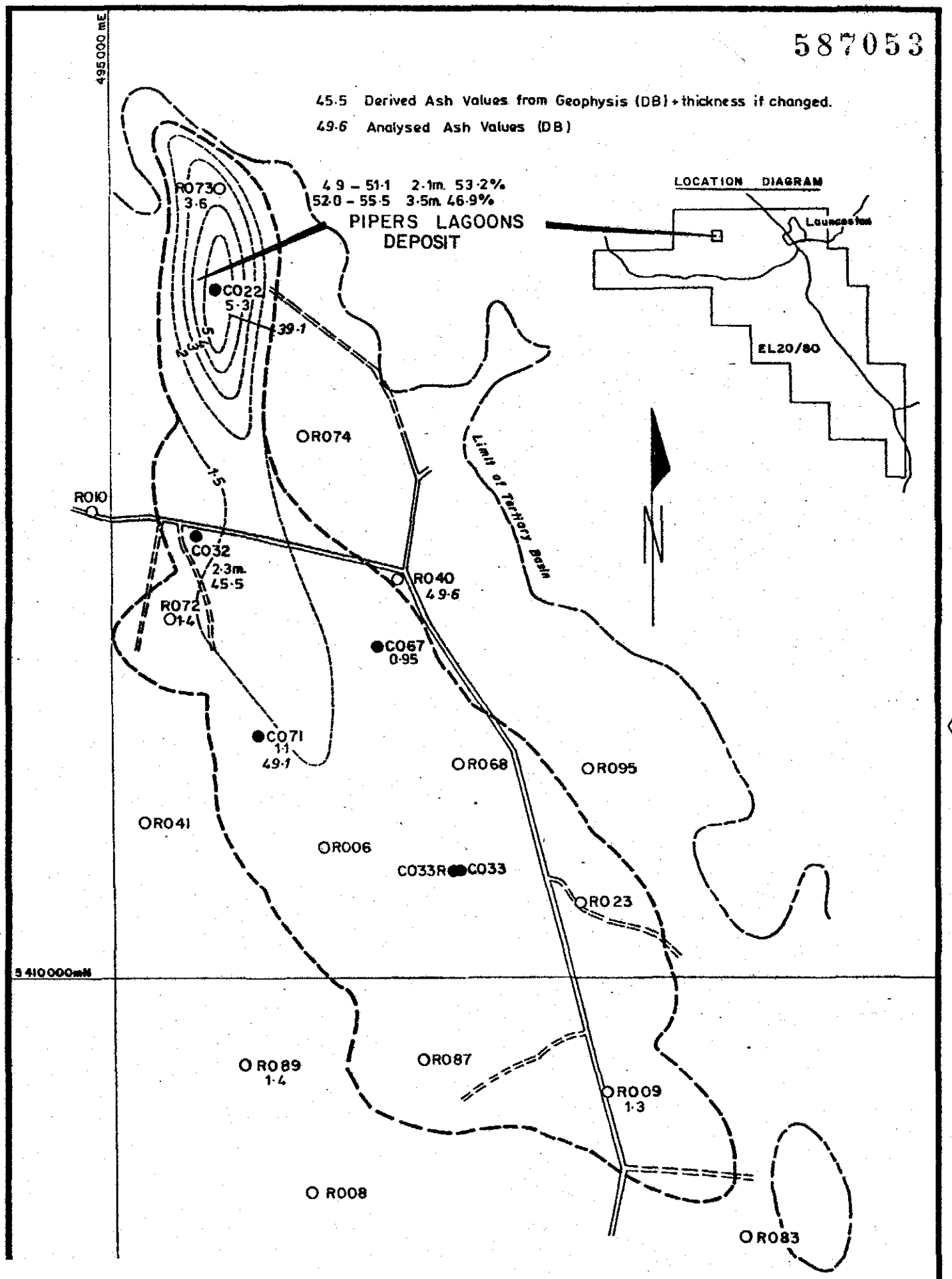
42·4 Derived Ash Values from Geophysis (DB) + thickness if changed.

42·2 Analysed Ash Values (DB)



CSR Limited Coal Division — EXPLORATION AND EVALUATION GROUP		
DRAWING / DATE	EL 20/80 LAUNCESTON PIPERS LAGOONS PC3 SEAM ISOPACHS	SCALE 1 : 25 000
DRAWN C. J. March '83		FIGURE 29
CHECKED		DRAWING No 70020-45
REVISED		

587053



5 cm

Scale 1:25000

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Kilometres

CSR Limited Coal Division — EXPLORATION AND EVALUATION GROUP		
DRAWING / DATE	EL 20/80 LAUNCESTON	SCALE 1 : 25 000
DRAWN C.J. March '83	PIPERS LAGOONS	FIGURE 30
CHECKED	PC4 SEAM ISOPACHS	DRAWING No 70020 - 46
REVISED		

APPENDIX I

EL20/80 LAUNCESTON, TASMANIA

A REVIEW OF THE COAL RESOURCES AND PROSPECTIVITY

EXPLORATION LICENCE EL 20/80 - LAUNCESTON
ANNUAL EXPLORATION REPORT
AND EXPLORATION PROGRESS REPORT FOR
THREE-MONTH PERIOD ENDED 22 FEBRUARY, 1983

APPENDIX 1

EXPLORATION LICENCE 20/80 LAUNCESTON,
TASMANIA
A REVIEW OF THE COAL RESOURCES
AND PROSPECTIVITY

APPENDIX 2

EL20/80 LAUNCESTON, TASMANIA

A REVIEW OF THE NON-COAL RESOURCES AND PROSPECTIVITY

EXPLORATION LICENCE EL 20/80 - LAUNCESTON
ANNUAL EXPLORATION REPORT
AND EXPLORATION PROGRESS REPORT FOR
THREE-MONTH PERIOD ENDED 22 FEBRUARY 1983

APPENDIX 2

EXPLORATION LICENCE 20/80 LAUNCESTON TASMANIA
A REVIEW OF THE NON-COAL RESOURCES

For full details of drillholes in this area see 1:25 000 scale maps

LAUNCESTON

Westbury

Deloraine

Hadspen

Carrick

Western Junction

Evandale

Perth

Longford

Bracknell

Cressy

Powranna

Launceston Airport

BLACK SUGARLOAF

MT. BARROW

PIPERS LAGOON

LAKE TREVALLY

DIPROSE LAGOON

DOUBLE LAGOON

LAKE AUGUSTA

LAKE FERGUS

GREAT LAKE

ARTHURS LAKE

GREAT WESTERN TIERS

HUMMOCKY HILLS

MILLERS BLUFF

BOUNDARY EL 20/80

Campbell Town

BASS HIGHWAY

LAKE HIGHWAY

TASMAN HIGHWAY

MIDLANDS HIGHWAY

MEANDER RIVER

ESK RIVER

SOUTH ESK RIVER

ST PATRICKS RIVER

ISIS RIVER

MACQUARIE RIVER

Rivulet

Westons

Western Tiers Railway

SOUTHERN RAILWAY LINE

460000mE

5360000mN

146°30'

147°00'

147°30'

42°00'

41°30'

40'

50'

10'

20'

480

500

520

540

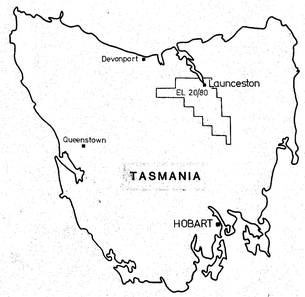
5420

5400

5380

5360

LOCALITY MAP



SCALE
50 0 50
Kilometres

LEGEND

C023 ● CSR drillhole, coal cored.

R025 ○ CSR drillhole, chip sampled.

Compiled from Tasmania 1:100 000 Topographic Survey Series 8215 Tamar, 8315 St Patricks, 8314 South Esk, 8214 Meander Edition 3 1979.

SCALE 1:100,000

5 cm

GN. T.N. MN.

GRID CONVERGENCE 0.2°

GRID/MAGNETIC ANGLE 13.1°

TRUE NORTH, GRID NORTH AND MAGNETIC NORTH ARE SHOWN DIAGRAMMATICALLY FOR THE CENTRE OF THE MAP. MAGNETIC NORTH IS PRESENTLY MOVING WESTERLY AND MOVES EASTERLY BY 0.1° IN ABOUT THREE YEARS.

LEGEND

HIGHWAY SEALED, UNSEALED
ROAD SEALED, UNSEALED
RAILWAY
POWER TRANSMISSION LINE

CSR Limited Coal Division — **EXPLORATION AND EVALUATION GROUP** CSR

DRAWING	DATE
DRAWN B.A.W.	JULY '81
CHECKED	
REVISED	March '83

EL 20/80 LAUNCESTON

LOCATION OF DRILLHOLES

SCALE 1:100 000

FIGURE 4

DRAWING No 70020-7

587058

LEGEND

- Highway, sealed road
- Unsealed road, vehicular track, lane
- Railway
- 'Farmville' Homestead
- Drain
- C033 CSR drillhole coal cored
- R009 CSR drillhole chip sampled
- Deposit Outline
- Prospect Outline
- Outline of Basement Rock.

PIPERS LAGOONS DEPOSIT

LOATTA DEPOSIT

SELBOURNE DEPOSIT

HILLCREST PROSPECT

STATE FOREST

STATE FOREST

WESTBURY

HAGLEY

MEANDER

MEANDER

BASS HIGHWAY

WESTERN LINE

ROSEBURN ROAD

SELBOURNE ROAD

BLACK SUGARLOAF RIDGE

BLACK RIVER

BLACK RIVER

WESTBURY AREA

EL 20/80

LAUNCESTON

KEY SHEET DIAGRAM

(TASMANIAN 1:25 000 TOPO. SERIES)

PARKHAM	BRIDGENORTH	LAUNCESTON
DELORAINE	WESTBURY	PROSPECT

G.N. T.N. M.N.

GRID CONVERGENCE 0·2°

GRID MAGNETIC ANGLE 13·0°

TRUE NORTH, GRID NORTH AND MAGNETIC NORTH ARE SHOWN DIAGRAMMATICALLY FOR THE CENTRE OF THE MAP. MAGNETIC NORTH IS CORRECT FOR 1980 AND MOVES EASTERLY BY 0·1° ABOUT EVERY THREE YEARS

SCALE 1: 25 000

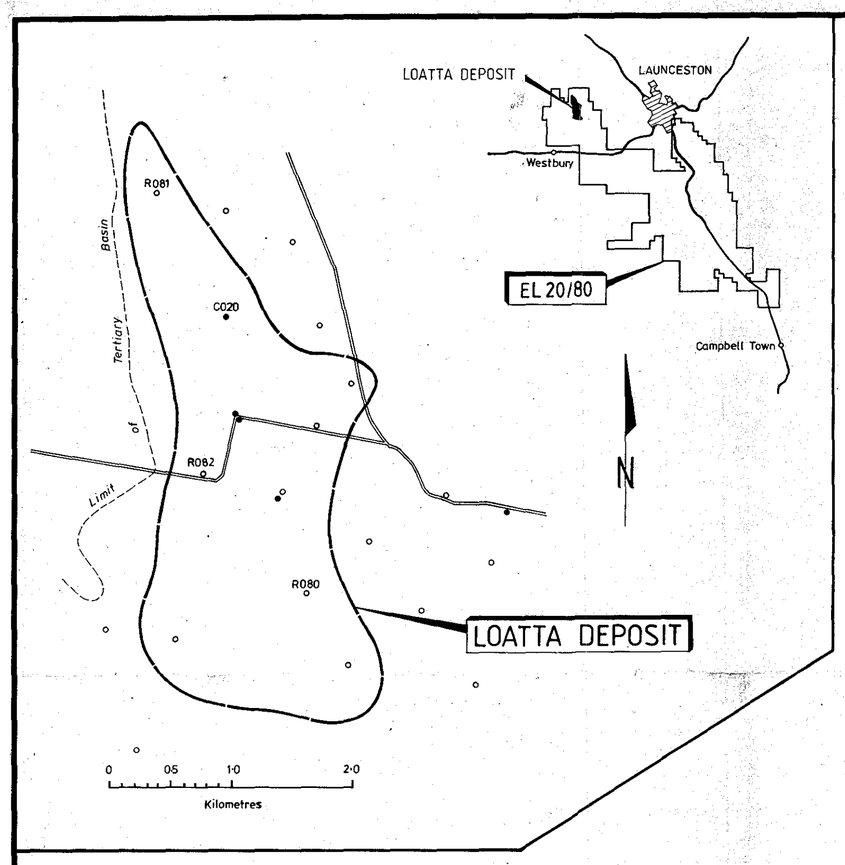
1·0 0·5 0 0·5 1·0 1·5 2·0

Kilometres

5 cm

CSR Limited Coal Division	EXPLORATION AND EVALUATION GROUP	
DRAWN A.Y. Sept.'82	EL 20/80 LAUNCESTON WESTBURY AREA BROWN COAL DEPOSITS & PROSPECTS	SCALE 1:25000
CHECKED		FIGURE 5
REVISED I.W. Mar.'83		DRAWING No. 70020 – 72

587059



RL in metres.

R081

Water Level

4·88 LB2
9·6
11·4 LB3
15·2
33·4 LC1
35·7
36·8 LC2
42·0
42·6 LC3
44·5
LD0
86·6

1·0 1·5 2·0 2·5
APPARENT G/CC

LB Seam
LC Seam
LD Seam

C020

Water Level

6·8
7·5 LB1
10·4
11·02 LB2
20·3
21·4 LB3
25·1
28·8 LC1
32·4
35·9

1·0 1·5 2·0 2·5
APPARENT G/CC

LB Seam
LC Seam
LD Seam

R082

Water Level

28·8 LA1
30·2
31·0 LA2
33·9
35·2 LA3
37·4
47·9
49·0 LB1
49·5
51·8 LB2
60·6
62·5 LB3
65·1
68·2 LC1
69·8
70·8 LC2
72·4
72·85 LC3
74·7
75·25 LC4
76·8
LD0
TD 144·0

1·0 1·5 2·0 2·5
APPARENT G/CC

LA Seam
LB Seam
LC Seam
LD Seam

R080

Water Level

20·0 LA1
21·6
24·8 LA3
27·8
32·7
37·2 LB1
39·2
52·0 LB2
53·7
56·0 LB3
61·6
63·0 LC1
67·2
68·0 LC2
69·2
70·5 LC3
LD0
TD 114·0

1·0 1·5 2·0 2·5 3·0

RL in metres

200 190 180 170 160 150 140 130 120 110 100 90 80 70 60

5 cm

LEGEND

LITHOLOGY REFERENCE

- U U SOIL
- CLAY
- SAND
- V V BASALT
- S S SIDERITE
- LIGNITE
- INFERIOR LIGNITE
- LIGNEOUS CLAY
- INTERBEDDED SEDIMENTS [LIG. CLAY/CLAY 50:50]

CSR Limited Coal Division	EXPLORATION AND EVALUATION GROUP	CSR
DRAWING: DRAWN M.R.N. — DATE: Mar.'83; CHECKED; REVISED	EL 20/80 LAUNCESTON LOATTA DEPOSIT EXAMPLES OF SEAM CORRELATIONS	SCALE: 1:200 Vertical FIGURE 12 DRAWING No 70020-145

587060

587061

EXPLORATION LICENCE 20/80, LAUNCESTON

TASMANIA

A REVIEW OF THE COAL RESOURCES AND PROSPECTIVITY

P. Ellis

CSR Coal Division
Exploration & Evaluation Group
13th Floor,
10 Eagle Street,
BRISBANE Qld. 4000

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APPENDIX 3

Rufus Lagoons Area

Summary of carbonaceous and ligneous horizons intersected during exploratory drilling by:-

i) Getty Oil Development Company
ii) Tasmanian Department of Mines
iii) AAR Limited

APPENDIX 4

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APPENDIX 5

General Conditions Governing Exploration Licences

1. SUMMARY

In Tasmania black coal occurs in the Permo-Triassic Parmeener - Supergroup sedements. Brown coal occurs in Tertiary non marine sedimentary successions.

Exploration Licence 20/80 Launceston, which is held by AAR Limited, covers an area of 2,339 km^2. It contains the largest area of unconsolidated Tertiary sediments in Tasmania, and minor Parmeener Supergroup strata. It has supported very small scale coal mining in the past. Tertiary brown coal and Triassic black coal were mined at Rosevale and from the Longford coal field respectively.

Numerous holes have been drilled by the Tasmanian Department of Mines, private water well contractors, and mining companies. The present knowledge of the coal geology of the licence area suggests that it is prospective for small to medium sized deposits.

Three brown coal deposits, the Loatta, Pipers Lagoons and Selbourne deposits have been delineated through exploration by CSR Coal Division. These coal deposits contain a total of 118 Mt (in situ) indicated Class I and Class II brown coal reserves and small inferred reserves.

Six areas with potential for Tertiary brown coal resources and six areas with potential for Permo-Triassic black coal resources have been assessed, and ranked according to their prospectivity.

The areas with potential Tertiary brown coal resources are the Hillcrest Prospect, Carrick, Breadalbane-Relbia, Rufus Lagoons, Vaucluse Reservoir and Henrietta Plains.

The six potential black coal areas are the Longford coal field, Hummocky Hills, the Mt. Arnon, Birralee, Bridgenorth-Glengarry and Reedy Marsh areas.

Areas of EL 20/80 which are not considered to be prospective for coal and non-coal resources are delineated. These areas should be relinquished prior to 22nd February, 1983. The area to be retained totals 954km^2, for which an expenditure commitment less than $200,000 is required for the year ending 22nd February, 1984.

2. INTRODUCTION

2.1 Scope

This report reviews the prospectivity of Exploration Licence EL 20/80 Launceston for coal. It draws on all of the available geological and geophysical data. Areas suggested for relinquishment are outlined. The non coal resources, of EL 20/80 Launceston and the coal resources of areas adjacent to EL 20/80 are assessed in separate reports.

2.2 Tenure

EL 20/80 covering an area of 2,339 km^2 has been held by AAR Limited since 19th September, 1980, and has been progressively renewed until 22nd February, 1983.

2.3 Location and Access

EL 20/80 Launceston extends from Campbell Town in the south-east, west to Deloraine, and north to Launceston, (Figure 1). It is located on the Meander, South Esk, and Tamar 1 : 100,000 Topographic Map Series. For further details refer to Ellis 1982c.

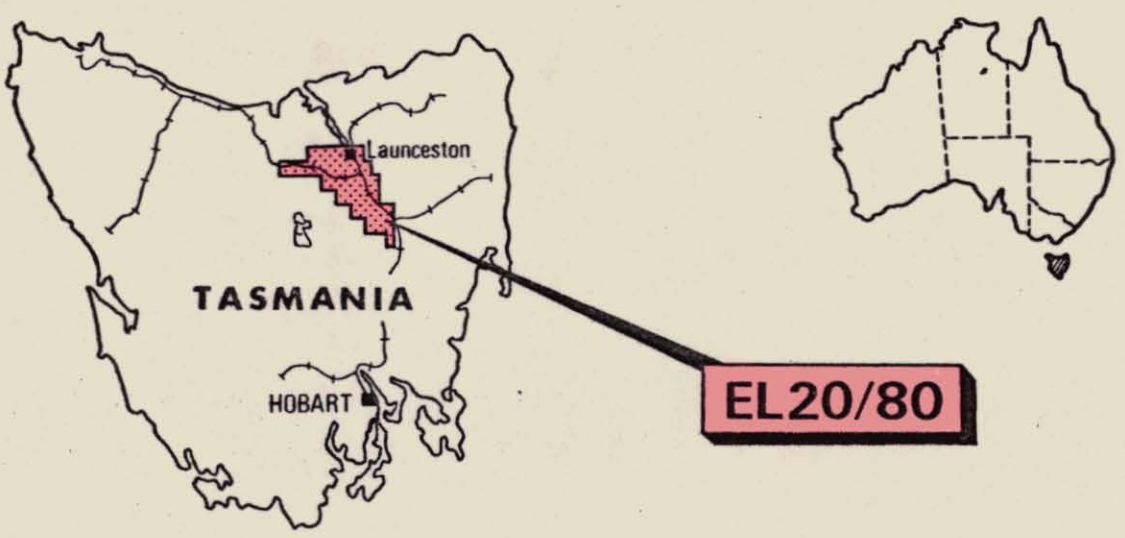
2.4 Climate, Physiography and Land Use

The climate of the area is temperate. The annual average rainfall throughout the area ranges from approximately 500 to 1,000mm and generally falls during the winter months, (Matthews, in press).

The Launceston Basin is flat to gently undulating. It is surrounded on all sides by much higher terrain, notably the Great Western Tiers to the west and Ben Lomond to the east.

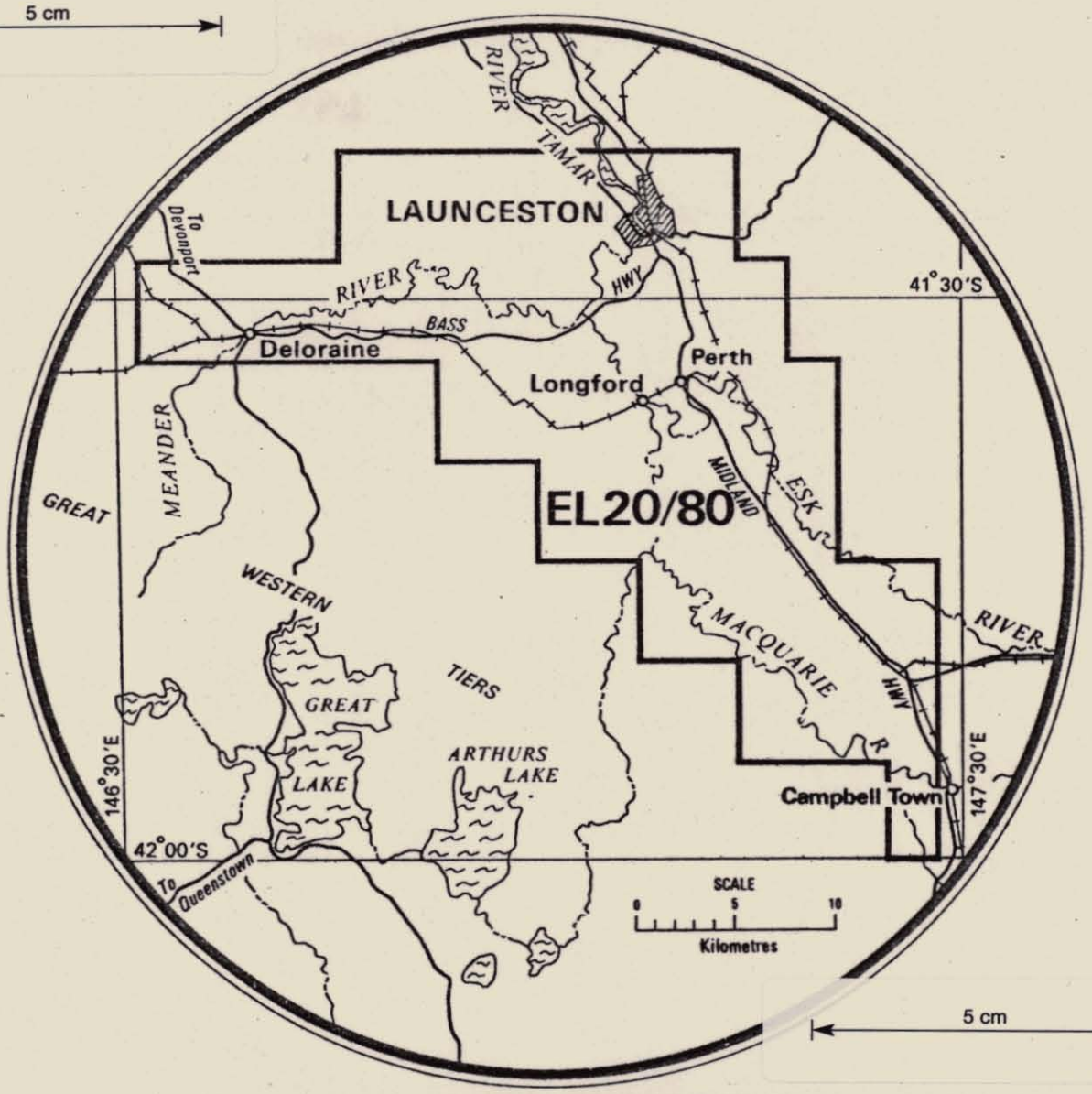
The major land use of EL 20/80 Launceston is farming, predominantly sheep and cattle grazing. The Carrick-Westbury area is notable for its large number of horse, cattle and sheep studs, and intense cultivation of peas, beans, opium poppy, and cereal crops.

587069



SCALE
0 50 100 150
Kilometres

5 cm



5 cm

EL 20/80 LAUNCESTON TASMANIA

70020-8

FIGURE 1

3. GEOLOGY OF TASMANIAN COAL BASINS

3.1 Regional Setting of EL 20/80

EL 20/80 Launceston lies within the Permo-Triassic Parmeener Supergroup Coal Basin and the Tertiary Launceston Basin. The Tertiary Launceston Basin unconformably overlies the Permo-Triassic Basin. Tertiary Launceston Beds, (Johnson, 1888) outcrop over approximately three quarters of the licence area.

Parmeener Supergroup strata outcrop along the margins of the Launceston Basin and in a discontinuous central horst which is expressed in the Hummocky Hills and hills to the north of Perth which extend north-westerly to Carrick.

The stratigraphy of the Parmeener Supergroup and Launceston Basins of EL 20/80 is shown in Figure 2. The stratigraphic sequence has been compiled from the Launceston, Quamby, Longford and Frankford 1 : 63,600 Geological Atlas Series, and the Lake River 1 : 50,000 Geological Atlas and the respective accompanying explanatory notes.

3.2 Parmeener Supergroup Coal Basins

3.2.1 Introduction

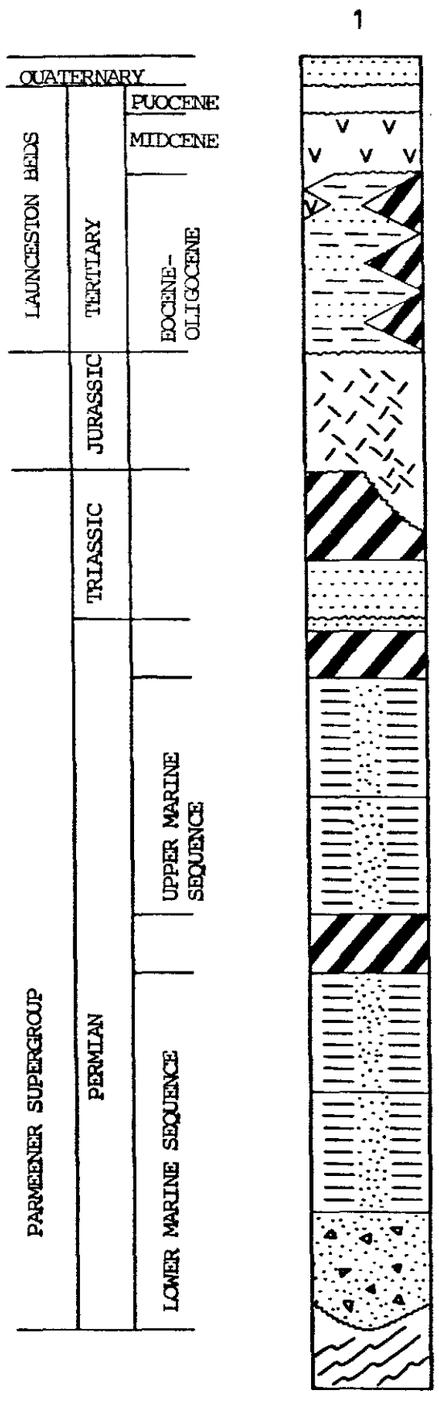
The Parmeener Supergroup refers to sedimentary strata of Permian to late Triassic age.

Approximately half of Tasmania is underlain by Parmeener Supergroup strata. (Figure 3).

The main Parmeener Supergroup basin occupies the central and south-eastern portion of Tasmania. Lower Permian remnants are found in the north-west corner of Tasmania.

The stratigraphy of the Parmeener Supergroup is shown in Figure 2.

Permo-Triassic coal seams are characteristically thin and laterally impersistent. The coal measure sequences are characterized by rapid lateral and vertical facies variations. The Parmeener Supergroup is affected by major faulting and folding, commonly producing steep dips.

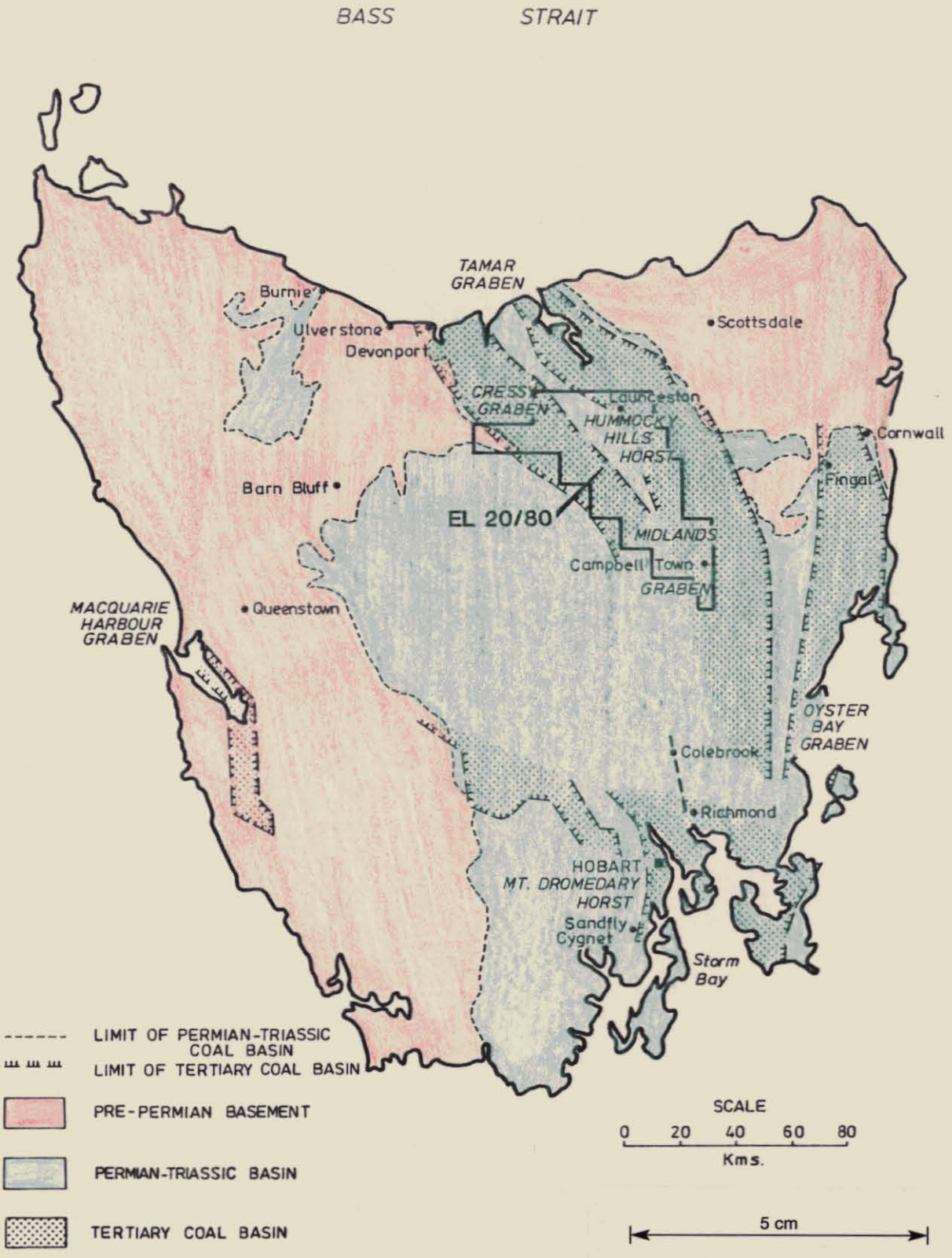


Stratigraphic Name	Lithological Description	Prospective Area in EL 20/80	Thickness Range
	Alluvium		
Upper Zone	Gravel, boulder beds		
	Alkali - Olivine basalts		Up to 60m
Middle Zone	Clay, Silt, Sand Brown Coal and Oil Shale	Loatta, Pipers Lagoons and Selbourne Deposits	0–1,000m
Lower Zone		Breadalbane Lignite	
Dolerite Intrusion	Medium to course grained, tholeiitic dolerite		0–305m
Fingal or Newtown Coal Measures	Feldspathic Sandstone Black coal Seams	Longford Coal Field Norwich and Pateena Mines	0–200m
Knocklofty or Ross Sandstone	Quartzose Sandstone		60–100m
Cygnet Coal Measures Jackey Formation	Carbonaceous Sandstone and Shale with Plant Fragments,	thin coal seams	less than 45m
Bogan Gap Group	Predominantly unfossiliferous mudstone		up to 200m
Poatina Group	Fossiliferous Mudstone and Sandstone		40–100m
Mersey Coal Measures Liffey Group	Carbonaceous Quartz-Mica Sandstone and Shale, thin coal seams		30–49m
Golden Valley Group	Unfossiliferous erratic rich mudstone, shale limestone and sandstone		45–60m
Quamby Mudstone	Unfossiliferous, dark grey pyritic mudstone. Includes Tasmanite Oil Shales of Railton-Latrobe Area		75–120m
Stockers Tillite	Tillite and erratic rich mudstone		0–140m
Unconformity			
Basement — Silurian	Turbidite sequences, dominately shale and siltstone		
Ordovician	Siliceous conglomerate		
Cambrian	Turbidite sequences containing quartzite		
Precambrian	Quartzite		

Note: Column 2 after Johnson 1873 only applies to Stratigraphy of Launceston Area

Compiled from information contained in Mathews (1974).

CSR Limited Coal Division	EXPLORATION AND EVALUATION GROUP	CSR
DRAWING	DATE	STRATIGRAPHY OF THE PARMEENER SUPERGROUP AND LAUNCESTON BASIN IN EL 20/80
DRAWN C.J.	Nov. '82	SCALE
CHECKED		FIGURE 2
REVISED		DRAWING No 70020 - 90



CSR Limited Coal Division — EXPLORATION AND EVALUATION GROUP		
DRAWING / DATE	COAL BASINS OF TASMANIA	SCALE: AS SHOWN
DRAWN: C. J. Dec. '82		FIGURE 3
CHECKED		DRAWING No: 70020 – 92
REVISED		

Igneous intrusions are frequently present within Parmeener Supergroup coal measure strata. The two main factors affecting the preservation of coal are erosion and intrusion of coal measure strata by dolerite dykes and sills.

3.2.2 Parmeener Supergroup in EL 20/80

3.2.2.1 Lower Parmeener Supergroup

The Lower Parmeener Supergroup has been divided into a "Lower Marine Sequence", a "Lower Freshwater Sequence" and an "Upper Marine Sequence".

The Lower Marine Sequence, which consists of the Stockers Tillite and time equivalents, is overlain by the Quamby Mudstone which is overlain by the Golden Valley Group. The Stockers Tillite rests unconformably on pre Permian basement rocks. The Quamby Mudstone contain the Tasmanite oil shales of the Latrobe-Devonport area, (Jennings, et al 1976).

The Lower Freshwater Sequence includes the Mersey Coal Measures. They consist of coarse-grained, well washed cross bedded quartz and mica sandstone with minor carbonaceous shale and coal seams.

The Mersey Coal Measures are known to occur in the north-western portion of the Parmeener Supergroup Coal Basin. They take their name from the coal locality in the Mersey River Valley south of Devonport. These coal measures are found in the Lower Permian Remnants at Preolenna and Barn Bluff. (refer Figure 3). However Kerogenite and Pelionite oil shales are commonly interbedded with the coal. Coal and oil shale seams are less than 1m and up to 2m thick respectively. Coal seams contain high sulphur, low ash, moderate specific energy steaming coal, and oil shale.

The Liffey Group is a time equivalent of the Mersey Coal Measures in EL 20/80. Thin (less than 30mm) coal seams are documented in the Liffey Group.

The Upper Marine Sequence is up to 300m thick to the south-east of EL 20/80, and ranges in thickness from 80 to 150m within the EL. It consists of the Poatina and Bogan Gap Groups.

3.2.2.2 Upper Parmeener Supergroup

The Upper Parmeener Supergroup has been subdivided into an "Upper Freshwater Sequence" and a "Triassic Sequence".

The Upper Freshwater Sequence contains the Cygnet Coal Measures which are not documented in the Midlands area of the Parmeener Supergroup Coal Basin. The Cygnet Coal Measures take their name from a small out-crop area near Mt. Cygnet, approximately 50km south-west of Hobart. In EL 20/80 the Jackey Formation is a time equivalent of the Cygnet Coal Measures, and ranges up to 50m thick. The Jackey Formation and Clog Tom Sandstone are possibly time equivalents.

Coal from the Cygnet Coal Measures is a moderately high ash and low sulphur content, moderate specific energy steaming coal. Semi-anthracite to anthracite coal is found in seams proximal to Jurassic dolerite intrusions.

The Jackey Formation is underlain by the Bogan Gap and Poatina Groups. The thickness of these strata ranges up to 300m.

The Triassic sequence commences with the Knocklofty Sandstone and time equivalents which range in thickness up to 100m.

The Triassic Coal Measures occur throughout most of the upper Triassic sequence. Seams are characterized by common stone bands and coal with moderately high to high inherent ash, low sulphur and moderate specific energy. In the Fingal-Cornwall District seam thicknesses including stone bands range up to 4.9m.

Associated coal measure sediments are lithic sandstones, siltstones, mudstones and carbonaceous shales.

3.2.3 Jurassic Dolerite

Parmeener Supergroup Strata are intruded by Jurassic tholeiitic dolerite sills and dykes in excess of 305m thick.

In most places the dolerite appears as a capping such as on the Great Western Tiers and other remnant peaks.

Dolerite has consistently intruded the Parmeener Supergroup at the base of the Triassic in the Launceston Basin (Longman and Leaman, 1971).

3.3 Tertiary Coal Basins

Non-marine Tertiary sediments were deposited in north to north-west trending grabens initiated in the early Tertiary. Four major grabens are recognised, namely the Midlands Graben, the Derwent and Macquarie Harbour Grabens and the Oyster Bay Graben, (refer to Figure 3.

Brown coal and carbonaceous horizons occur in all grabens. Brown coal seams are characteristically laterally impersistent. Tertiary strata are rarely affected by faults.

3.3.1 Tertiary In EL 20/80

EL 20/80 Launceston lies within the Midlands Graben. The Midlands Graben bifurcates on either side of the Hummocky Hills. The western or Cressy Graben, extends northwards to Port Sorrell and Devenport. The eastern or Tamar Graben continues to the ocean at the mouth of the Tamar River, (refer Figure 3).

The Tamar Graben extends southwards as far as the Ross area. Smaller horsts and grabens continue through the Midlands to the Hobart area. A deep but narrow graben between Richmond and Colebrook may be a southerly extension of the Cressy Graben.

The Launceston Basin refers to both the Cressy and Tamar Grabens.

Deposition of sediments commenced in the Palaeocene - Lower Eocene and continued until the Upper Oligocene (Matthews, 1974). Sediments are predominantly non-marine clays, silts, sands and gravels with minor marine or brackish environment influences.

Environemnts of deposition were in a state of constant flux during the Tertiary, alternating from fluviatile to lacustrine, with swamps and subaerial facies. This is reflected by the rapid laterial facies changes interpreted from exploratory drilling.

The primary source of the inorganic sediments was the sandstones, siltstones and mudstones of the Permian and Triassic strata, and the Jurassic dolerite.

The regional stratigraphy of EL 20/80 is summarised in Figure 2. Figure 4 shows the schematic spatial relationships between rock types of the Launceston Basin.

A basin wide correlation of Tertiary strata, in particular brown coal horizons, has not been published. A formal intrabasinal stratigraphic sequence has not been established for the Launceston Basin. The term Launceston beds, as used by Johnson (1888), to describe the Tertiary strata of the Launceston area is adopted.

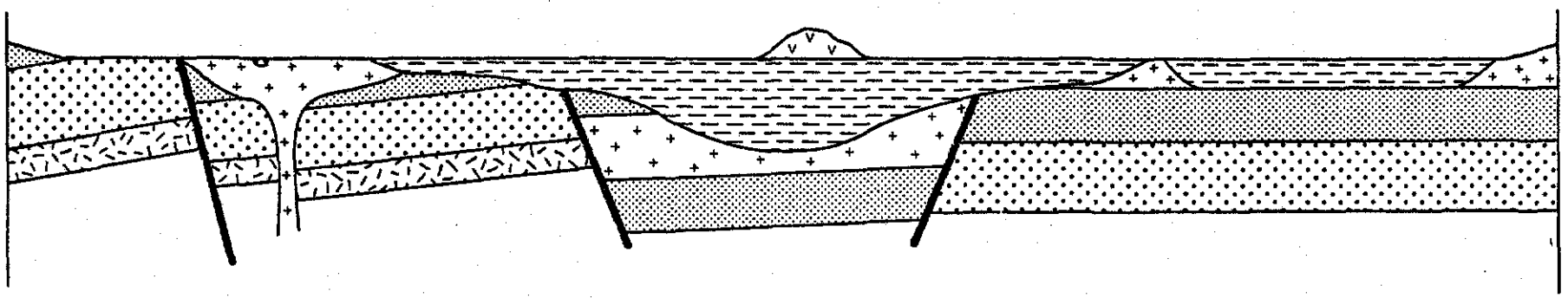
Johnson (1873) arbitrarily divided the sediments of the Launceston area of the Launceston Basin into 3 zones, known as the lower, middle and upper zones.

The lower zone contains brown coal seams, which rest unconformably upon Parmeener Supergroup strata on the West Tamar. This zone contains laminated strata, and numerous fossil leaves, possibly deposited in a lacustrine or flood plain environment.

The middle zone is represented by cross bedded sands and clays, most probably deposited in a fluviatile environment. Middle zone strata outcrop at Windmill Hill in Launceston.

The upper zone is represented by low rounded hills and terraces flanking the present course of the Tamar River.

Further discussions of the geology and conceptual models of brown coal development of EL 20/80 Launceston is outlined in exploration progress reports, (Osborne, 1981; Ellis, 1982a, 1982b, 1982c).



LEGEND

- Tertiary Basalt
- Launceston Beds
  clay, silt, sand, lignite and oil shale
- Jurassic Dolerite
- Triassic
  lithic sandstone, quartzose sandstone, shale
- Permian
  glaciomarine sequence, pebbly mudstone and sandstone, tillite
- Cambrian Basic Volcanics

CSR Limited Coal Division EXPLORATION AND EVALUATION GROUP CSR		
DRAWING / DATE	EL 20/80 LAUNCESTON	SCALE —
DRAWN C.J. Sept. '82	SCHEMATIC	FIGURE 4
CHECKED	STRATIGRAPHIC DIAGRAM	DRAWING No. 70020-74
REVISED		

4. PREVIOUS EXPLORATION AND MINING

4.1 Pre 1922 Coal Exploration

The first recorded drilling in the area presently covered by EL 20/80 was in 1886, when attempts were made to ascertain the extent of Fingal coal measures which outcrop at the Launceston coal field. Two holes were drilled on the property Belmont, the deepest going to 272m in Tertiary sediments. (Figure 5).

Hills and others (1922), summarised coal exploration and mining activities in Tasmania in the publication "Coal Resources of Tasmania". The report details various exploration adits and mines within the area.

Most of the early exploration and mining activities in the Tamar area were concentrated close to Launceston, and in areas near coal outcrops.

Parmeener Supergroup black coal is recorded at Dilston, Georgetown, and the Longford coal fields.

At Georgetown, two seams, 15cm and 20cm thick respectively are documented. They possibly belong to the Fingal Coal Measures. Coal of Permian age, and considered equivalent to the Cygnet Coal Measures was mined at Dilston, which is situated on the east side of the Tamar River north of Launceston, (Carey, 1947). Two shafts were sunk, and one reached coal at 15m but was abandoned. The coal had a high ash content and did not burn readily (Longman, 1966).

The Longford coal field is situated east of the Cressy Highway, and approximately midway between Longford and Hadspen. The Triassic Fingal Coal Measures crop out on the property Norwich, and a coal seam outcrops in Jordans Creek near the Cressy Highway. Several prospect shafts were sunk on the property Norwich and a small quantity of coal was mined. This was known as the Norwich Colliery. (Refer to Figure 5).

On the adjoining property Esk Lynn, now owned by Mr. J. Terry, over 800 tons of coal was raised by a two man operation in the Pateena mine. This mine operated during the period 1916 - 1919. The main entry is by dip tunnel situated on Jordans Creek.

Tertiary brown coals are recorded in outcrop from Legana, Relbia, near Corra Lynn, a railway cutting near the Launceston Airport and at Rosevale. Brown coal has been worked at Rosevale by sinking shafts and tunnelling. Near St. Leonards an adit was dug into a bank of the North Esk River.

The St. Leonards Lignite is also referred to in numerous texts as the Breadalbane Lignite. The adit in a bank of the north Esk River is the only known working of brown coal in the Breadalbane and St. Leonards area. This suggests that references to the Breadalbane and St. Leonards lignite are made towards the same locality. For locations of coal occurrences refer to Figure 5.

4.2 Bauxite Exploration

Bauxite from the St. Leonards and launceston areas was mapped and extensively sampled by the Australian Aluminium Commission in 1946 (Longman, 1966).

Exploration for bauxite in the Rosevale area was conducted in 1946. Exploration was confined to mapping lateritic Tertiary basalt and Jurassic dolerite, and minor costeaning operations.

A bauxite lease is presently held and occasionally worked on Mr. D. Johnson's property, "Oakleigh".

4.3 Ceramic Clays

A clay mining lease was held on the property "The Springs" which is situated north of Launceston Airport. The clay was to be mined and transported to Hobart for use in the ceramics industry. Details of who held the lease and when it was held are not known to the author.

4.4 Groundwater Resources

The first recorded drilling for groundwater in the Launceston Basin was in 1929 at the Conara railway station where two holes were drilled by the Tasmanian Department of Mines. Numerous hand dug wells, and contract water bores have been drilled since 1929. (Matthews, in press).

The Tasmanian Department of Mines commenced a systematic study of groundwater resources in 1965. Some 236 holes have been drilled to provide a wide coverage of the Launceston Basin. For further details refer to Matthews (1974 and in press). Valuable stratigraphic information is contained in the drill logs of these holes.

4.5 Oil Exploration

Two oil exploration holes were drilled by C.G. Selzburger in the Bracknell area and at Hagley. These holes penetrated 670 and 792.5m of Tertiary sediments respectively before intersecting Jurassic dolerite. No oil bearing zones were intersected.

4.6 Regional Geophysical Surveys

A regional gravity survey of the Launceston Basin was conducted by the Tasmanian Department of Mines. (Longman and Leaman, 1971). Resistivity surveys have been performed by the Tasmanian Department of Mines staff in various sections of the Launceston Basin.

4.7 Uranium Exploration

Getty Oil Development Company Ltd., carried out a 122 hole rotary chip drilling programme in 1972-73 aimed at locating uranium mineralization associated with redox interfaces within the sediments of the Launceston Basin. In general, the sandy units of the Launceston Basin are in a reduced state. Gamma radiation anomalies were intersected in boreholes within the Cressy, Bracknell, Bishopsbourne and Toiberry areas. However, this was regarded as syngenetic uranium concentration by organic material, and/or relict weathered surfaces.

Their work downgraded the uranium potential of the area, but significant ligneous horizons including brown coal seams were intersected.

4.8 Exploration by CSR Limited

Previous exploration for oil shale by AAR Limited and brown coal by CSR Limited within EL 20/80 Launceston is discussed in Osborne (1981) and Ellis (1982a, b and c), respectively.

During 1981, AAR Limited conducted an exploration programme to investigate the occurrence of oil shale, primarily in the Carrick-Longford area. Their investigations showed that thin oil shales are present in the Tertiary sequence in the Carrick area and reach a maximum thickness of 10 metres, yielding 49 litres/tonne at zero moisture. AAR Limited intersected ligneous facies including brown coal of significant thickness in the Rosevale-Westwood area.

Two follow up exploration programmes have been conducted by CSR Limited. One in conjunction with AAR Limited in late 1981 to delineate the extent of brown coal and oil shale occurrences in the Rosevale-Westwood and Carrick-Longford areas respectively. The second programme, in early 1982, provided further information on deposit boundaries and seam correlations within the prospects outlined in the 1981 programme.

5. EVALUATION OF COAL POTENTIAL

5.1 Introduction

EL 20/80 has potential for small to medium sized deposits of black and brown coal.

Sections 5.2 and 5.4 discuss the black coal and brown coal potential respectively.

5.2 Evaluation of Parmeener Supergroup Black Coal Potential

Parmeener Supergroup strata crop out along the margins of the Tertiary Launceston Basin. These areas are shown in Figure 5 and the strata cropping out are summarised in Table 1.

TABLE 1

Areas Containing Outcropping Parmeener Supergroup Strata in EL 20/80

Area	Outcropping Parmeener Supergroup Strata
Birralee	Knocklofty sandstone, Clog Tom Sandstone, Bogan Gap Group, Liffey sandstone, Stockers Tillite
Bridgenorth-Glengarry	Knocklofty sandstone, Clog Tom sandstone, Bogan Gap Group, Liffey sandstone
Carrick Hadspen	Knocklofty sandstone
Reedy Marsh	Knocklofty sandstone, Bogan Gap Group, Liffey sandstone
Longford Coalfield	Fingal Coal Measures
Mt. Arnon	Jackey Formation and correlates, upper glacio-marine sequence
Hummocky Hills	Fingal Coal Measures, Knocklofty sandstone and equivalents

5.2.1 Birralee, Bridgenorth-Glengarry and Reedy Marsh Areas

These areas are not considered to be prospective for Parmeener Supergroup coal or oil shale.

Coal and oil shale seams are thin, and will occur at depths generally greater than 60m. Thin (30mm) coal seams are documented in the Liffey Sandstone (Mersey Coal Measure time equivalent), north of Birralee. Coal considered equivalent to the Cygnet Coal Measures was mined at Dilston, north of Launceston (Carey, 1949). Cygnet Coal Measures are not documented in EL 20/80. Thin oil shale seams are reported by Petro Quest Pty. Ltd., in the Mersey Coal Measures in the Reedy Marsh area, but outside the EL 20/80 boundary.

In areas of Parmeener Supergroup outcrop it may be possible to intersect Mersey Coal Measure, or time equivalent strata at depths less than 60m. However, in areas of no exposure due to dolerite capping or masking by Tertiary sediments depths to the Mersey Coal Measures will be greater than 60m, and could range up to 400m.

5.2.2 Longford Coalfield

The Triassic Fingal Coal Measures which crop out on the property Norwich, have been exposed by erosion of an overlying dolerite sill. The coal measures consist of feldspathic sandstones and intercalated shales. Exploratory drilling by CSR Limited has confirmed the existence of three coal seams, in rotary chip hole R030. Black coal was intersected at depths of 39.2, 71.6 and 74.3m. Seam thicknesses are 0.8, 1.1 and 0.4m respectively (Ellis, 1982a).

A coal seam outcrops in Jordans Creek near the Cressy Highway. The coal seams are thought to thin northwards and thicken downdip towards the south, (Hills and others, 1922).

The coal measures are truncated to the east by the Pateena Fault. Erosion of coal measures is indicated from drillhole data west of the Cressy Highway and south-west of Longford. Two diamond drillholes were drilled in 1886 on the property Belmont to depths of 210 and 272m, and CSR rotary hole R031 was drilled to a depth of 72m. The three holes failed to intersect Parmeener Supergroup strata (Matthews, in press; Ellis 1982a).

The extent of coal measure sediments south of the norwich coal field is uncertain.

Four contract water bores CW1 to CW4 drilled immediately south of CSR rotary drillhole R030 intersected Jurassic dolerite at depths of 5 to 24m below Tertiary sediments (Matthews 1974).

It is not known whether coal measure strata underly the dolerite. Longman and Leaman (1971) consider that the coal measures overly the dolerite.

Getty Oil Uranium prospecting holes V1, V2 and V5 intersected Parmeener Supergroup strata of probable Triassic age at depths of 95, 95 and 55m respectively (Middleton 1973). Two contract water bores, CW5 and CW6, drilled adjacent to the Cressy Highway, and north of the Longford coal field, failed to intersect coal measures. Contract water bore CW3 was stopped at 30m in dolerite and CW6 intersected dolerite at 31m below Tertiary strata.

Coal seams of the Longford coal field are not amenable to open cut mining methods, due to thickness of overburden, thinness of seams, and dolerite overburden.

The coal is oxidized near the surface. It is not considered by Hills and others (1922) to be suitable for steam generation due to it's high ash and total moisture content. It has been reported by local farmers that spontaneous combustion of the coal has occurred since closure of the Pateena mine.

Hills and others (1922) quote indicated reserves of 900,000 tonnes and large inferred reserves for the Longford coal field. The subsurface extent of the Fingal Coal Measures is not fully known. A conservative estimate of their extent is approximately 3.5km^2, and it is assumed that coal measure strata will be encountered below dolerite in contract water bores CW1 to CW6 inclusive.

The maximum expected coal resource of the area, assuming a cumulative coal thickness of 1.9m throughout is less than 10Mt.

5.2.3 Mt. Arnon Area

An outlier of Upper Permian strata surrounded by dolerite and considered by Matthews (1974) to contain the upper freshwater sequence of the Jackey Formation and correlatives crops out in the Mt. Arnon area. The extent of the Jackey Formation and presence of coal seams is not documented.

The stratigraphically lower glacio-marine Poatina and Bogan Gap Group sediments are also recorded in outcrop.

This area has very low potential for a coal resource. Coal seams of the Cygnet Coal Measures are invariably thin, and the Upper Permian strata are probably not continuous below the dolerite.

Longman and Leaman (1971) consider that the Mt. Arnon area is the site of a dolerite feeder pipe, which branches out laterally into a sheet like body, 305 - 437m thick that underlies the upper Permian Strata.

5.2.4 Hummocky Hills

Triassic sediments of equivalent age to the Fingal Coal Measures, and the lower Triassic Knocklofty or Ross Sandstone outcrop in the Hummocky Hills area. The Triassic sediments are intruded and hornfelsed by two Jurassic dolerite sills, which have a total exposed thickness of 305m. The total thickness of the Upper Triassic in this area is not known.

Thin coal seams are logged in Getty Oil exploration hole 07. Coal will probably be semi-anthracitic, due to dolerite intrusions. Coal quality is expected to be similar to other Triassic coal in Tasmania. For discussion purposes the Hummocky Hills area has been divided into 4 sub-areas, (Figure 5).

The four sub-areas are numbered in order of decreasing prospectivity. Sub-area 1 may contain coal reserves amenable to open cut mining methods. Sub-areas 2, 3 and 4 may contain coal resources amenable to underground mining methods. Sub-area 2 is ranked ahead of sub-area 3 primarily on the basis of geotechnical parameters such as proximity to rivers and stability of overlying strata.

Sub-Area 1

This area covers approximately 16km^2. It is the most prospective sub-area for coal possibly amenable to open cut mining methods in the Hummocky Hills region. The relationship between Triassic sediments and Jurassic dolerite in this area is uncertain. It is assumed that the dolerite overlies the sediments, and has subsequently been eroded. The maximum expected coal resource of this area assuming a seam thickness of 1m is less than 20Mt.

Sub-Area 2

This area includes the main Hummocky Hill and covers approximately 40Km^2. Complexly intruded Triassic sediments outcrop approximately 300 metres above sea level close to the top of Hummocky Hill. The sediments are hornfelsed and underlain and overlain by dolerite sills. These sediments are not considered prospective for coal, although they may contain graphite.

Triassic sediments outcropping in Area 1 may be continuous below the dolerite in Area 2. This area is not considered prospective for open cut mining because dolerite and hornfels overburden is greater than 300m thick.

The maximum expected coal resource of this area assuming a seam thickness of 1m is less than 50Mt.

Up to 4Mt of graphite may be present. This assumes a seam 1m thick covering an area of 4km^2.

Sub-Area 3

This area of approximately 15km^2 is situated east of Cressy. Logs of Getty Oil uranium prospecting holes and Department of Mines ground water investigation holes were used to delineate this area below Tertiary sediments.

41.6m of Triassic strata including thin coal seams have been intersected below dolerite in Getty Oil exploration hole 07. Department of Mines ground water investigation holes 1 and 6 intersected Triassic strata overlying dolerite. The relative stratigraphic positions of the dolerite and Triassic sediments are uncertain.

Shallow intersections of Triassic coal measures may possibly occur below dolerite in this area. However, the dolerite thickness could be up to 300m.

The maximum expected coal resource of this area, assuming a seam thickness of 1m is less than 20Mt.

Sub-Area 4

This area is situated on the property "Stone Quarry", and covers approximately 6km^2. Minor exposures of Triassic strata and dolerite crop out in this area. Tertiary sediments are the dominant rock type.

Depth to coal seams, if present, is unknown. This area is considered to have potential for coal amenable to underground mining methods.

The maximum expected coal resource of this area, assuming a seam thickness of 1m, is less than 10Mt.

5.3 Tertiary Brown Coal Deposits

Three brown coal deposits, Loatta, Pipers Lagoons and Selbourne Deposits, have been delineated in the Rosevale, Westwood and Selbourne areas of EL 20/80 Launceston, Figure 6.

Exploratory drilling to date has identified 118 million tonnes (in situ) of indicated Class I and Class II brown coal reserves and small inferred reserves. The coal occurs in up to 9 brown coal seams ranging in thickness from 1.5 to 8.5m and at depths generally less than 60m. Substantial reserves of brown coal occur at depths from 10 to 30m. The reserves of the three deposits are shown in Table 2.

Analyses of core samples show the coal to be a moderately high ash, low sulphur brown coal. The average in situ quality of the brown coal reserves of the Loatta, Pipers Lagoon and Selbourne Deposits is presented in Table 2.

TABLE 2

EL 20/80 LAUNCESTON

WEIGHTED AVERAGE IN SITU COAL RESERVES

(Indicated Class I & II)

AND COAL QUALITY OF INDIVIDUAL DEPOSITS

Deposit	Relative Density gm/cc	Total Moisture %	Volatile Matter %	Ash %	Fixed Carbon %	Specific Energy MJ/kg	Total Sulphur %	Indicated Reserves Tonnes 10^6
Loatta	1.32	48.1	18.0	21.8	12.1	7.6	0.17	56
Pipers Lagoon	1.33	46.3	18.0	21.9	13.8	7.6	0.11	43
Selbourne	1.33	46.4	18.0	23.7	11.9	7.2	0.18	19
TOTAL/AVERAGE	1.33	47.2	18.0	22.1	12.7	7.5	0.15	118

5.4 Evaluation of Tertiary Brown Coal Potential

Within EL 20.80 Launceston six areas outside the deposits outlined in section 5.3 have Tertiary brown coal potential. The areas are the Hillcrest Prospect, Carrick, Rufus Lagoons, Breadalbane, Henrietta Plains and Vaucluse Reservoir, (Figure 5).

The coal quality of these areas is expected to be similar to coal of the Loatta, Pipers Lagoon and Selbourne Deposits.

5.4.1 Hillcrest Prospect

The Hillcrest Prospect lies to the east and north of the Selbourne Deposit. Small inferred and potential brown coal reserves have been defined in the Hillcrest Prospect. Two brown coal seams ranging in thickness from 1.5 to 2m thick occur at depths between 15.4 and 51m. Less than 40Mt of inferred and potential brown coal reserves may occur in this area.

5.4.2 Carrick Area

AAR cored hole C034 intersected 2.7m of highly interbanded inferior lignite, east of Carrick.

An area containing less than 20Mt of potential brown coal reserves is delineated, extending northwards from C034. An approximate facies map can be drawn from available borehole data. A positive correlation between the facies distribution of the Carrick area and Loatta and Pipers Lagoons Deposits was obtained. From this, it was postulated that a brown coal deposit may parallel the margin of the Launceston Basin.

5.4.3 Breadalbane-St. Leonards Area

The Breadalbane-St. Leonards area is bisected by the Glen Dhu Fault with the downthrown side to the east. (Refer to Figure 5).

A schematic cross section of the area shows the stratigraphic relationships of the potential coal areas occurring on either side of the Glen Dhu Fault, (Figure 7). Brown coal seams occur near the base of the Tertiary succession, and in places unconformably overly pre-Tertiary basement.

SCHEMATIC SW–NE CROSS SECTION OF THE BREADALBANE – ST. LEONARDS AREA

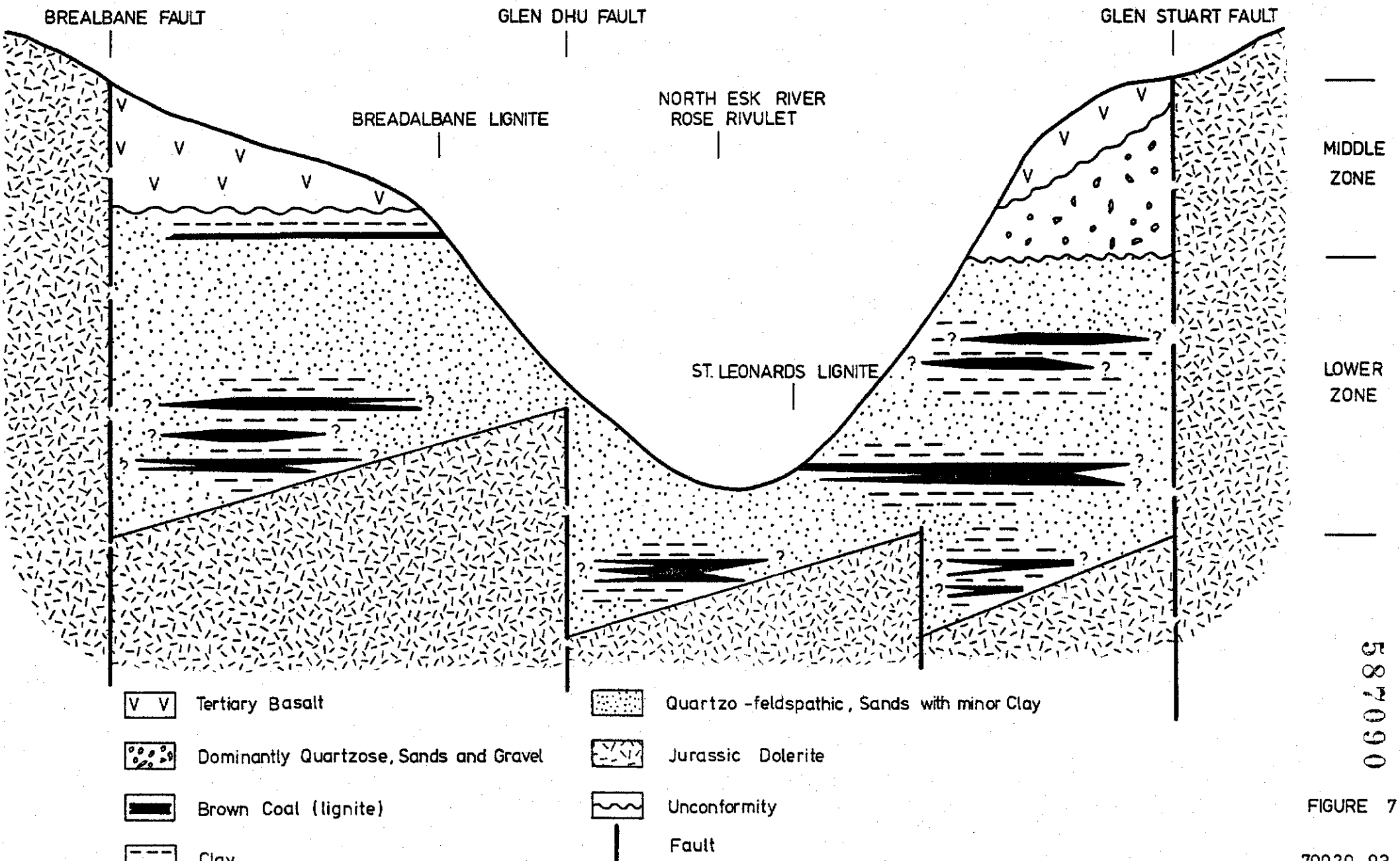


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FIGURE 7

70020-93

The thickest brown coal seams will be found close to the pre-Tertiary basement highs which are located near faults. Seams will thin and split with distance away from basement highs. In general more seams will be present in the deeper parts of the basin. Conceptual models of brown coal formation are discussed in Ellis (1982b).

Brown coal in the Breadalbane-St. Leonards area is interbedded with quartzo-feldspathic sands. The grain size of coal measure sediments in this area is coarser than the grain size of coal measure strata of the Loatta and Pipers Lagoons areas. This may indicate a dominantly fluviatile environment for the Breadalbane-St. Leonards area. Frequent lateral facies changes are to be expected, consequently laterally impersistent coal seams will be prevalent.

Brown coal has been recorded in the Breadalbane-St. Leonards area from the following locations:- (Refer Figure 3).

i) A 3m thick seam of brown coal is exposed on a bank of the North Esk River near St. Leonards. An adit was dug in to the seam to exploit the brown coal resource.

ii) A seam of lignite, 1 to 1.5m thick is exposed in a railway cutting north of the Launceston Airport.

iii) Woody plant material is recorded in outcrop in a bank of the North Esk River near the bridge at Relbia.

iv) Tasmanian Department of Mines water investigation borehole 51, situated 3km east of the Launceston Airport. 3m of wood fragments was intersected at 19.8m. Further zones of woody material, sometimes clayey and sandy, up to 10m thick, occur at 152m.

v) A contract water bore situated 1km east of Evandale intersected a 2.6m thick coal seam. The coal is assumed to be of Tertiary age.

Carbonaceous material has been recorded in the following locations:-

i) Ligneous clay outcrops in a creek bank near the property "Talisker";

ii) Getty Oil uranium prospecting hole W1 intersected carbonaceous clay;

iii) Tasmanian Department of Mines water investigation boreholes 50 and 46 intersected ligneous and carbonaceous clays and woody material.

Three potential coal areas have been delineated (Figure 5) and are discussed separately.

Sub-Area 1

This area occurs on the western side of the Glen Dhu Fault. It covers approximately 6km^2, and is adjacent to the Launceston Airport. Based on a single coal seam 1 to 1.5m thick it's potential coal resource is less than 10Mt.

The maximum expected overburden thickness in this area is 60m, however, this includes up to 50m of basalt.

It is expected that stratigraphically lower brown coal seams will be present in deeper sections of the basin, near the Breadalbane Fault.

Sub-Area 2

This area of approximately 4km^2 occurs on the eastern side of the Glen Dhu Fault, north-east of Relbia. Based on a single coal seam 3m thick the resource potential of this area is less than 15Mt.

Thickness of overburden ranges up to 60m, but is most commonly less than 30m. Tertiary basalt overlies the western margin of the deposit.

The North Esk River flows through this area. The effects of erosion upon distribution of brown coal is unknown. It is expected that some brown coal has been eroded.

Sub-Area 3

This area covers approximately 12km^2. It occurs on the eastern side of the Glen Dhu Fault. The potential coal resource is less than 40Mt based on a single coal seam 3m thick.

Sand and bouldery overburden generally less than 60m thick but ranging up to 80m occurs.

The Rose Rivulet bisects the potential deposit and has created a steep sided valley. Overburden thickness increases towards the eastern and western margins of the area.

5.4.4 Vaucluse Reservoir and Henrietta Plains Areas

These two potential coal areas are located in the south-east of the Launceston Basin, east of the Hummocky Hills.

Borehole data in this area of the Launceston Basin is form Getty Oil uranium exploration holes, and Tasmanian Department of Mines ground water investigation holes.

The Tertiary sediments of this area of the Launceston Basin are dominated by sands and gravels. Lower energy environments are represented by carbonaceous silts and clays which contain much wood and peaty material. Thin coal seams may occur within these horizons. Carbonaceous horizons are commonly highly interbanded, and coal seams can not be correlated using existing borehole data. Coal seams are typically laterally impersistent and of limited aerial extent.

5.4.4.1 Vaucluse Reservior

Carbonaceous clay, silt and sand horizons 1.5 to 6.1m thick and containing 40 to 70% wood and peat material were intersected in uranium holes B6, C1, C2, and C12 at depths ranging from 9.8 to 79.2m. A summary of carbonaceous horizons intersected in this area is included as Table 3 in Appendix 1.

Uranium exploration holes C3 to C11 inclusive failed to penetrate Tertiary basalt. The presence of coal seams below the basalt has been postulated.

This area has potential for thin coal seams occurring at depths of 20 to 30m close to the basin margins and greater than 70m towards the basin axis. This area has potential for less than 40Mt of brown coal, when based on an area of approximately 12km^2 and a single brown coal seam thickness of 1.5 to 3m.

5.4.4.2 Henrietta Plains

Carbonaceous clay, silt and sand horizons 1.5 to 51.8m thick and containing 10 to 50% wood and peat material, occur at depths of 12 to 51.8m in the Henrietta Plains area. Peaty seams 1.5 to 3m thick, containing 90 - 100% peaty and woody material were intersected at depths between 32 and 51.8m. A summary of carbonaceous horizons intersected in this area is included as Table 4 in Appendix 2.

The Henrietta Plains area has potential for thin shallow coal seams occurring in up to 3 isolated sub-areas of each approximately 6km^2. Sub-area 1 has a coal potential of less than 20Mt. Sub-area 1 has a coal potential of less than 10Mt. Sub area 3 is the least prospective of the Henrietta Plains.

5.4.5 Rufus Lagoons Area

The Rufus Lagoons Area is situated within the triangle formed between the towns of Carrick, Longford and Bishopsborne.

Getty Oil, the Tasmanian Department of Mines and AAR exploration boreholes have intersected significant carbonaceous horizons in the Rufus Lagoons Area.

Downhole gamma, self potential and resistivity logs are available from some of the Getty Oil and all AAR boreholes. In many cases lithological boundaries on the geophysical logs and lithological logs did not correspond. The lithological logs and geophysical logs have been reinterpreted, and a summary of coal intersections is presented as Appendix 3.

Pre-Tertiary basement outcrops near Carrick parallel with the Carrick-Longford Road. A basement high which was intersected in CSR rotary chip hole R027 subdivides the area into two coal forming sub-areas. (Figure 5).

Residual Bouger Anomalies indicate that pre-Tertiary basement in this area has a flat plateau like morphology, with a palaeoslope to the south (Longman and Leaman, 1971). The predominant sedimentary environment was probably a series of deltaic swamps with a southwesterly palaeodrainage pattern.

The distribution of coal sems in these two potential coal areas is similar to coal seam distribution within the Loatta, Pipers Lagoon and Selbourne Deposits, refer to Ellis (1982c).

Brown coal seams range in thickness up to 6.7m but are usually less than 2m thick and typically interbanded with clay. Coal seams are laterally impersistent and generally occur at depths greater than 60m, but shallower intersections occur. (Figure 8).

The main geotechnical problems in the Rufus Lagoons area (as with the entire Tertiary sequence) are slope instability and a high groundwater table. Several lagoons fed by natural springs occur in this area.

Sub-Area 1

At least four brown coal horizons occur in this area. The shallowest coal intersected was at 39.6m depth. All other coal intersections were at a depth exceeding 60m.

Inferred in situ reserves of less than 60Mt have been calculated for this area, Table 5 Appendix 4).

Sub-Area 2

Getty Uranium boreholes V1 - V14 were drilled between Carrick and Longford parallel to pre-Tertiary basement highs. Cross section V12 - V1 (Figure 8) shows 3 troughs separated by basement highs.

Shallow brown coal was intersected at depths between 10 and 60 metres close to basement highs. Most coal seams were intersected at depths ranging from 60 to 140m. Coal seam thickness ranges up to 3.2m, but is frequently less than 2m.

AAR boreholes, R050, R051, R054, and R058 were drilled to depths of approximately 60m in Tertiary sediments. Coal was not intersected in these holes. It is envisaged that brown coal will be intersected at depths greater than 60m.

Detailed reserve calculations were not attempted due to the lensoidal nature of coal seams. However, the brown coal potential of this area is estimated as less than 60Mt, being similar to Sub Area 1.

6. RANKING OF POTENTIAL COAL AREAS WITHIN EL 20/80

6.1 Introduction

The potential coal resource areas within EL 20/80, other than the Loatta, Pipers Lagoon and Selbourne coal deposits, have been tentatively ranked according to their prospectivity. Due to the limited data available for each area, a number of assumptions regarding potential coal reserves, depth to coal, and coal quality have been made. The ranking process has enabled a better definition of areas suitable for relinquishment.

Two tables have been prepared which show the relative prospectivity of each resource area based on ranking according to selected criteria. Table 6 shows the ranking of the areas according to the criteria outlined in Section 6.2, while Table 7 shows a "best fit" indicative ranking.

6.2 Criteria Used to Rank the Potential Coal Areeas

1. Areas in which coal seams are known to occur are ranked higher than areas which contain no known coal seams.

2. Reserve Classification

   Potential coal areas that contain indicated and/or inferred coal resources are ranked higher than areas containing potential coal reserves.

3. In Situ Reserves

   In situ black coal reserves were compared with brown coal reserves on an energy per tonne basis. The specific energy of typical Tasmanian black coal is approximately 3 times more than that of typical Tasmanian brown coal. The tonnage of all potential black coal areas was multiplied by 3 for direct comparison with tonnages of brown coal.

4. Depth to Coal

   Coal occurring at depths less than 60m was ranked higher than coal occurring at depths greater than 60m. Where coal occurred at depths ranging from say 20 to 120m, the average depth to the coal throughout the potential deposit was used.

Criteria 1 to 3 inclusive carry a greater weighting than do cirteria 4 to 7 inclusive. Criteria 1 to 3 are written in order of descending weighting factor.

Criteria 4 to 7 inclusive have an equal weighting factor.

5. Location Problems

Potential coal areas that did not underly towns, cities, airports, railway lines, major roads, and other significant cultural features were ranked higher than coal areas that were located close to or beneath significant cultural features.

6. Geotechnical Parameters

Aspects such as highwall slope stability, stream diversion, groundwater table, overburden rock types were considered. All potential coal areas had at least two geotechnical problems. Those with more than two geotechnical problems were ranked lower than those potential coal areas with two problems.

7. Potential coal areas amenable to underground mining methods.

TABLE 6

RANKING OF POTENTIAL COAL AREAS USING CRITERIA ESTABLISHED IN SECTION 6.2

Coal Area	Sub-Area	Reserve Classification	Coal Measures	Potential In Situ Reserve Mt.	Ranking of Coal Area	
Longford		Indicated and Inferred	Fingal	10	1	Further exploratory drilling warranted to determine extent of Triassic coal measures.
Hillcrest Prospect		Inferred and Potential	Tertiary	40	=2	Exploratory drilling is planned for next exploration programme.
Rufus Lagoons	1	Inferred	Tertiary	60	=2	Further exploratory drilling and geophysical logging is required to estimate coal quality of this area.
Carrick		Potential	Tertiary	20	=3	Further exploratory drilling along the margins of the Launceston Basin required.
Henrietta Plains	1	Potential	Tertiary	20	=3	Exploratory drilling and geophysical logging required to estimate the coal quality of this area.
Rufus Lagoons	2	Potential	Tertiary	60	=4	As for Rufus Lagoons Sub Area 1.
Breadalbane	2	Potential	Tertiary	15	=4	Exploratory drilling required to delineate reserves. A stratigraphic hole situated on the downthrown side of a fault is warranted.
Breadalbane	3	Potential	Tertiary	40	=4	Exploratory drilling required to delineate reserves. A stratigraphic hole situated on the downthrown side of a fault is warranted.
Hummocky Hills	3	Potential	Fingal	20	=4	Exploratory drilling only warranted if coal is intersected in sub-area 1.
Henrietta Plains	2	Potential	Tertiary	10	=4	As for Henrietta Plains Sub Area 1.
Vaucluse Reservoir		Potential	Tertiary	40	=4	As for Henrietta Plains sub-area 1.
Breadalbane	1	Potential	Tertiary	10	5	As for Breadalbane sub-areas 2 and 3.
Hummocky Hills	1	Potential	Fingal	20	6	Exploratory drilling required to determine if black coal seams occur in the coal measures.
Hummocky Hills	2	Potential	Fingal	50	=7	As for Hummocky Hills Sub Area 3.
Henrietta Plains	3	Potential	Tertiary	10	=7	As for Henrietta Plains Sub Area 1.
Hummocky Hills	4	Potential	Fingal	10	8	Exploratory drilling not recommended.
Mt. Arnon		Potential	Cygnet	NC	=9	Exploratory drilling not recommended.
Birralee, Bridgenorth-Glengarry, Reedy Marsh		Potential	Mersey	NC	=9	Exploratory Drilling not recommended.

TABLE 7

INTUITIVE RANKING OF POTENTIAL COAL AREAS

Coal Area	Sub-Area	Reserve Classification	Coal Measures	Potential In Situ Reserve Mt.	Ranking of Coal Area
Selbourne		Inferred and Potential	Tertiary	40	1
Longford		Indicated and Inferred	Fingal	10	2
Breadalbane	3	Potential	Tertiary	40	=3
Breadalbane	1	Potential	Tertiary	10	=3
Carrick		Potential	Tertiary	20	=3
Vaucluse Reservoir		Potential	Tertiary	40	=4
Rufus Lagoons	1	Inferred	Tertiary	60	=4
Henrietta Plains	1	Potential	Tertiary	20	=5
Henrietta Plains	2	Potential	Tertiary	10	=5
Breadalbane	2	Potential	Tertiary	15	=6
Rufus Lagoons	2	Potential	Tertiary	60	=6
Henrietta Plains	3	Potential	Tertiary	10	7
Hummocky Hills	1	Potential	Fingal	20	8
Hummocky Hills	2	Potential	Fingal	50	9
Hummocky Hills	3	Potential	Fingal	20	9
Hummocky Hills	4	Potential	Fingal	10	11
Mt. Arnon		Potential	Cygnet	NC*	11
Birralee, Bridgenorth-Glengarry, Reedy Marsh		Potential	Mersey	NC*	12

* NC Reserves not estimated.

7. RELINQUISHMENT OF NON PROSPECTIVE COAL AREAS

The conditions governing exploration licences in Tasmania have recently been revised. The changes are effective from 1st July, 1982, and include a scale of increasing annual expenditure commitment and rental fees, and a requirement to reduce the area of exploration licences. The revised conditions governing exploration licences are included as Appendix 5.

EL 20/80 covers an area of 2,339km^2 and expires on 22nd February, 1983. The budget for EL 20/80 during YEM 83 is currently $200,000. A similar budget is expected to be granted for YEM 84.

The total expenditure to retain EL 20/80 in its present configuration during YEM 84 will be in excess of $485,000. The figure is derived from a minimum expenditure commitment of $467,800 ($200 per km^2), and an annual rental fee of $17,542.50 ($7.50 per km^2).

To keep within an anticipated YEM 84 budget of $200,000 the area of EL 20/80 must be reduced. The non prospective coal areas of EL 20/80 which cover 1,385km^2, have been delineated (areas numbered 1 to 8 inclusive, Figure 9), and can be relinquished with no further exploratory drilling.

By relinquishing the non prospective coal areas the area retained would cover 954km^2 and incur a total annual expenditure less than $200,000. This figure includes a minimum expenditure commitment of $190,800 and an annual rental fee of $7,155.00.

The non prospective coal areas of EL 20/80 which have been outlined for relinquishment include the Launceston, Bridgenorth, Birralee, Baloraine, Cressy and Campbell Town districts. These areas are mainly located along the northern, western and southern boundaries of the EL. Two minor areas occur (numbered 7 and 8) along the eastern boundary, and lie outside the Tertiary coal basin.

The Launceston District (area 1) includes the City of Launceston which is a populous residential and industrial area. Jurassic dolerite up to 300m thick outcrops throughout most of the district. The prospective coal aeas are of Tertiary age. They are generally located close to built up areas, and close to the Tamar River.

The Bridgenorth-Birralee District (area 2) is located north and west of the Loatta, Pipers Lagoons and Selbourne coal deposits. Most of the area outlined to be relinquished lie outside the Tertiary coal basin, while the remainder is non-prospective Tertiary strata.

The Deloraine District (area 3) is located west of Westbury. Intersections of brown coal are unlikely. Tertiary basalt generally overlies detritus derived from the Great Western Teirs.

The area outlined for relinquishment in the Cressy District (area 4) is situated southwest of the Western Line Railway between the towns of Westbury and Cressy. Numerous exploration holes have been drilled in this area. Coal was rarely intersected during exploration drilling, and when present occurs at depths greater than 60m.

The Campbell Town District (areas 5 and 6), is situated south and west of the Hummocky Hills. Jurassic dolerite, Triassic sediments and Tertiary bassalt outcrop throughout most of this area. Exploratory drill holes sited in areas of Tertiary sediments have failed to intersect brown coal or carbonaceous horizons.

8. CONCLUSIONS AND RECOMMENDATIONS

The Loatta, Pipers Lagoons and Selbourne brown coal deposits containing 118Mt in situ brown coal have been delineated north of Westbury. Six areas with brown coal potential, and two areas with black coal potential have been outlined within the EL.

Potential brown and black coal deposits will be small, with highly interbanded, moderately high ash, thin, laterally impersistent coal seams. Individual coal deposits will rarely exceed 50Mt. Potential brown coal deposits will be similar to the Loatta, Pipers Lagoons and Selbourne Deposits. Potential black coal deposits are thought to be similar to Fingal Valley coal deposits, which are commonly structurally complex.

A budget in excess of $485,000 will be required during YEM 84 to retain EL 20/80 in its present configuration.

An area of at least 1,385Km^2 must be relinquished to reduce expenditure below $200,000.

The non prospective coal areas of EL 20/80 have been delineated. These areas cover 1,385km^2, and can be relinquished with no further exploratory drilling. It is recommended that these areas be relinquished, (Figure 9).

The total area of EL 20/80 following relinquishment of 1,385km^2 would be 954km^2. This area would include the Loatta, Pipers Lagoons and Selbourne coal deposits and the most prospective potential coal areas.

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APPENDIX I

Summary of Carbonaceous Horizons in the Vaucluse Reservoir Area.

APPENDIX I

TABLE 3

SUMMARY OF CARBONACEOUS HORIZONS
IN THE VAUCLUSE RESERVOIR AREA

Borehole	Depth	Thickness	Lithology	Secondary Lithology
B6	42.7	3.0	Carbonaceous Sandy Silt	Wood 40-50%
	70.1	3.0	Carbonaceous Sandy Silt	Wood 40%
	76.2	3.0	Peat 60%	Carbonaceous Sandy Silt
	79.2	6.1	Carbonaceous Sandy Silt	Peat 40%
C1	19.8	1.3	Peat 60-70%	Silty Carbonaceous Clay
C2	42.7	1.3	Carbonaceous Silt	Peat 30-40%
	45.7	1.3	Peat 60-70%	Silty Carbonaceous Clay
	50.3	1.5	Peat 70%	Silty Carbonaceous Clay
C12	29.6	3.0	Peat 70-80%	Clay

APPENDIX 2

Summary of Carbonaceous Horizons in the Henrietta Plains Area.

APPENDIX 2

TABLE 4

SUMMARY OF CARBONACEOUS HORIZONS
IN THE HENRIETTA PLAINS AREA

Borehole	Depth	Thickness	Lithology	Secondary Lithology
J1	12.2	39.6	Silty Sands	Bands - Carbonaceous Clay
H5	25.9	1.5	Carbonaceous Silty	Peat 20-30%
"		1.5	Sand	
"	29.0	1.5	Sand	Peat 20-30% Wood 5-8%
"	30.5	1.5	Sand	Peat 40-50%
"	32.0	1.5	Sand	Peat 30-40%
"	33.5	1.5	Sand	Peat 10-20%
"	51.8	3	Peat 90-100%	Carbonaceous Silty Sand
H6	9.1	51.8	Carbonaceous Silty Sand	Peat 25%
F1	24.4	6.1	Carbonaceous Sandy Silt	Bands of Peat
F4	32.0	1.5	Peat 60%	Wood 40%
	65.5	16.8	Sandy Carbonaceous Silt	Peat and Wood Rich Bands 10-30%
F5	32.0	1.5	Sand Carbonaceous	Peat 20-50%
F6	21.3	4.0	Silty Carbonaceous Clay	Wood 40%
	35.1	1.5	Sandy Silt	Peat and Wood 30%
F7	16.8	7.6	Silty Carbonaceous Clay	Peat and Wood 30%
	24.4	1.5	Peat and Wood 60%	Silty Carbonaceous Clay
64	39.6	9.1	Clayey Sand	Wood fragments

APPENDIX 3

RUFUS LAGOONS AREA

Summary of carbonaceous and ligneous horizons intersected during exploratory drilling by:-

1. Getty Oil Development Company

2. Tasmanian Department of Mines

3. AAR Limited

NOTE TO APPENDIX 3

The summary of carbonaceous and ligneous horizons has been compiled from downhole geophysical and lithological logs.

Gamma, spontaneous potential, and resistivity logs are available from most AAR and Getty Oil Development Comapny exploration holes. When available, the geophysical logs have been interpreted to procide a more detailed estimate of coal quality and thickness, than the lithological logs.

If geophysical logs are unavailable then depths, thicknesses, and lithology are quoted per the lithological log.

GETTY OIL DEVELOPMENT COMPANY BOREHOLE S12

Geophysical Log Available

Depth	Thickness	Lithological Description
89.0		Clay, silty
89.3	0.3	
90.2	0.9	Clay, silty interbanded ligneous clay 60:40
90.8	0.6	Inferior lignite
91.7	0.9	Clay, silty
92.4	0.7	Inferior lignite
95.1	2.7	Inferior lignite, interbedded ligneous clay 80:20

GETTY OIL DEVELOPMENT COMPANY BOREHOLE S13

Geophysical Log Available

Depth	Thickness	Lithological Description
83.2		Clay, sandy
84.0	0.8	Inferior lignite
84.6	0.6	Ligneous clay
85.5	0.9	Inferior lignite, bands ligneous clay
86.6	1.1	Inferior lignite
87.5	0.9	Ligneous clay
89.6	2.1	Inferior lignite, interbanded ligneous clay 70:30
92.0	2.4	Clay, carbonaceous
92.5	0.5	Inferior lignite
95.4	2.9	Ligneous clay, interbanded inferior lignite 60:40
95.9	0.5	Ligneous clay
97.2	1.3	Inferior lignite, bands ligneous clay
99.5	2.3	Lignite
100.6	1.1	Clay, carbonaceous
101.0	0.4	Siderite
102.1	1.1	Inferior lignite
113.4		
115.5	2.1	Lignite
116.7	1.2	Ligneous clay
119.0	2.3	Inferior lignite, interbanded ligneous clay 80:20
120.1	1.1	Lignite
121.0	0.9	Ligneous clay
121.9	0.9	Inferior lignite
123.4	1.5	Clay, carbonaceous, silty
124.1	0.7	Siderite
124.8	0.7	Clay, carbonaceous, silty
125.1	0.3	Inferior lignite

BOREHOLE S13 (cont.)

Depth	Thickness	Lithological Description
127.3	2.2	Clay
130.5	3.2	Clay, carbonaceous, silty, bands ligneous clay and inferior lignite
133.0	2.5	Ligneous clay, interbanded clay, carbonaceous silty 60:40
134.1	1.1	Lignite
135.6	1.5	Ligneous clay, interbanded inferior lignite 70:30
137.2	1.6	Clay
137.8	0.6	Inferior lignite

GETTY OIL DEVELOPMENT COMPANY BOREHOLE S14

Geophysical Log Available

Depth	Thickness	Lithological Description
61.0	2.2	Ligneous clay
62.2	1.2	Lignite, bands ligneous clay
63.7	1.5	Lignite
64.6	0.9	Ligneous clay
65.8	1.2	Inferior lignite
72.2	6.4	Clay, carbonaceous, silty, interbanded ligneous clay 60:40
75.3	3.1	Ligneous clay, interbanded clay, carbonaceous silty 60:40
76.8	1.5	Inferior lignite, interbanded ligneous clay 60:40
77.7	0.9	Clay, carbonaceous silty
80.5	2.8	Ligneous clay, interbanded clay, carbonaceous silty 70:30
83.2	2.7	Lignite
84.1	0.9	Ligneous clay
87.5	3.4	Inferior lignite
91.4	3.9	Clay, carbonaceous silty
92.0	0.6	Siderite
97.5	5.5	Not recorded
98.8	1.3	Inferior lignite
104.2	5.4	Inferior lignite, interbanded ligneous clay 90:10
105.8	1.6	Clay
108.2	2.4	Inferior lignite
111.6	34.	Clay, carbonaceous
113.1	1.5	Ligneous clay
114.0	0.9	Clay
114.6	0.6	Inferior Lignite

BOREHOLE S14 (cont)

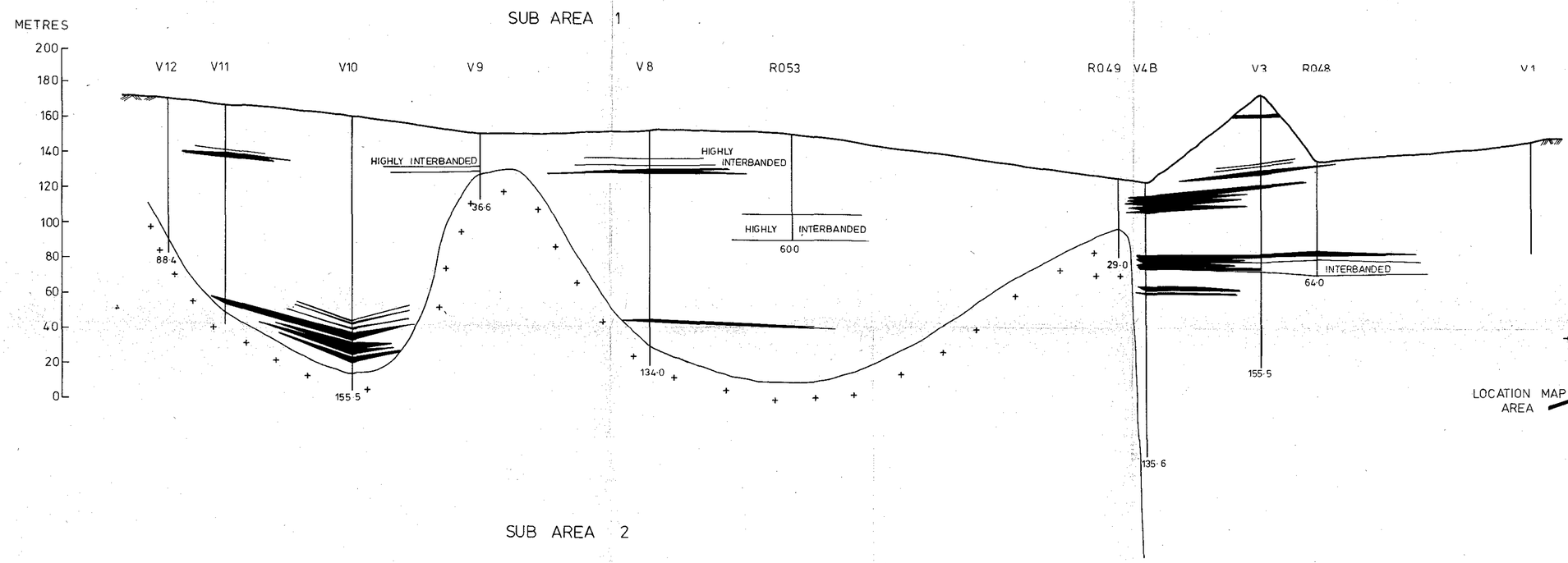
Depth	Thickness	Lithological Description
117.7	3.1	Clay, carbonaceous
120.7	3.0	Inferior lignite, interbanded ligneous clay 90:10
121.2	0.3	Clay
122.0	0.8	Inferior lignite
123.6	1.6	Clay, carbonaceous
124.4	0.8	Inferior lignite
125.4	1.0	Ligneous Clay
126.2	0.8	Inferior lignite
127.7	1.5	Clay, carbonaceous, bands ligneous clay
128.3	0.6	Inferior lignite
130.1	1.8	Ligneous clay, interbanded clay, carbonaceous 70:30
130.5	0.4	Clay
131.4	0.9	Clay, carbonaceous
133.0	0.6	Inferior Lignite

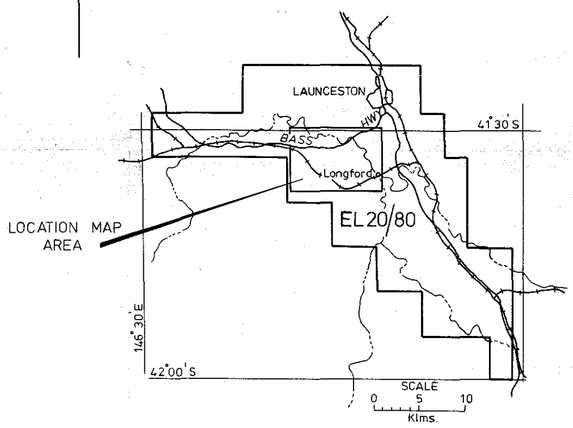
GETTY OIL DEVELOPMENT COMPANY BOREHOLE S15

Geophysical Log Available

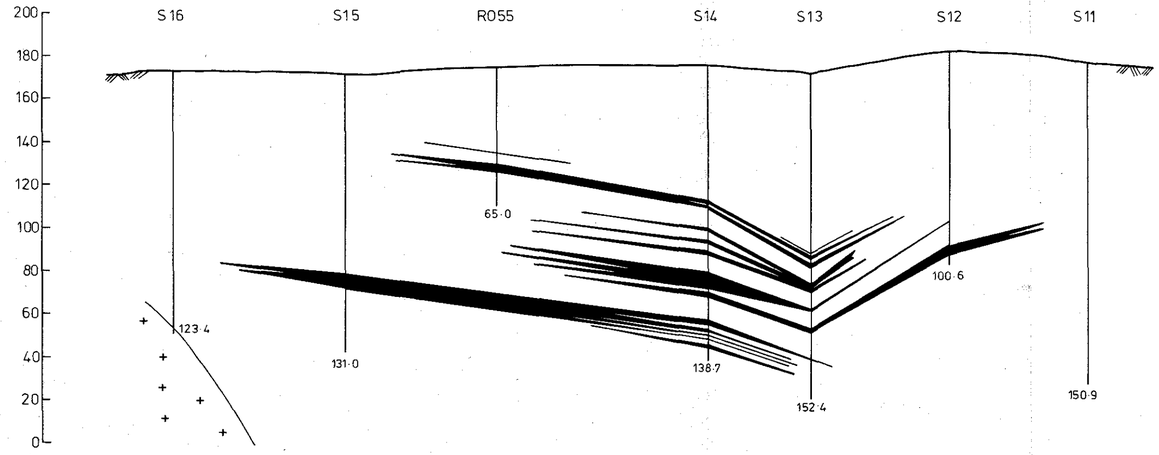
Depth	Thickness	Lithological Description
89.9	11.9	Ligneous clay, interbanded clay carbonaceous 50:50
90.7	0.8	Inferior lignite
92.2	1.5	Ligneous clay, interbanded inferior lignite 60:40
98.3	6.1	Lignite

SUB AREA 1



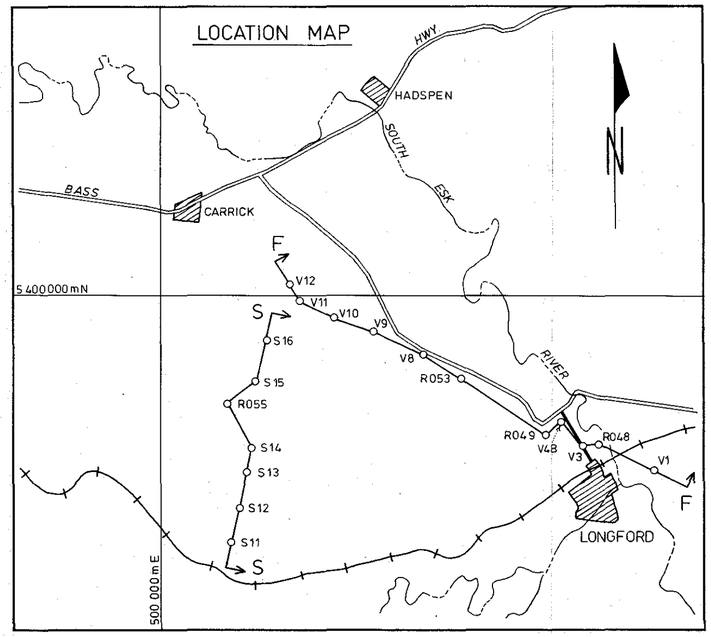


SUB AREA 2



LEGEND

- BROWN COAL
- HIGHLY INTERBANDED / INTERBANDED BROWN COAL
- <50% BROWN COAL SEAMS
- + + JURASSIC DOLERITE
- V12 GETTY OIL DEVELOPMENT COMPANY URANIUM EXPLORATION HOLE
- S15 URANIUM EXPLORATION HOLE
- R053 AAR OIL SHALE EXPLORATION HOLE

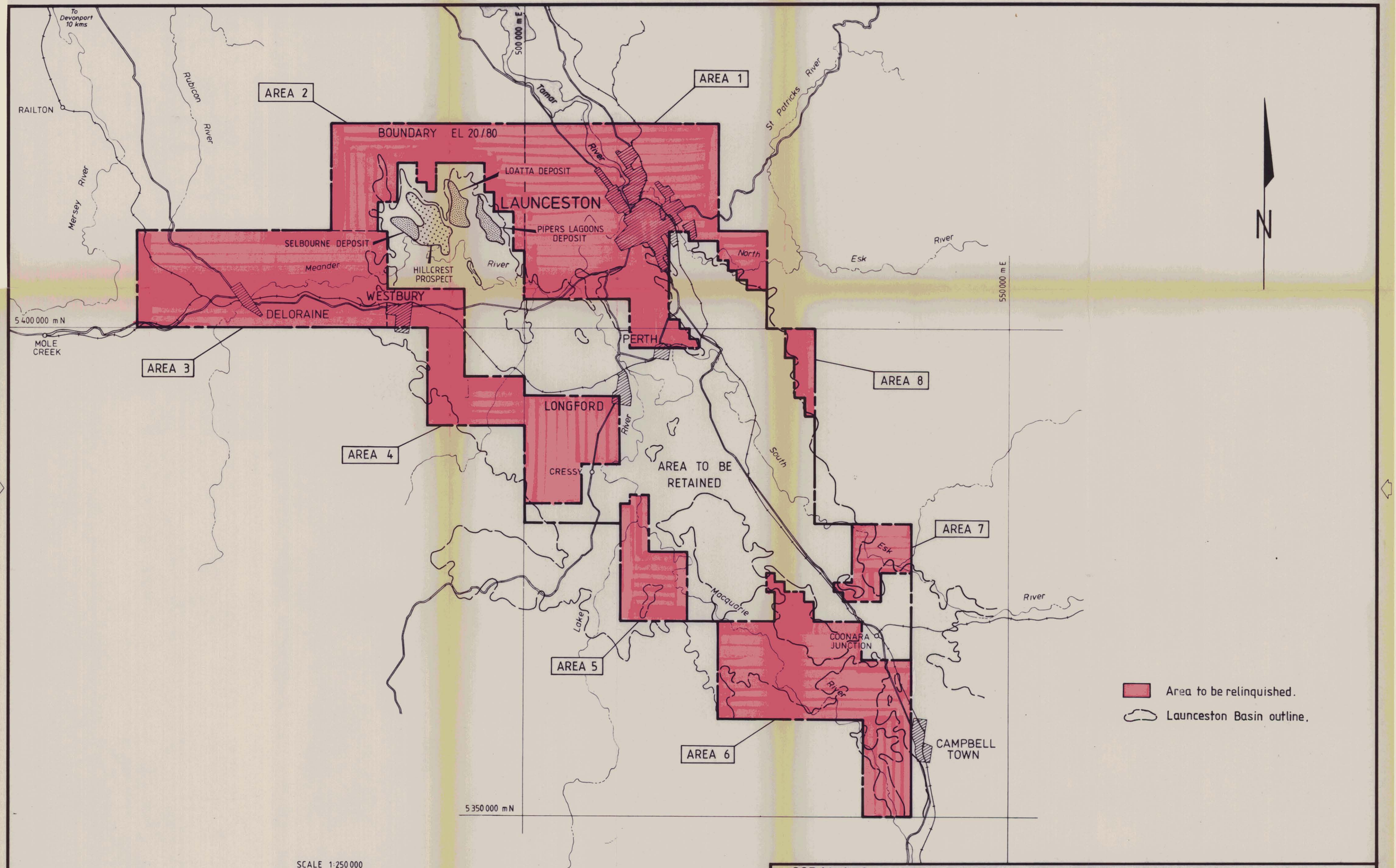


Location of cross sections S16 - S11, V12 - V1 from FIGURE 5 1:100 000 map.

5 cm

587118

CSR Limited Coal Division	EXPLORATION AND EVALUATION GROUP	
DRAWING / DATE	EL 20/80 LAUNCESTON RUFUS LAGOONS SUB AREAS 1 AND 2 CROSS SECTIONS V12–V1 & S16–S1	SCALE 1:25 000 H, 1:2 000 V
DRAWN C. J. — Nov. '82		FIGURE 8
CHECKED		DRAWING No 70020 - 91
REVISED		



CSR Limited Coal Division	EXPLORATION AND EVALUATION GROUP	CSR
DRAWING / DATE	EL 20/80 - LAUNCESTON PROPOSED RELINQUISHMENT AREA	SCALE 1 : 250 000
DRAWN MRN / Dec.'82		FIGURE 9
CHECKED		DRAWING No 70020 - 94
REVISED		

GETTY OIL DEVELOPMENT COMPANY BOREHOLE V3

Geophysical Log Available

Depth	Thickness	Lithological Description
12.5	2.4	Lignite
38.4	0.9	Lignite
40.8	2.4	Clay, carbonaceous
41.3	0.5	Lignite
41.8	0.5	Ligneous clay
41.9	0.1	Lignite
43.6	1.5	Ligneous clay, bands clay, carbonaceous
44.2	0.6	Lignite
44.5	0.3	Clay, carbonaceous
45.6	1.1	Inferior lignite
50.3	4.7	Clay, carbonaceous, interbanded ligneous clay 60:40
52.0	1.7	Inferior lignite, interbanded ligneous clay 90:10
53.9	1.9	Ligneous clay, interbanded clay, carbonaceous 80:20
57.0	3.1	Clay, carbonaceous, interbanded clay 80:20
59.1	2.1	Clay
61.3	2.2	Ligneous clay
61.9	0.6	Clay, carbonaceous
76.2	2.3	Ligneous clay, abundant ligneous fragments
79.2	3.0	Clay, carbonaceous, abundant ligneous fragments
80.5	1.3	Clay
82.3	1.8	Clay, carbonaceous
83.2	0.9	Clay
86.4	3.2	Ligneous clay, bands inferior lignite
90.4	4.0	Clay, carbonaceous
92.0	1.6	Inferior lignite
96.9	4.9	Clay, carbonaceous
97.7	0.8	Inferior lignite
98.9	1.2	Clay, carbonaceous
99.1	0.2	Inferior lignite
99.4	0.3	Clay, carbonaceous
99.8	0.4	Inferior lignite

GETTY OIL DEVELOPMENT COMPANY BOREHOLE V4

No Geophysical Log

Depth	Thickness	Lithological Description
16.8	8.6	Lignite. Grading to an inferior lignite, banded with ligneous clay towards base.
48.8	6.1	Lignite, interbanded silt, carbonaceous 80:20
61.0	1.6	Lignite, interbanded clay, carbonaceous 80:20
62.5	1.6	Lignite, interbanded clay, carbonaceous 70:30

GETTY OIL DEVELOPMENT COMPANY BOREHOLE V8

Geophysical Log Available

Depth	Thickness	Lithological Description
18.3	2.1	Clay, carbonaceous, interbanded inferior lignite 80:20
20.1	1.8	Clay, carbonaceous, interbanded inferior lignite 50:50
21.0	0.9	Clay, carbonaceous
21.3	0.3	Siderite
24.4	3.1	Inferior lignite, woody, interbanded sand, silty carbonaceous 60:40
111.3	3.1	Lignite, interbanded clay, silty 85:15

GETTY OIL DEVELOPMENT COMPANY BOREHOLE V11

No Geophysical Log

Depth	Thickness	Lithological Description
29.0	1.6	Inferior lignite, bands silt, sandy
113.0	1.7	Inferior lignite, bands silt, carbonaceous

GETTY OIL DEVELOPMENT COMPANY BOREHOLE V10

Geophysical Log Available

Depth	Thickness	Lithological Description
116.7	0.6	Lignite
117.0	0.3	Ligneous clay
117.9	0.9	Lignite
118.1	0.2	Ligneous Clay
118.4	0.3	Inferior lignite
118.9	0.5	Ligneous clay, interbanded inferior lignite 50:50
119.6	0.5	Inferior lignite
120.2	0.6	Clay, carbonaceous
121.6	1.4	Inferior lignite, interbanded ligneous clay 90:10
122.1	0.7	Lignite
123.3	0.5	Ligneous clay
127.1	3.8	Inferior lignite, interbanded lignite, interbanded ligneous clay, 50:30:20
128.6	1.5	Clay, carbonaceous
131.2	2.6	Lignite, interbanded inferior lignite, interbanded ligneous clay 60:30:10
136.4	5.2	Inferior lignite, interbanded ligneous clay 60:40
137.2	0.8	Clay, carbonaceous
139.9	2.7	Inferior lignite, sandy

TASMANIAN DEPARTMENT OF MINES

Groundwater Investigation Hole 19 [EP068956]

Location: 3km west of Longford
Elevation: 147.8 m
No Geophysical Log

Depth	Lithological Description
0- 9.1	Red sandy clay
9.1- 16.8	Quartz and limonite gravel, rounded and angular fragments, vein and granite (?) quartz
16.8- 25.9	Dark brown clay
25.9- 32.0	Gravel, mainly limonitic, some quartz fragments
32.0- 36.6	Brown clay
36.6- 42.7	Wood fragments
42.7- 57.9	Wood fragments with coarse sand and grit fragments
57.9- 68.6	Wood fragments, a few grit fragments
68.6- 70.1	Wood fragments with clay
70.1- 79.3	Wood fragments
79.3- 86.9	Wood fragments with grit
86.9- 91.4	Wood fragments
91.4- 99.1	Wood with sand and grit
99.1-103.6	Wood fragments
103.6-118.9	Wood with sand
118.9-143.3	Wood with sand, some clay
143.3-152.4	Wood with coarse sand, fine grit

AAR OIL SHALE EXPLORATION BOREHOLES

Borehole Number	Total Depth (m)	Geophysical Log	Summary of Carbonaceous and/or Ligneous Strata
R048	64	Y	Possible ligneous zones 50-53m, 57-64m Interval logged by site geologist as grey silty clay containing wood fragments
R049	40	Y	No carbonaceous strata. Dolerite intersected at total depth.
R050	60	Y	No carbonaceous strata
R051	60	Y	No carbonaceous strata Note: drilled on site of Water Investigation Hole 19
C052	65	Y	No carbonaceous strata
R053	60	Y	Possible brown coal intersection 46-60m. Interval 42-60m logged by site geologist as poor sample return
R054	62	Y	No carbonaceous strata
R058	62	Y	No carbonaceous strata

APPENDIX 4

Rufus Lagoons Sub Area 1

Reserve Calculations

APPENDIX 4

Table 5

Rufus Lagoons, Sub Area 1

Reserve Calculation

Seam	Area	Average Seam	In Situ Coal Inferred Reserves Mt
1	2Km^2	3	6
2	3Km^2	4.5	14
3	4Km^2	6.6	26
4	2Km^2	3.7	7
TOTAL			53

APPENDIX 5

General Conditions Governing Exploration Licences in Tasmania.

EXPLORATION LICENCES

The general conditions governing exploration licences have been reviewed. The following alterations have been approved and will take effect from 1st July, 1982:

1. PERIOD OF LICENCE:

It is proposed to issue exploration licences for twelve months with renewals for further twelve month periods.

2. PERIOD OF TENURE:

Licences will have tenure limited to a maximum of ten years. Holders of current licences which exceed five years will be given five years to complete exploration.

3. SIZE OF LICENCE AREA:

(a) Mineral licences are not to exceed 250 km^2.

(b) Coal, oil and shale licences are not to exceed 500 km^2.

(c) During the first five years of tenure the area must be reduced by a minimum of 50% of the original licence area.

(d) (i) Holders of a current exploration licence which exceeds five years but does not exceed the maximum area for a five year old licence (125 km^2 - minerals; 250 km^2 - coal, oil and shale) will be given a further five years to complete exploration.

(ii) Holders of a current exploration licence which exceeds five years and which exceeds the maximum area for a five year old licence (125 km^2 - minerals; 250 km^2 - coal, oil and shale) will be given two years to reduce to the maximum permitted area and a further three years to complete exploration.

(iii) Holders of a current exploration licence in its fifth year of tenure which exceeds the maximum area for a five year old licence (125 km^2 - minerals; 250 km^2 - coal, oil and shale) will be given two years to reduce to the maximum permitted area and a further four years to complete exploration.

(e) On reduction a licence is not to be subdivided into more than four parts.

(f) Licence boundaries should conform to Australian metric grid co-ordinates.

4. FEES:

There will be one annual fee at a fixed rate per square kilometre, as follows:

Year	*Rate per km²* $
First	2.50
Second	5.00
Third	7.50
Fourth	10.00
Fifth	12.50
Sixth	15.00
Seventh	17.50
Eighth	20.00
Ninth	22.50
Tenth	25.00

5. EXPENDITURE COMMITMENT:

(a) Minimum expenditure commitment to be as follows:

(i) First two years at $100 per km^2 per annum

(ii) Next three years at $200 per km^2 per annum

(iii) Last five years at $500 per km^2 per annum

The minimum expenditure will be $5000 per annum.

(b) Over expenditure in one year may be carried forward to the next year only to offset under expenditure.

(c) Subject to (b) above under expenditure in one year is to be made up the next year, together with that year's commitment.

(d) Licence holders not satisfying expenditure commitments in successive years will be required to show cause why all or part of a licence should not be revoked.

(e) A licence holder may apply to the Director of Mines to waive or reduce expenditure commitments.

(f) (i) Reported expenditure must be itemised.

(ii) Only actual costs incurred in exploration work are to be included.

(iii) Administration costs such as Director's salary should not exceed 10% of annual expenditure.

6. REPORTING:

(a) Quarterly reports should include a statutory declaration of expenditure, an itemised breakdown of expenses and a brief resumé of work in progress and completed.

(b) Annual reports should provide a full technical report with plans and assay results detailing all exploration undertaken during the year and proposed exploration for the renewal period.

(c) A final report should be a complete summary of exploration work plus any new data not previously reported on the surrendered area.

(d) A final report, with all relevant data, is required for any area relinquished during the term of the licence.

(e) The Director of Mines is to be notified immediately any discovery of significant mineralisation is made.

(f) Where research is undertaken on a licence and is attributed to exploration activity and expenditure a complete record must be submitted to the Department of Mines.

(g) All reports submitted to the Department are held for official purposes and remain confidential until -

(i) a period of five years has elapsed from the date when the report was due to be submitted; or

(ii) a licence expires, is relinquished, or is cancelled; or

(iii) the area to which a report relates is no longer held by the licencee;

whichever shall occur first.

7. PERFORMANCE DEPOSITS:

All applicants are required to provide a performance deposit to ensure compliance with all conditions of the licence.

The amount of deposit required is determined by the size, environmental sensitivity of the area and the programme to be carried out.

8. PRIVATE LAND DEPOSITS:

This deposit is required from all licence holders prior to exploring on private land. It is obtained to ensure rehabilitation is completed on relinquishment of the licence. The amount is determined by the extent and type of exploration work proposed and the nature of the land being explored.

9. APPLICATION FOR NEW LICENCE:

All applications have to be advertised in a newspaper within seven days of marking out. The newspaper to be used is governed by the telephone area code for the area:

002 - Mercury; 003 - Examiner; 004 - Advocate.

It will be necessary to advertise in two papers where two area codes are affected by the licence application.

A plan is required to accompany the advertisement on a scale no smaller than 1:750 000. The plan should include readily recognisable features such as towns, mountains or coastline.

10. APPLICATION FOR RENEWAL OF LICENCES:

Applications should be made one month before the expiration date and should include the following:

(a) the licence document for endorsement;

(b) renewal fees;

(c) a full technical report on past year's work;

(d) the proposed programme for the next twelve month period;

(e) a plan showing the area to be relinquished where a licence is due for reduction or is voluntarily reduced.

11. RETENTION AREAS:

In special circumstances consideration will be given to a renewal of a licence beyond the limit of ten years. This licence will be subject to special conditions.

(H. Murchie)
DIRECTOR OF MINES
9th June, 1982

LICENCES WHICH EXCEED THE MAXIMUM AREA ALLOWED:

Licence of (years)	*To reduce (years)*	*To complete exploration (years)*
1	4	5
2	3	5
3	2	5
4	2	4
5	2	3
6	2	3
7	2	3
8	2	3
9	2	3
10+	2	3

LAUNCESTON
Deloraine
Westbury
Carrick
Hadspen
Perth
Evandale
Longford
Bracknell
Cressy
Campbell Town
LOATTA DEPOSIT
PIPERS LAGOONS DEPOSIT
SELBOURNE DEPOSIT
HILLCREST PROSPECT
CARRICK AREA
LONGFORD COALFIELD
RUFUS LAGOONS
MT ARNON AREA
BREADALBANE - ST. LEONARDS AREA
HUMMOCKY HILLS
HENRIETTA PLAINS AREA
DIPROSE LAGOON
VAUCLUSE RESEVOIR AREA
GREAT LAKE
GREAT WESTERN TIERS
ARTHURS LAKE
EL 5/82 (1) C.R.A. EXPL. PTY LTD
EL 9/82 C.R.A. EXPL. PTY LTD
EL 10/82 C.R.A. EXPL. PTY LTD
EL 13/82 C.R.A. EXPL. PTY LTD
EL 12/82 C.R.A. EXPL. PTY LTD
EL 11/82 C.R.A. EXPL. PTY LTD
BOUNDARY EL 20/80
For full details of drillholes in this area see 1:25 000 scale map
LOCALITY MAP
TASMANIA
Devonport
Launceston
Queenstown
HOBART
EL 20/80
LEGEND
CSR drillhole, coal cored.
CSR drillhole, chip sampled.
Outline of the Longford Basin, after Mathews 1974
Uranium borehole - Getty Oil Development Company
Investigation water bore - Tasmanian Dept. of Mines with depth to Dolerite and Triassic strata.
Depth to basement is >153 m.
Oil prospecting hole
Diamond drillhole
Brown coal deposit
Potential coal area
Contract water bores
Tasmania Mines / Mines Dept. water bores
Compiled from Tasmania 1:100 000 Topographic Survey Series 8215 Tamar, 8315 St Patricks, 8314 South Esk, 8214 Meander Edition 3 1979
SCALE 1:100 000
HIGHWAY SEALED, UNSEALED
ROAD SEALED, UNSEALED
RAILWAY
POWER TRANSMISSION LINE
TRUE NORTH, GRID NORTH AND MAGNETIC NORTH ARE SHOWN DIAGRAMMATICALLY FOR THE CENTRE OF THE MAP. MAGNETIC NORTH IS CORRECT FOR 1979 AND MOVES EASTERLY BY 0·1° IN ABOUT THREE YEARS.

CSR Limited Coal Division	EXPLORATION AND EVALUATION GROUP	CSR
DRAWN B.A.W. — DATE JULY '81	EL 20/80 — LAUNCESTON	SCALE 1:100 000
CHECKED	LOCATION OF EXPLORATION, COAL DEPOSITS	FIGURE 5
REVISED J.M. — NOV. '82	AND PROSPECTIVE AREAS.	DRAWING No. 70020-34

587134

LEGEND

- Highway, sealed road
- Unsealed road, vehicular track, lane
- Railway
- 'Farmville' Homestead
- Drain
- C033 CSR drillhole coal cored
- R009 CSR drillhole chip sampled
- Deposit Outline
- Prospect Outline
- Outline of Potential Reserves
- Outline of Basement Rock.

PIPERS LAGOONS DEPOSIT

LOATTA DEPOSIT

SELBOURNE DEPOSIT

HILLCREST PROSPECT

STATE FOREST

STATE FOREST

WESTBURY

HAGLEY

MEANDER RIVER

BASS HIGHWAY

WESTERN LINE

WESTBURY AREA

EL 20/80

KEY SHEET DIAGRAM

(TASMANIAN 1:25000 TOPO. SERIES)

PARKHAM	BRIDGENORTH	LAUNCESTON
DELORAINE	WESTBURY	PROSPECT

GRID CONVERGENCE 0°2'

GRID MAGNETIC ANGLE 13°0'

TRUE NORTH GRID NORTH AND MAGNETIC NORTH ARE SHOWN DIAGRAMMATICALLY FOR THE CENTRE OF THE MAP. MAGNETIC NORTH IS CORRECT FOR 1980 AND MOVES EASTERLY BY 0°1' ABOUT EVERY THREE YEARS

SCALE 1:25000

10 0.5 0 0.5 1.0 1.5 2.0 Kilometres

6 cm

CSR Limited Coal Division	EXPLORATION AND EVALUATION GROUP	CSR
DRAWING	DATE	
DRAWN A.Y.	Sept '82	
CHECKED		
REVISED		

EL 20/80 LAUNCESTON
WESTBURY AREA
BROWN COAL DEPOSITS & POTENTIAL RESERVES

SCALE 1:25000

FIGURE 6

DRAWING No. 70020 – 73

587135

587136

EXPLORATION LICENCE 20/80 LAUNCESTON

TASMANIA

A REVIEW OF THE NON COAL

RESOURCES AND PROSPECTIVITY

P. Ellis

Prepared by:

Exploration & Evaluation Group
CSR Energy Division,
13th Floor, AMP Place,
10 Eagle Street,
BRISBANE, Qld. 4000

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4. Analysis of red and yellow Ochres from the Mowbray Deposit.

5. Producers and Production of crushed Dolerite in the Launceston Area 1958 to 1964 inclusive.

6. Basalt Overburden to the Loatta and Selbourne Deposits intersected during exploratory drilling.

7. Gravel and sand production and producers in EL 20/80 Launceston.

1. SUMMARY

Exploration Licence 20/80 Launceston which is held by AAR Limited covers an area of 2,339 km^2. It contains the largest area of unconsolidated Tertiary sediments in Tasmania. It also contains rocks of Precambrian, Ordovician, Silurian, Permian, Triassic, Jurassic and Quaternary ages which may have potential for non coal resources.

The non coal resources of EL 20/80 are currently exploited by small scale quarrying activities. In many cases the resources have been exploited by the landowner for use on farming properties.

EL 20/80 contains large potential resources of aggregates, silica, clay and groundwater. The resource potential of EL 20/80 for bauxite, barite, diatomaceous earth, ochre and base metal sulphides is small.

2. INTRODUCTION

2.1 Scope

This report reviews the prospectivity of the non coal resources of Exploration Licence (EL) 20/80 Launceston drawing on all of the available geological data.

This report has been produced in conjunction with a report entitled Exploration Licence 20/80 Launceston, Tasmania. A Review of the Coal resources and Prospectivity which outlines the prospective coal areas, and areas suitable for relinquishment.

2.2. Tenement Details

EL 20/80 Launceston, covering an area of 2,339km^2, was granted to AAR Limited on 19th September 1980, for a term of one year.

An extension for a 6 month period was granted on 22nd August, 1981. A further application for a twelve month extension of EL 20/80 Launceston was made, and the EL was granted for the period 22nd February, 1982, to 22nd February, 1983.

In Tasmania, exploration licences are granted for coal and oil shale, all minerals, and oil. EL 20/80 was granted to AAR Limited to explore for oil shale and coal.

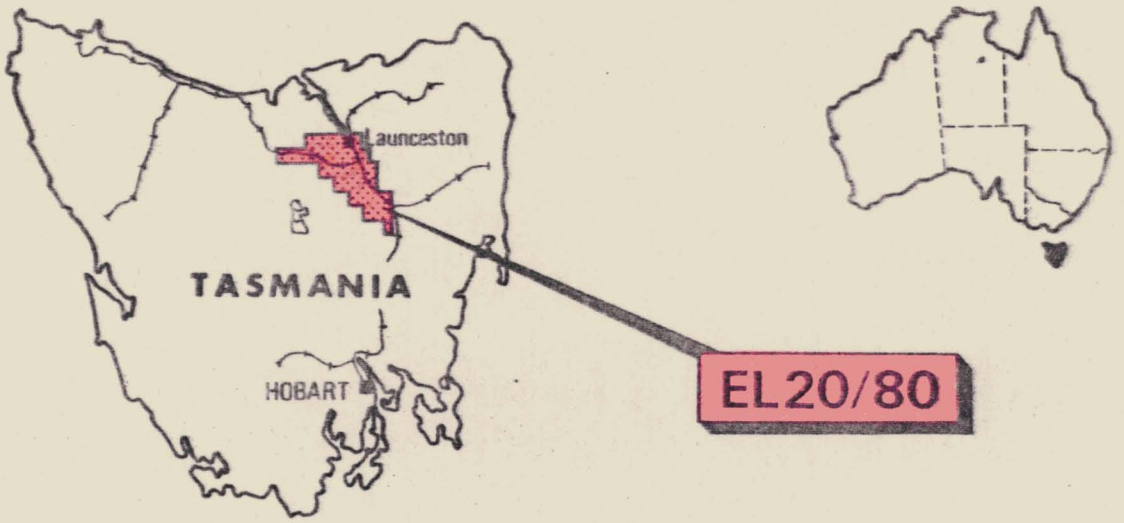
2.3 Location and Access

EL 20/80 Launceston extends from Campbell Town in the south-east, west to Deloraine, and north to Launceston, (Figure 1). It is located on the Meander, South Esk, and Tamar 1 : 100,000 Topographic Map Series.

The Bass and Midlands Highways traverse the area from east to west and north-west to south-east, respectively. The Western Line Railway also crosses the area in an east-west direction, through Perth, Longford and Westbury. The Southern Line Railway parallels the Midlands Highway between Powranna and Campbell Town, and junctions with the Western Line Railway at Western Junction (Figure 2).

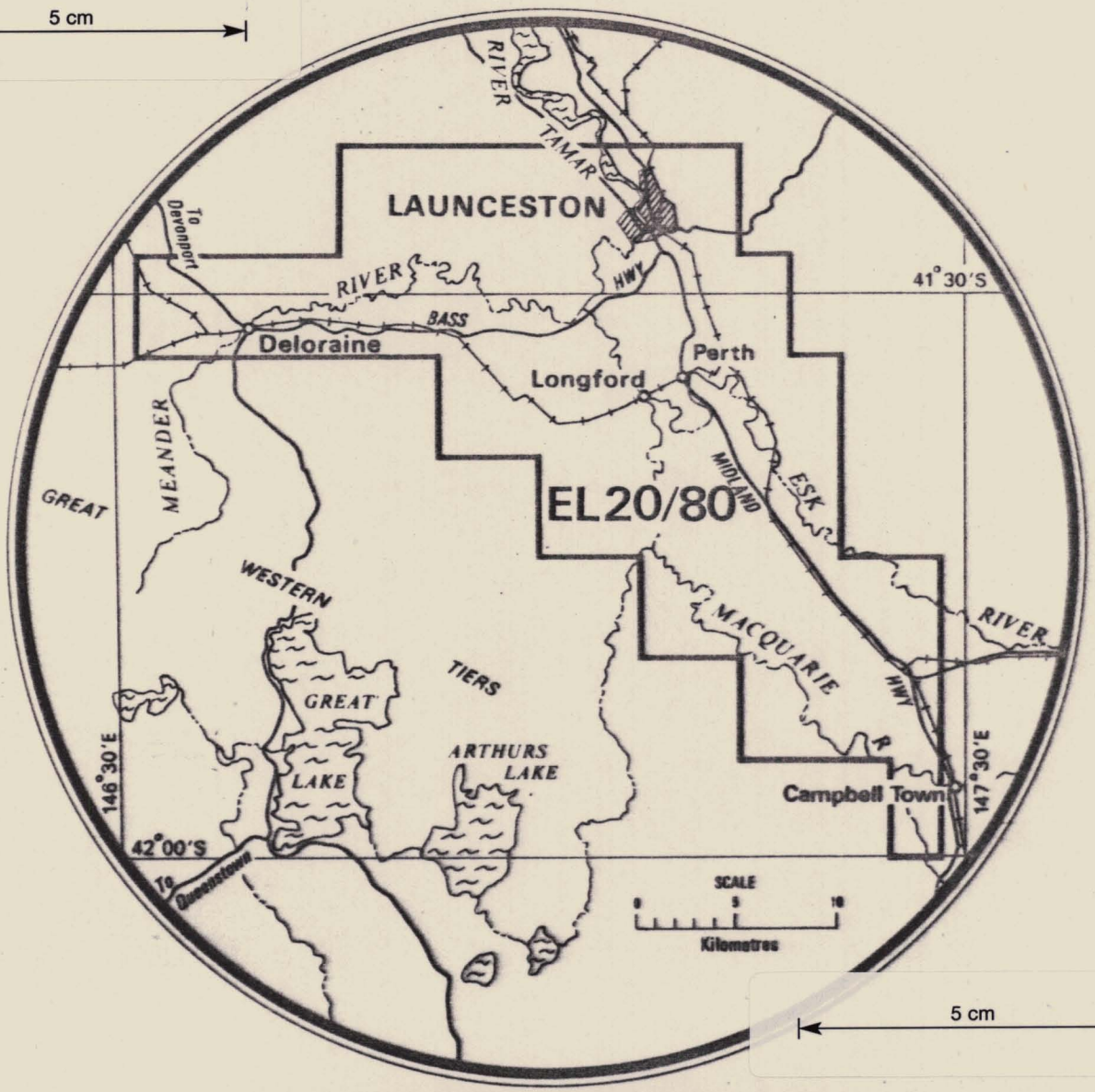
Access in the northern sections of the EL (Westbury, Rosevale, Selbourne) is generally via sealed shire roads and well maintained farm tracks which enable good dry weather access. However, access can only be gained to some sites in the summer months as pastures are extremely boggy when wet. January through March is the ideal time for an exploration programme in the north of the EL.

587144



SCALE
0 50 100 150
Kilometres

5 cm



EL 20/80 LAUNCESTON TASMANIA

70020-8

FIGURE 1

Access in the southern sections of the EL (Conara, Campbell Town, where farms are larger, is predominantly through pastures, once off the sealed shire roads. The southern areas of the EL are drier than the north, and exploration is possible from January through to May.

2.4 Climate, Physiography and Land Use

The climate of the area is temperate. The annual average rainfall throughout the area ranges from approximately 500 to 1,000mm, and generally falls during the winter months, (Matthews, 1974).

The Launceston Basin is flat to gently undulating. It is surrounded on all sides by much higher terrain, notably the Great Western Tiers to the west and Ben Lomond to the east.

The major land use of EL 20/80 Launceston is farming, predominantly sheep and cattle grazing. The Carrick-Westbury area is notable for its large number of horse, cattle and sheep studs, and intense cultivation of peas, beans, opium poppy, and cereal crops.

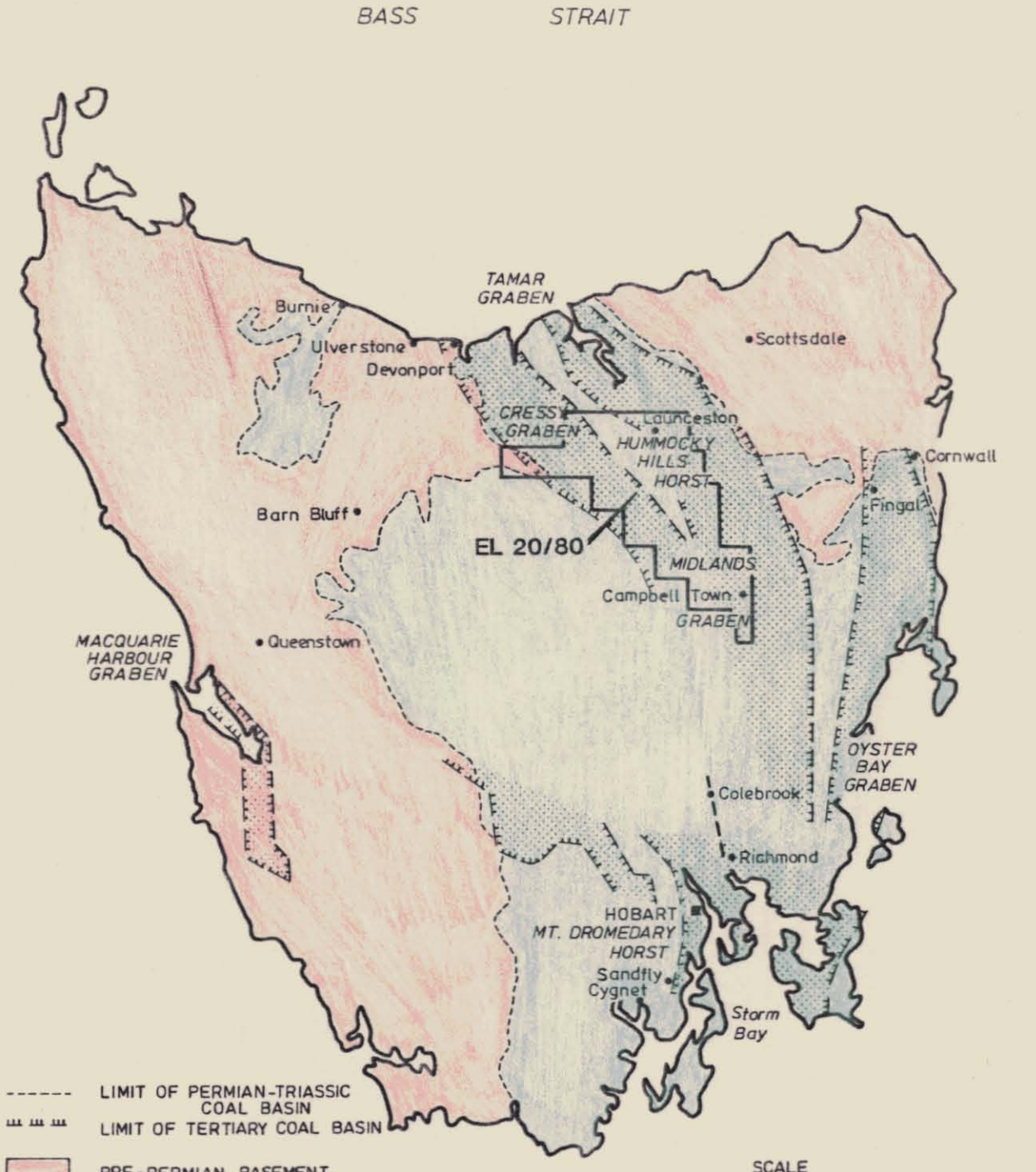
3. REGIONAL GEOLOGICAL SETTING OF EL 20/80

EL 20/80 lies within the Permo-Triassic Parmeener Supergroup Coal Basin and the Tertiary Launceston Basin, (Figure 2). The Permo-Triassic Coal Basin unconformably overlies Precambrian, Cambrian, Ordovician, and Silurian strata. The Tertiary Launceston Basin unconformably overlies the Permo-Triassic Coal Basin.

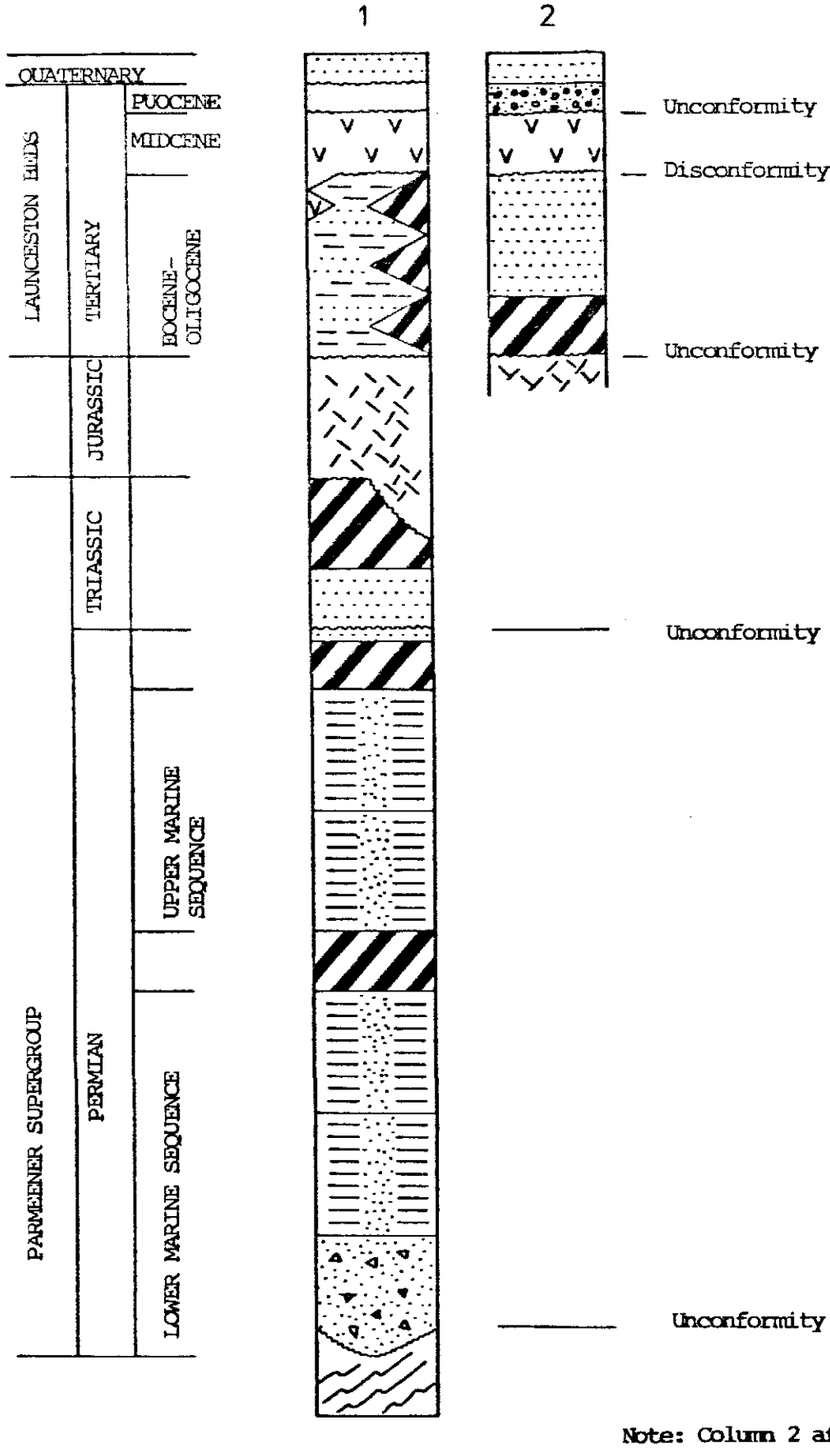
Predominately non-marine Tertiary Launceston Beds, (Johnson, 1888) outcrop in approximately three quarters of the license area. Pre-Tertiary strata outcrop along the margins of the Launceston Basin and in a discontinuous central horst which is expressed in the Hummocky Hills and hills to the north of Perth extending northwesterly to Carrick.

For further details on the stratigraphy of EL 20/80 refer to 'Exploration Licence 20/80 Launceston, Tasmania. A review of the Coal Resources and Prospectivity.

587147



CSR Limited Coal Division — EXPLORATION AND EVALUATION GROUP — CSR		
DRAWING / DATE	COAL BASINS OF TASMANIA	SCALE AS SHOWN
DRAWN C.J. Dec. '82		FIGURE 2
CHECKED		DRAWING No 70020 – 92
REVISED		



Stratigraphic Name	Lithological Description	Prospective Area in EL 20/80	Thickness Range
	Alluvium		
Upper Zone	Gravel, boulder beds		
	Alkali – Olivine basalts		Up to 60m
Middle Zone	Clay, Silt, Sand Brown Coal and Oil Shale	Loatta, Pipers Lagoons and Selbourne Deposits	0–1,000m
Lower Zone		Breadalbane Lignite	
Dolerite Intrusion	Medium to course grained, tholeiitic dolerite		0–305m
Fingal or Newtown Coal Measures	Feldspathic Sandstone Black coal Seams	Longford Coal Field Norwich and Pateena Mines	0–200m
Knocklofty or Ross Sandstone	Quartzose Sandstone		60–100m
Cygnet Coal Measures Jackey Formation	Carbonaceous Sandstone and Shale with Plant Fragments.	thin coal seams	less than 45m
Bogan Gap Group	Predominantly unfossiliferous mudstone		up to 200m
Poatina Group	Fossiliferous Mudstone and Sandstone		40–100m
Mersey Coal Measures Liffey Group	Carbonaceous Quartz-Mica Sandstone and Shale, thin coal seams		30–49m
Golden Valley Group	Unfossiliferous erratic rich mudstone, shale limestone and sandstone		45–60m
Quamby Mudstone	Unfossiliferous, dark grey pyritic mudstone. Includes Tasmanite Oil Shales of Railton-Latrobe Area		75–120m
Stockers Tillite	Tillite and erratic rich mudstone		0–140m
Basement: Silurian	Turbidite sequences, dominately shale and siltstone		
Ordovician	Siliceous conglomerate		
Cambrian	Turbidite sequences containing quartzite		
Precambrian	Quartzite		

Note: Column 2 after Johnson 1873 only applies to Stratigraphy of Launceston Area

Compiled from information contained in Mathews (1974).

CSR Limited Coal Division	EXPLORATION AND EVALUATION GROUP	
DRAWING	DATE	STRATIGRAPHY OF THE PARMEENER SUPERGROUP AND LAUNCESTON BASIN IN EL 20/80
DRAWN C. J.	Nov. '82	SCALE
CHECKED		FIGURE 3
REVISED		DRAWING No 70020 - 90

4. BAUXITE

Bauxite occurs as the remnants of ferruginous pisolitic laterite developed on dolerite and basalt, within Tertiary grabens, (refer to Figures 2 and 4). The deposits appear to range in age from middle to late Tertiary. In general, Bauxite deposits in EL 20/80 are small, with grade ranging from 33 to 41.5% Al_2O_3. They are commonly in or close to built up residential areas. In EL 20/80 Bauxite is known from St. Leonards, Launceston, Rosevale, and the Campbell Town and Conara districts.

4.1 St. Leonards

The St. Leonards Bauxite deposit has been extensively sampled by the Australian Aluminium Commission in 1946. The total reserve in the St. Leonards district is estimated at 160,500 tons assaying 41.5% Al_2O_3.

The thickness of Bauxite ranges up to 2.6m and averages 1.6m. The overburden thickness ranges from a few centimetres to 5.9m and averages 2.7m. Overburden consists of predominantly clay, sand, gravel and sandy clay.

4.2 Launceston

Bauxite occurs in several small deposits in the Cataract Gorge area near Launceston. These deposits are situated in built up residential areas. Bauxite reserves and quality of these deposits are not available.

4.3 Rosevale

Bauxite occurs in seams up to 0.6m thick over basalt and dolerite in the Rosevale area, (Figure 5). It is of no economic significance, due to very small potential reserves.

Bauxite overlies dolerite on the property Oakleigh. Pisolitic ironstone laterite overlies the bauxite and is used as top dressing for unsealed roads in the Rosevale area. Refer to Section 10.2.1 for further description of pisolitic ironstone gravels.

4.4. Campbell Town - Conara Districts

Small deposits of Bauxite occur in the Campbell Town - Conara districts. The deposits are derived from weathered volcanics and occur as earthy and clayey material in layers of up to 2.1m thick. They underly a thin covering of highly ferruginous lateritic gravel.

The grade of the deposits is variable, with an average of approximately 33 to 36% Al_2O_3 and 2 to 5% SiO_2.

5. BARITE

All economic Barite deposits in Tasmania are associated with rocks of Cambrian age. Barite nodules have been excavated from an irrigation channel south-west of Cressy. The nodules are almost spherical, and the Barite is very finely crystalline and cream to light brown in colour.

This occurrence of Barite in Tertiary strata is only of academic interest. It is not known whether the Barite has been derived from a Cambrian source terraine.

6. CLAY

The annual clay production in Tasmania during 1981 - 1982, excluding production by the Hydro Electric Commission was 103,000m^3. Over two thirds of clay produced is used for brick manufacture. Other uses of clay are manufacture of tiles, pipes, and cement. Tertiary clay deposits in the Launceston area have been extensively quarried for brick, tile and pipe manufacture.

Clay is the dominant sedimentary rock type in the Launceston Basin. Between 30 and 50 metres, and occasionally up to 80m of continuous clay has been intersected during exploratory drilling in the central sections of the Cressy Trough, (refer to Figure 3).

Most of the clay samples taken during exploratory drilling have been subjected to a rudimentary field examination while they are in a wet state. Some of the samples logged as clay may contain silt and sand. Infrequent detailed mineralogical and size fraction analysis of samples has been performed by the Tasmanian Department of Mines, Matthews (1974), the Getty Oil Development Company, and CSR Limited.

Kaolinitic clays commonly occur throughout the Launceston Basin. Kaolinitic and bentonitic clays have been logged in CSR boreholes in the Rosevale, Westwood and Selbourne areas of EL 20/80.

6.1 Kaolin

Kaolinitic clays commonly underly Tertiary basalt in areas close to outcropping Jurassic dolerite. The clays were probably derived by weathering of the dolerite. The overlying basalt has preserved the kaolin clay from erosion.

Kaolinitic clays occur in the overburden of the Loatta, and Pipers Lagoons deposits, north of the Selbourne Deposit, and overlying the Breadalbane lignite, (Figures 4 and 5). Table 1 (included as Appendix 1), summarises the kaolinitic clay intersected during exploratory drilling by CSR Limited in the Rosevale, Westwood and Selbourne areas. The kaolinitic clay occurs at depths of 0.5 to 21.3 metres and ranges in thickness from 0.3 to 8 metres.

Two clay samples (IM4526 and C2579) from the Rosevale area of EL 20/80 were submitted for XRD analysis of the clay fraction, (memo from J. Siemon, 24.3.82, reference JES/amb/2.07.01).

The following results were obtained:-

IM 4526 A surface sample from the property Loatta east of rotary chip hole R021.

Consists of kaolinite, and a mixed layer clay consisting of smectite interstratified with small amounts of either chlorite or illite. Minor illite may be present as a separate species.

This type of clay could be expected to have a good plasticity and be suitable for use as a ceramic clay.

C 2579 A chip sample from the interval 4 to 8m in rotary chip hole R004.

Contains kaolinite, quartz, illite and possibly minor smectite.

The chart record for this sample is extremely poor, indicating that the major component - kaolinite, is poorly crystalline to amorphous.

Further laboratory testing of these samples is required to determine the possible industrial usage of this clay.

No reserves have been calculated for the Loatta, Pipers Lagoons and Selbourne areas.

The kaolinitic clay overlying the Breadalbane lignite, (Figure 4), is approximately 8m thick. The aerial extent of the clay is not known. No reserves are calculated for this area.

A Hobart based ceramics company held a mining lease for this area. The company's objective was to mine the clay and transport it to a manufacturing plant in Hobart. This venture never reached fruition. The lease was bought by the owner of the property, 'The Springs'. The owner of 'The Springs' holds a lease over the area for quarrying of Tertiary basalt. The area is leased out to Brambles Transport and Plant Services who are the quarry operator (refer to Section 10.1).

Kaolinitic clay occurs in other areas of the Launceston Basin. However the Getty Oil Development Company uranium exploration lithological logs and the Tasmanian Department of Mines ground water investigation hole lithological logs do not detail the presence of kaolinitic clays. Kaolinite the most abundant clay mineral in most samples analysed by the Tasmanian Department of Mines, and apart from quartz is the only mineral present in all samples, (Matthews 1974). The clay mineralogy of water bore samples from Matthews (1974) is included as Appendix 2.

6.2 Structural Clay

Tertiary sediments have been extensively quarried for brick, tile and pipe manufacture in the Launceston city area. Sandy and clayey sediments were blended to produce a suitable material.

Clay production from the Launceston area prior to 1958 has not been recorded. Clay production and producers of clay in the Launceston area during the period 1958 to 1964 is included as Appendix 3.

The average brick production of these Launceston based producers ranged from less than 4,000 to 113,000 bricks per week. This production rate is typical of country areas.

The Clifton Brick Company Pty. Ltd., of Longford is the only current clay brick producer in the Tamar region. Production rates and raw material sources are not known to the author.

Bricks were manufactured in Westbury using clay from quaternary alluvial clay terraces along Quamby Brook, (Figure 4). No further details regarding brick manufacture at Westbury are known.

7. DIATOMACEOUS EARTH

No commercial production of diatomite has occurred in Tasmania. A small diatomite deposit is recorded in the Bishopsbourne area. The diatomite is reported to be grey in colour and to contain abundant diatoms.

The size, exact location, and grade of the deposit is not known to the writer.

8. OCHRE

Red and yellow ochres occur as residual deposits produced by the weathering of Jurassic Dolerite at Mowbray.

The deposit was worked for several years in the early 1900's in conjunction with a deposit near Beaconsfield. The product was used for paint manufacture in Launceston.

Total production and existing reserves are not documented.

The most important factors governing the suitability of ochres is their colour, opacity, surface area number and particle size. Analysis of these parameters has not been performed.

The red ochre from Mowbray has a low total iron content, ranging from 45 to 56%, and a high alumino silicate content of between 41 and 45%. Other red ochre deposits currently worked throughout the world have total iron contents ranging from 63 to 96.5%.

The yellow ochre from Mowbray has an iron oxide content of approximately 43% which compares favourably with the 20 to 50% of other ochre deposits throughout the world.

Analytical results are shown in Table 3, (Appendix 4).

A total of 2,459 ton of ochre has been produced in Tasmania to 1966. In 1966 65 tons of ochre was produced. Present production is from deposits at Spalford which is situated south of Ulverstone. The ochre is red in colour and is derived from the decomposition of Tertiary basalt.

9. SILICA

In Tasmania Pre-Cambrian and Ordovician quartzite occurs as competent rock deposits and alluvial or talus deposits.

Pre-Cambrian and Ordovician conglomerate and quartzite beds occur in the northwest of EL 20/80 in the Birralee-Glengarry area, and west of Deloraine at Dunorlan, (Figure 4).

Pre-Cambrian quartzite north of Beaconsfield and at Hastings in southeastern Tasmania have been used in the manufacture of ferrosilicon. The Mt. Lyell Railway and Mining Company has used Pre-Cambrian quartzite as a smelter flux.

Besser Bricks Ltd., of Ulverstone use quartzite gravel from alluvial fan deposits at Flowerdale which is situated northwest of EL 20/80, for brick manufacture.

BHP held an exploration lease (93M/69) situated north of EL 20/80, which covered the Ordovician strata of Mt. Careless. The peaks of this area are comprised of decomposed and disaggregated quartz sandstone.

Pre-Cambrian and Ordovician quartzite are mainly used for construction materials in EL 20/80.

Ordovician quartzite is quarried from a number of sites in EL 20/80, Figure 4. Production, size fractions and reserves are summarised in Appendix 7.

Pre-Cambrian quartzite outcropping in the Birralee area is currently not quarried, (Figure 4). Large reserves of sandy quartzite occur in the Dunorlan area, (Figure 4).

Potential reserves of silica in EL 20/80 are very large. For further discussion of silica gravels see Section 8.7.2.

10. CONSTRUCTION MATERIALS

Construction materials include gravel and sand, and crushed and broken stone. These two categories of construction material will be discussed separately.

10.1 Crushed and Broken Stone

Crushed rock for aggregate, filling and road construction is generally obtained from Tertiary basalt and Jurassic dolerite in Tasmania.

Production of crushed stone in Tasmania during 1981 - 1982 including limestone not used for cement manufacture, and excluding the Hydro Electricity Commission production was 980,000m^3.

Readymix - BMI is currently the largest producer of aggregates in the Launceston area.

Jurassic Dolerite

Jurassic dolerite outcrops along the margins of the Tertiary Launceston Basin, (Figure 4). The maximum exposed thickness of dolerite in EL 20/80 is 305m.

Dolerite is quarried in the Launceston area, mainly at Mowbray and St. Leonards as an aggregate for concrete or as road construction material.

Production of the various quarries in the Launceston area from 1958 to 1964 inclusive was small, and is shown in Table 4, (Appendix 5).

Tertiary Basalt

Tertiary basalt occurs in several areas within EL 20/80. The main occurrences in the Launceston Basin are in the Campbell Town -Epping Forest area, near Whitemore, Westbury, Selbourne, Rosevale, Westwood, Deloraine, Evandale, Relbia, Breadalbane, White Hills and St. Leonards.

The Loatta and Selbourne deposits and the Hillcrest Prospect, (Figure 5), are overlain by up to 20m of basalt. Following exploratory drilling and field mapping in the brown coal areas the basalt as mapped by the Tasmanian Department of Mines, can be subdivided into decomposed lateritic basalt and relatively unweathered basalt.

Figure 5 shows the distribution of lateritic basalt and relatively unweathered basalt. In these brown coal areas, intersections of fresh and weathered basalt during exploratory drilling are shown in Table 5, (Appendix 6).

The basalt in the Rosevale, Westwood and Selbourne areas is not a prospective source of crushed rock. The basaltic soil produced from weathering of the basalt is intensely cultivated. If crushed rock was required, then dolerite would be used in these areas because areas of dolerite outcrop are not amenable to agriculture. The basalt overburden could be used for construction purposes if the brown coal was mined.

Basalt is quarried at Relbia and Breadalbane. Brambles Transport and Plant Services operate a quarry on the property 'The Springs'. The basalt at this location is slightly weathered and is only suitable for road construction material. The quarry at Relbia is located on the Cocked Hat Hill. The operator of the quarry is W.L. and N.J. Hoggett Cartage Contractors.

A potential source of crushed stone is the hornfelsed Triassic sediments of the Hummocky Hills. The hornfels could be quarried and used as a road construction material. Triassic sandstone has been extensively used as a construction material in the Midlands area of Tasmania.

10.2 Gravel and Sand

Extensive deposits of sand and gravel occur throughout northern Tasmania, and are principally used for road construction and cement requirements.

Production of sand and gravel in Tasmania during the 1981 - 1982 financial year excluding the Hydro Electricity Commission production was 167,000m^3 and 1,130,000m^3 respectively.

10.2.1 Gravel

Tertiary Gravels

Gravel is quarried from the Tertiary conglomerate beds at St. Leonards, Alanvale, Legana and Prospect, and from river terraces and flats near St. Leonards and Relbia.

Further gravel deposits are located north of the Selbourne Deposit. The gravel is deposited on slopes adjacent to the Four Springs Creek. The gravel includes talus derived from Jurassic dolerite, and Permian and Triassic sediments, and minor pisolitic ironstone.

Small gravel deposits are quarried on numerous farming properties where the gravel is produced for domestic use only. A gravel deposit on the property Summer Hall, owned by Mr. D. Viney occurs as overburden to the Pipers Lagoons Deposit, (Figure 4).

Production of gravel in the Launceston area is typical of country areas, and is on a par with some mainland capital cities on a per capita basis. Production of gravel in the launceston area from 1954 to 1965 inclusive is presented as Table 6, (Appendix 7).

Quaternary Gravel

Quaternary gravel occurs as overburden to the Selbourne deposit. This is only a small deposit.

Quartzite Gravel

Quartzite gravels are currently quarried from recent talus deposits throughout EL 20/80, (Figure 4). For further details refer to Section 9.

Quartz gravel is quarried by V. Lockwood in the Birralee area and used as a construction material. The Tasmanian Department of Main Roads quarries Ordovician quartzite at Frankford, for road construction. Quartz gravel is frequently used by the Westbury Shire Council for aggregate.

Sandy quartzite talus is currently quarried at Dunorlan.

Pisolitic Ironstone (Buckshot Gravel)

Pisolitic ironstone (buckshot gravel) gravel deposits occur at Rosevale, Westwood, Black Sugarloaf, the Rufus Lagoons area, Black Hills, Prospect and Trevallyn, (Figure 4).

Pisolitic ironstone originates from meteoric water which leaches iron from a mafic source rock, such as dolerite, and deposits it in the 'B' horizon of a soil profile as nodules or at the water table to form a ferricrete layer.

The pisoliths are concentrated by removal of the clay and soil in which they formed. Deposits of this nature rarely exceed 0.5m in thickness, and are of restricted aerial extent. This material is used for road construction mainly as a surface on unsealed roads.

The Longford Shire Council currently utilise the iron oxide pisoliths from the property Woodstock at Rufus Lagoons. Reserves in this area are unknown. Very small to medium sized deposits are occasionally quarried in the Rosevale area.

Rotary chip hole R011 intersected 7m of ironstone gravel, at a depth of 1.3m. This occurrence in the Westwood area is situated on prime grazing land, and overlies Tertiary basalt.

Lag deposits of pisolitic ironstone are common on the eastern flanks of the Hummocky Hills. These deposits extend southwards through Cleveland and Conara to Campbell Town.

10.2.2 Sand

Sand is used mainly as a fine aggregate in concrete and a dilutant for clay and brick manufacture.

The larger sand deposits of the Launceston area are near Dilston, Swan Bay, Alanvale, Legana and Prospect. Sand is produced from the washing of gravel at Prospect.

Potential sand deposits are located throughout EL 20/80, in particular parallel to the South Esk River and in the Hummocky Hills area.

CSR rotary chip hole R031 which is adjacent to the South Esk River intersected 72m of clayey Tertiary sand. Wind blown and river sand is the dominant outcropping rock type west of the Hummocky Hills Horst, in the Macquarie River area.

11. BASE METAL SULPHIDES

CSR rotary chip hole R027 (Figure 4), intersected pre-Tertiary silicified shale basement at a depth of 8.1m, in the Rufus Lagoons area. The basement may be the Silurian Mathinna Slates. Cassiterite-Wolframite-Sulphide quartz fissure veins occur at Storys Creek and Rossarden in the Mathinna Beds immediately above microgranite cupolas.

The basement rock type intersected may also be the Lower Permian Quarnby Mudstone, which is also pyritic.

The depth to pre-Tertiary basement in the Rufus Lagoons area is generally greater than 100m, and commonly exceeds 150m. The basement rock intersected in rotary chip hole R027 is probably an isolated upfaulted block, of limited aerial extent. At most, its aerial extent is approximately 2 to 3 km^2.

A memo dated 12.11.1982, reference 2.07.01 recommended that a palynological analysis and geochemical analysis for the following elements Cu, Pb, Zn, Sn, and W be undertaken.

The basemetal sulphide potential of this area is small due to the uncertain age of the pre-Tertiary basement and its limited aerial extent.

12. GROUNDWATER RESOURCES

The Tasmanian Department of Mines has conducted an extensive groundwater investigation programme in the Launceston Basin. The majority of water bores in the Launceston basin have been drilled in Tertiary strata.

Groundwater in the Launceston Basin is mainly stored as intergranular water in Tertiary sediments and in fissures of the pre-Tertiary rocks. Water occurring in Tertiary basalt is stored in fissures, vesicles and in weathered zones.

The majority of water bores in the Launceston Basin have been drilled in Tertiary strata.

Tertiary basalt has a high success rate for water bores. Water bores drilled in basalt are concentrated in the Whitemore-Westbury-Hagley area and the Campbell Town -Epping Forest area.

Tertiary sediments contain aquifers at depths of up to 150m. Medium grained sand aquifers occur at a number of stratigraphic levels.

Groundwater suitable for domestic, stock and agricultural use is available from most areas of the Launceston Basin. Areas of no significant groundwater are located under Longford, east of the Hummocky Hills, and on the eastern margin of the Launceston Basin.

Areas of saline groundwater are situated in the Evandale, Epping Forest and Bishopsbourne areas.

Quantities of water available may range from about 1,000 - 2,500m^3 per day in the Cressy Graben, and northern part of the Tamar Graben, and up to 6,500m^3/day in the gravel aquifers of the southern part of the Tamar Graben.

An estimate of the water storage capacity of the Launceston Basin to a depth of 150m is 5.85 x $10^9 m^3$, with approximately 3.9 x $10^9 m^3$ being extractable, (Matthews 1974). This estimate is not the total volume of water available, as recharge from rainwater can be expected.

13. CONCLUSIONS AND RECOMMENDATIONS

Large potential resources of aggregates, silica, clay, and groundwater occur in Precambrian, Ordovician, Silurian, Triassic, Jurassic and Quaternary units in EL 20/80.

Most of the non coal resources of EL 20/80 are presently exploited by small operations. They are usually situated in areas where grazing and cultivation are not viable. In many cases they are operated by the landowner or leased out to local firms who pay the landowner a royalty.

The utilization by CSR Limited of the non coal resources excluding groundwater, in EL 20/80 as outlined in this report will be dependent upon utilization of the present coal deposits and potential coal resources. (Refer to Exploration Licence 20/80 Launceston, Tasmania. A review of the coal resources and prospectivity). Most of the resources and potential resources outlined in this report occur in prime grazing and agricultural areas.

If it is socially and economically essential that the coal resources of EL 20/80 are utilized, then the non coal resources associated with the coal resources will be developed.

The non coal resources of the coal deposits and potential coal areas is summarised in Tables 8 and 9 respectively.

Overburden of the Coal Deposits and Prospects

Kaolinitic clay, basalt and gravel occur as overburden of the Loatta, Pipers Lagoons and Selbourne Deposits.

Preliminary laboratory testing of kaolin clay samples indicates their suitability as a ceramics clay. Further sampling and laboratory testing is required to determine the possible industrial usage of the clay.

The unweathered basalt is a potential hard rock aggregate, and could be used in conjunction with locally available gravels for construction purposes if the area was mined.

TABLE 8

Non Coal Resources of Coal Deposits in EL 20/80

Potential Non Coal Resource of Coal Deposit

Coal Deposit	Construction Materials				
	Clay	Crushed Stone	Gravel	Sand	Other
Pipers Lagoons	Kaolinitic	Dolerite	Quartz Pisolitic-Ironstone	Quaternary Quartz sandy loam	Water
Loatta	Kaolinitic	Basalt Dolerite	Pisolitic-Ironstone		Water
Hillcrest Prospect		Basalt Dolerite		Quaternary Quartz sand	Water

TABLE 9

Non Coal Resources of Potential Coal Areas in EL 20/80

Potential Non Coal Resource of Area

Potential Coal Area	Construction Materials				Other
	Clay	Crushed Stone	Gravel	Sand	
Hillcrest	Kaolinitic	Basalt Dolerite			Water
Longford		Dolerite		Tertiary Sand	Water
Breadalbane	Kaolinitic	Basalt Dolerite	Gravel	Tertiary Sand	Water
Carrick		Dolerite		Tertiary Sand	Water
Rufus Lagoons		Dolerite	Pisolitic- Ironstone	Tertiary Sand	Water Base Metal Sulphides
Henrietta Plains		Basalt Dolerite		Tertiary Sand Quaternary Sand	
Hummocky Hills		Basalt Dolerite Triassic Horn- fels	Pisolitic Ironstone	Quaternary Sand	Water
Birralee, Bridgenorth- Glengarry		Quartzite	Quartzite Gravel		Silica

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Overburden of the Potential Coal Areas

Construction materials commonly occur as overburden or close to the potential coal areas of EL 20/80. Basalt and dolerite are the dominant rock types and can be used to produce crushed stone. Tertiary and Quaternary sands and gravel are common in the region between the Hummocky Hills and Campbell Town. The non coal resources occurring as overburden to potential coal areas should be assessed during future drilling programmes.

Groundwater

Groundwater suitable for domestic stock and agricultural use is available from most areas of the Launceston Basin. Quantities of water available range from 1,000 - 6,500m^3 per day.

The water storage capacity of the Launceston Basin is large. Approximately 3.9 x 109m^3 of water is extractable down to a depth of 150m.

Other Resources

The resource potential of EL 20/80 for bauxite, barite, diatomaceous earth, ochre and base metal sulphides is small.

An area of 1,385km^2 considered to have no coal potential is recommended for relinquishment in the report 'Exploration Licence 20/80 Launceston, Tasmania. A review of the Coal Resources and Prospectivity'. When this area is relinquished it will not effect exploration for non coal resources. It is unlikely that CSR Limited will explore for non coal resources unless they occur as overburden to potential coal areas, (Figure 6).

A separate exploration licence is required to explore for non coal resources in Tasmania. It is not recommended that a separate exploration licence be applied for to explore for non coal resources, as they can be assessed during coal exploration.

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APPENDIX 1

Kaolinitic Clay Intersections in the Overburden of the Loatta, Pipers Lagoons and Selbourne Brown Coal Deposits.

APPENDIX 1

TABLE 1

Summary of Kaolinitic Clay Intersections in the Overburden of the Loatta, Pipers Lagoons and Selbourne Brown Coal Deposits of EL 20/80 Launceston.

Borehole	Depth to Top of Clay	Thickness	Colour	Zone of Laterite Profile
R 002	2.5	0.3	Mottled grey and buff	Mottled
R 004	0	4.0	Mottled grey, yellow and brown	Mottled
R 004	4.0	4.4	Mottled grey, yellow and brown, Bands of yellow silt	Mottled
R 020	3.9	1.1	Mottled grey and yellow	Mottled
R 020	5.0	2.0	Mottled cream and yellow	Mottled
R 021	0.5	2.0	Mottled cream and yellow	Mottled
R 021	2.5	0.7	Mottled white and cream	? Pallid
R 021	3.2	1.8	Mottled white and cream	? Pallid
R 021	5.0	7.85	Mottled cream and yellow	? Mottled
R 065	4.5	6.0	Mottled grey, blue, yellow & pink	Mottled
R 065	6.0	1.5	Light grey, white and yellow	Mottled
R 065	7.5	2.5	Light grey-white	Pallid
R 065	10.0	2.5	Light to mid grey-white	Pallid
R 067	3.0	0.5	Light to mid grey-white	Pallid
R 068	1.0	1.0	Mottled yellow and grey	Mottled
R 069	4.2	0.9	Mottled orange, pink and grey	Mottled
R 070	2.0	4.3	Mottled grey, pink and yellow	Mottled
R 070	6.3	0.7	Light to mid grey	? Pallid
R 071	4.0	1.0	Light white and off white	Pallid
R 072	1.0	1.5	Mottled cream and yellow	Mottled
R 073	3.0	1.0	Mottled grey, yellow and pink	Mottled
R 074	2.4	1.0	Mottled grey and pink	Mottled
R 079	2.0	1.0	Mottled grey, white, orange and yellow	Mottled
R 081	1.1	1.7	Mottled grey, pink and yellow	Mottled
R 082	21.3	2.2	Mottled blue and grey	? Pallid
R 083	4.5	1.0	Light white - off white	? Pallid
R 083	5.5	0.7	Mottled off white-white, yellow and brown	? Pallid

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APPENDIX 2

Clay Mineralogy of Clay Samples taken from Tasmanian Department of Mines Gound Water Investigation Holes.

(Tables from Matthews, 1974)

Hole	Depth (m)	Montmorillonite		Illite		Kaolinite		Gibbsite		Quartz	
		Area (mm^2)	%	Area (mm^2)	%	Area (mm^2)	%	Area (mm^2)	%	Area (mm^2)	%
OP 1	274	228	12			653	69			351	19
OP 2	365.8	648	53			256	42			72	6
IH A	9.1-11.9			39	15	266	52			330	32
IH 2	10.7					228	58			324	42
	86.9	154	5	46	7	1080	77	54	2	245	9
	146.3					231	87			72	13
IH 15	12.2	trace?		trace?		425	82			189	18
	74.7*			53	8	1035	78			221	8
	152.4					432	92			72	8
IH 21	7.6					160	77			95	23
	56.4			68	23	390	65			147	12
	144.8					108	49			221	51
IH 36	24.4+					360	59			450	37
	59.4	56	4			560	89			83	6
	152.4					256	57			391	43
	187.5			55	8	1080	83			229	9
IH 44	18.3			190	14	2250	81			263	5
	112.8					195	84			72	16
	167.6	41	3			546	91			65	5
IH 50	12.2	480	64			117	31	10	1	30	4
	19.8	180	59			45	30	8	3	25	3
	33.5	176	29			198	64	18	3	26	4
	42.7	152	44			83	49	12	4	12	4
	61.0	33	3			598	93	25	2	32	3
	91.4	56	4			588	93			30	2
	103.6	75	10			306	84			43	5.9
	131.1	39	22			117	67			36	10
IH 51	0 - 1.5					146	85			52	15
	4.6-6.1					228	88			60	12
	9.1-10.7					252	93			40	7
	30.5					240	95			25	5
	61.0					169	91			35	9
	91.4					154	91			29	9
	118.9	63	5			585	92			45	4
	137.2	72	7			434	90			30	3
IH 52	0 - 1.5					140	89			34	11
	9.1					113	86			38	14
	18.3	45	5			377	90	15	2	26	3
	29.0	59	9			286	87			26	4
	45.7	78	13			238	81			33	6
IH 57	6.1					207	62			252	38
	61	77	4	68	13	736	71			263	13
IH 68	1.5-3.0	188	17	90	33	162	29			228	21
	47.2					350	74	56	6	188	20

* undetermined peak at 2θ = 14.15°, 162mm^2, 6%

\+ undetermined peak at 2θ = 14.3°, 42mm^2, 3%

APPENDIX 2

Hole	Depth (m)	Montmorillonite		Illite		Kaolinite		Gibbsite		Quartz	
		Area (mm^2)	%	Area (mm^2)	%	Area (mm^2)	%	Area (mm^2)	%	Area (mm^2)	%
OP 1	274	228	12			653	69			351	19
OP 2	365.8	648	53			256	42			72	6
IH A	9.1-11.9			39	15	266	52			330	32
IH 2	10.7					228	58			324	42
	86.9	154	5	46	7	1080	77	54	2	245	9
	146.3					231	87			72	13
IH 15	12.2	trace?		trace?		425	82			189	18
	74.7*			53	8	1035	78			221	8
	152.4					432	92			72	8
IH 21	7.6					160	77			95	23
	56.4			68	23	390	65			147	12
	144.8					108	49			221	51
IH 36	24.4+					360	59			450	37
	59.4	56	4			560	89			83	6
	152.4					256	57			391	43
	187.5			55	8	1080	83			229	9
IH 44	18.3			190	14	2250	81			263	5
	112.8					195	84			72	16
	167.6	41	3			546	91			65	5
IH 50	12.2	480	64			117	31	10	1	30	4
	19.8	180	59			45	30	8	3	25	3
	33.5	176	29			198	64	18	3	26	4
	42.7	152	44			83	49	12	4	12	4
	61.0	33	3			598	93	25	2	32	3
	91.4	56	4			588	93			30	2
	103.6	75	10			306	84			43	5.9
	131.1	39	22			117	67			36	10
IH 51	0 - 1.5					146	85			52	15
	4.6-6.1					228	88			60	12
	9.1-10.7					252	93			40	7
	30.5					240	95			25	5
	61.0					169	91			35	9
	91.4					154	91			29	9
	118.9	63	5			585	92			45	4
	137.2	72	7			434	90			30	3
IH 52	0 - 1.5					140	89			34	11
	9.1					113	86			38	14
	18.3	45	5			377	90	15	2	26	3
	29.0	59	9			286	87			26	4
	45.7	78	13			238	81			33	6
IH 57	6.1					207	62			252	38
	61	77	4	68	13	736	71			263	13
IH 68	1.5-3.0	188	17	90	33	162	29			228	21
	47.2					350	74	56	6	188	20

* undetermined peak at 2θ = 14.15^{o}, $162mm^2$, 6%

\+ undetermined peak at 2θ = 14.3^{o}, $42mm^2$, 3%

APPENDIX 2

Clay Mineralogy of DH 3, Cressy

Depth (m)	Illite		Kaolinite		Gibbsite		Quartz	
	Area (mm^2)	%	Area (mm^2)	%	Area (mm^2)	%	Area (mm^2)	%
12.9-14.5	17.5	26	88	65			24	9
22.4-23.1			66	85			24	15
25.6-26.2			66	84			25	16
32.3-33.8			75	86			24	14
55.3-56.8			120	88	18	7	14	5
79.7-81.1			360	92			63	8
75.1-76.2			96	91			18	9
75.1-76.2	10	6	280	84			68	10
129.8-130.1	21	6	672	91			43	3
130.1-130.8	18	4	735	92			60	4
138.7	15	3	788	91			95	6
141			238	81			108	19

Clay Mineralogy of DH 4, White Hills

Depth (m)	Montmorillonite		Illite		Kaolinite		Gibbsite		Quartz	
	Area (mm^2)	%	Area (mm^2)	%	Area (mm^2)	%	Area (mm^2)	%	Area (mm^2)	%
10.31-10.68	40	50			10	25	6	8	14	18
24.38-24.78	522	90			18	6			25	4
25.08-25.38	168	60	9	13	27	19			23	8
34.6-35.5	203	55	12	13	32	17			53	14
35.51-37.02	248	89			9	7			11	4
46.01-47.53	195	67			30	21	6	2	30	10
48.18-49.05	18	7			98	73	25	9	28	11
48.18-49.05	75	15			187	74	25	5	33	7
49.05-50.57	115	36			78	49	25	8	25	8
50.57-52.09	28	7			143	76	25	7	40	11
52.74-53.61	91	22			135	65	28	7	26	6
55.13-56.65	293	25			390	67	50	4	145	4
56.65-58.17	66	11			196	66	22	4	118	20
59.69-61.61	288	28			360	69	26	3	15	1
61.61-63.13	113	52			83	38	25	6	20	5
63.13-64.65	224	40			147	52	26	5	23	4
64.65-66.17	297	45			154	47	36	6	14	2

APPENDIX 3

Clay Producers and Clay Production of the Launceston Area, 1958 to 1964 inclusive.

APPENDIX 3

TABLE 2

Clay Producers and Clay Production of the Launceston Area, 1958 to 1964 inclusive.

Company Producer	Production (m^3)
Machen Bricks Ltd.	73,253
Kings Meadows	
Huttons Bricks P/L	58,910
Prospect	
McHugh's Brick P/L, (now Humes)	14,717
Prospect Vale	
John Campbell P/L	3,138
Launceston	
G.R. Wise, Young Yown	954

APPENDIX 4

Analysis of Red and Yellow Ochres from the Mowbray Deposit.

APPENDIX 4

TABLE 3

Analysis of red and yellow ochres from the Mowbray deposit.

		Red Ochre %	Yellow Ochre %
Sample 1	Iron sesquioxide	45.28	42.62
	Alumina	13.72	8.78
	Silica	32.40	39.52
	Magnesia	1.84	1.50
	Lime	0.91	1.28
	Water	5.60	5.80
		Analyst: W.D. Reid	

		Red Ochre %	Yellow Ochre %
Sample 2	Iron Oxide	55.555	43.678
	Silica	37.5	40.613
	Alumina	4.166	9.195
	Magnesium & Calcium Salts	1.388	2.683
	Combined Water	1.389	3.831
		Analyst: A. Flounders	

APPENDIX 5

Producers and Production of Crushed Dolerite in the Launceston Area 1958 to 1964 inclusive.

APPENDIX 5

TABLE 4

Producers and production crushed dolerite in the Launceston area 1958 to 1964 inclusive.

PRODUCER	PRODUCTION (m^3)
Launceston Quarries, Mowbray	184,794
G. Rouse, St. Leonards	63,159
E.C. McHugh, Launceston	14,228
Launceston Corporation Quarry, Launceston	10,856
R.K. Sulzburger, Launceston	2,034

APPENDIX 6

Basalt Overburden to the Loatta and Selbourne Deposits intersected during exploratory drilling.

APPENDIX 6

TABLE 5

Summary of basalt intersections by CSR Limited in EL 20/80.

Borehole Number	Depth	Thickness	Lithology
R 011	8.3	14.2	Basalt
R 024	0	4.5	Weathered Basalt
	4.5	18.2	Basalt
R 026	0.9	3.6	Basalt
R 078	0	4.5	Weathered Basalt
R 080	0	12.6	Basalt
R 082	0	0.2	Weathered Basalt
	0.2	11.3	Basalt
R 088	0	2.0	Weathered Basalt
	2.0	4.0	Basalt, did not penetrate to base of basalt
R 092	0	1.6	Weathered Basalt
	1.6	17.2	Basalt
R 093	7.5	7.3	Basalt, contains zeolite infilling
	16.0	7.5	" "

APPENDIX 7

Gravel and Sand Production and Producers in EL 20/80 Launceston.

APPENDIX 7

TABLE 6

Production of gravel in the Launceston area from 1954 to 1965 inclusive.

Gravel Producer	Gravel Production (m^3)
Clays P/L, Launceston	9,646
E.B. Watchorn Estate, Prospect	3,676
E.C. McHugh, Launceston	1,555
J. Wise, Young Town	710
A.V. Watts, Launceston	352

APPENDIX 7

TABLE 7

Summary of size fractions, reserves, and production of some gravel and sand producers in EL 20/80.

	Name	Locality	Dust Ratio	Liquid Limit	Plasticity Index	Linear Shrink	Classification	Material
1.	Cartwright	Bridgenorth	0.87	39	21	10	SC - GC	Ironstone
2.	Macrow	Dunloran	0.50	-	Non plastic	-	SMD	Sandy quartzite
3.	Atkins	Dunloran	-	-	-	-	-	Sandy quartzite
4.	D.H. Johnston	Bridgenorth	0.52	21	5	3	SM - SC	Gravelly loam
5.	V. Lockwood	Birralee Road	0.34	-	Non Plastic	-	GP - GM	Quartz Gravel
6.	Jones	Ecclestone Road	0.85	26	7	3	SM - SC	Ironstone

	Sizing Analysis								
	Cumulative % passing (mm)								
	53	37.5	26.5	19	9.53	4.76	2.36	0.425	0.095
1.				100	95	69	46	42	36
2.	100	96	92	88	75	60	50	35	18
3.	100	98	88	83	76	67	58	39	14
4.				100	98	84	73	69	25
5.	100	97	87	77	57	44	38	26	9
6.				100	99	92	67	48	41

	STATUS	Estimated Production (m^3)	Reserves
1.	D	500	Nil - VS
2.	FW	1,000,000 +	VL
3.	FW	500,000	L
4.	OW	2-4,000	M
5.	OW	100,000	L
6.	OW	2,000	M

Locations 1 to 6 inclusive are shown on Figure 4

Classification

S = sand, C = clay, G = gravel, W = well graded,
P = poorly graded, L = low plasticity, M = mixed non-clay fines,
D = suitable plasticity.

Reserves

L = large, M = moderate, S = small, V = very

Status

D = disused, OW = occasionally worked, FW = frequently worked,
R = rehabilitated.

Compiled from Tasmania 1:100 000 Topographic Survey Series 8215 Tamar, 8315 St Patricks, 8314 South Esk, 8214 Meander Edition 3 1979

SCALE 1:100,000

2 1 0 2 4 6 8 10

5cm

GRID CONVERGENCE 0.2°

GN TN MN

GRID MAGNETIC ANGLE 13.1°

TRUE NORTH, GRID NORTH AND MAGNETIC NORTH ARE SHOWN DIAGRAMMATICALLY FOR THE CENTRE OF THE MAP. THE MAGNETIC NORTH CORRECT FOR 1979 AND MOVES EASTERLY BY 0.1° IN ABOUT THREE YEARS.

LEGEND

HIGHWAY SEALED, UNSEALED
ROAD SEALED, UNSEALED
RAILWAY
POWER TRANSMISSION LINE

LOCALITY MAP

Devonport
Launceston
EL 20/80
Queenstown
TASMANIA
HOBART

SCALE
50 0 50
Kilometres

LEGEND

QUATERNARY	Qs	Windblown and locally derived sand.
	Qt	Talus and Scree.
TERTIARY	Tg	Quartz sand and gravel.
TERTIARY–QUATERNARY	T-Q	Log deposits of ferruginous buckshot gravel and ferricrete including laterite and minor bauxite rich areas.
TRIASSIC	Rm	Shale with quartz and lithic sandstone.
	Rs	Dominately quartz sandstone.
ORDOVICIAN–SILURIAN –DEVONIAN ?	O-D	Quartzite and slaty siltstone with quartzite conglomerate.
ORDOVICIAN	Oo	Siliceous sandstone and conglomerate.
	Oct	Quartzite and, siltstone.
PRE-COAMBRIAN	Pb	Phyllite and orthoquartzite.

C033 CSR drillhole, coal cored.
R025 CSR drillhole, chip sampled.
Outline of the Longford Basin, after Mathews 1974.
Quarry - road stone
Quarry - building stone
Quarry - gravel
Quarry - clay

CSR Limited Coal Division	EXPLORATION AND EVALUATION GROUP		CSR
DRAWING	DATE	EL 20/80 LAUNCESTON NON COAL RESOURCES FACT MAP	SCALE 1:100 000
DRAWN B.A.W.	JULY'81		FIGURE 4
CHECKED			DRAWING No. 70020-114
REVISED S.M.C.	June'82		

LEGEND

- Highway, sealed road
- Unsealed road, vehicular track, lane
- Railway
- "Farville" Homestead
- Drain
- C033 CSR drillhole coal cored
- R009 CSR drillhole chip sampled

QUATERNARY

- Qa — Alluvium, terrace deposits, marsh and swamp deposits, boulder beds and gravel.
- Qs — Windblown and locally derived sand.
- Qt — Talus and Scree – Basalt (Qtb)

TERTIARY – QUATERNARY

- T-Q — Lag deposits of ferruginous buckshot gravel (Quaternary) and ferricrete including laterite and minor alumina rich areas (Tertiary).

TERTIARY

- Tl — Clay, sandy clay, unconsolidated and poorly consolidated sand and minor gravel horizons.
- Tg — Quartz sand and gravel – partly consolidated, some dolerite gravel (Tgd) and silica stone greybilly and silcrete ? (Tsil).

TRIASSIC

- R —

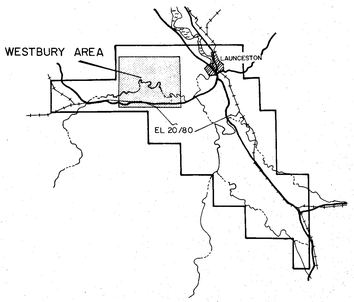
PERMIAN

- Pu — Upper freshwater sequence (Jackey Formation and correlates) and upper glacio-marine sequence of pebbly mudstone and pebbly sandstone.

IGNEOUS ROCKS

- Tb — Tertiary basalt.
- Tb — Decomposed Basalt, contains large basalt boulders (Mapped by CSR)
- Tb — Subsurface Basalt - Below Weathered and Decomposed Basalt intersected in CSR exploratory drillholes
- Tb — Outcropping Basalt (Mapped by CSR)
- Tb — Outcropping Basalt (Mapped by Tasmanian Department of Mines)

NOTE Geology from Tasmania Department of Mines 1:100 000 sheet Longford Basin Geology (1974)



KEY SHEET DIAGRAM
(TASMANIAN 1:25 000 TOPO. SERIES)

PARKHAM	BRIDGENORTH	LAUNCESTON
DELORAINE	WESTBURY	PROSPECT

GRID CONVERGENCE 0.2°
GRID MAGNETIC ANGLE 13.0°
TRUE NORTH GRID NORTH AND MAGNETIC NORTH ARE SHOWN DIAGRAMMATICALLY FOR THE CENTRE OF THE MAP. MAGNETIC NORTH IS CORRECT FOR 1980 AND MOVES EASTERLY BY 0.1° ABOUT EVERY THREE YEARS

SCALE 1:25 000
1.0 0.5 0 0.5 1.0 1.5 2.0
Kilometres
5 cm

CSR Limited Coal Division	EXPLORATION AND EVALUATION GROUP	CSR
DRAWN C. J. — Dec. '82	EL 20/80 LAUNCESTON NON COAL RESOURCES FACT MAP OF THE WESTBURY AREA	SCALE 1:25000
CHECKED		FIGURE 5
REVISED		DRAWING No. 70020 – 113

587189

PROPOSED AREA TO BE RELINQUISHED

AREA TO BE RETAINED

PROPOSED AREA TO BE RELINQUISHED

BOUNDARY EL 20/80

LAUNCESTON

Deloraine

Westbury

Hadspen

Carrick

Perth

Longford

Evandale

Western Junction

Bracknell

Cressy

Campbell Town

St Leonards

Prospect

Relbia

Powranna

BRIDGENORTH

BIRRALEE

BLACK SUGARLOAF

DUNORLAN

MEANDER RIVER

BASS HIGHWAY

LAKE HIGHWAY

TASMAN HIGHWAY

MIDLAND HIGHWAY

SOUTHERN HIGHWAY

ESK RIVER

SOUTH ESK RIVER

ST PATRICKS RIVER

MACQUARIE RIVER

WESTWOOD

WHITEMORE

BISHOPSBOURNE

QUAMBY BROOK

BLACKSHILL

HADLEY

RUFUS LAGOONS AREA

Woodstock

Summer Hill

Oakleigh

MELBOURNE

LIPPIS LAGOON

LAKE TREVALLYN

TREVALLYN

Cataract Gorge

MOWBRAY

MT BARROW

The Springs

Lignite

COCKED HAT HILL

BREADALBANE

Launceston Airport

HUMMOCKY HILLS

DIPROSE LAGOON

MILLERS BLUFF

GREAT WESTERN TIERS

GREAT LAKE

ARTHURS LAKE

LAKE AUGUSTA

LAKE FERGUS

DOUBLE LAGOON

OUSE RIVER

Rivulet

Weston

MEANDER RIVER

For full details of drillholes in this area see 1:25 000 Sheet

5360000mN

460000mE

146°30'

147°00'

42°00'

LOCALITY MAP

Devonport

Launceston

EL 20/80

Queenstown

TASMANIA

HOBART

SCALE

50 0 50

Kilometres

LEGEND

QUATERNARY	Qs	Windblown and locally derived sand.
	Qt	Talus and Scree.
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ORDOVICIAN	Oo	Siliceous sandstone and conglomerate.
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CD33 CSR drillhole, coal cored.

RC25 CSR drillhole, chip sampled.

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Quarry - gravel

Quarry - clay

Compiled from Tasmania 1:100 000 Topographic Survey Series 8215 Tamar, 8315 St Patricks, 8314 South Esk, 8214 Meander Edition 3 1979

SCALE 1:100 000

5cm

GRID CONVERGENCE 0.2°

GRID/MAGNETIC ANGLE 13.1°

TRUE NORTH, GRID NORTH AND MAGNETIC NORTH ARE SHOWN DIAGRAMMATICALLY FOR THE CENTRE OF THE MAP. MAGNETIC NORTH IS CORRECT FOR 1978 AND MOVES EASTERLY BY 0.1° IN ABOUT THREE YEARS

LEGEND

HIGHWAY SEALED, UNSEALED

ROAD SEALED, UNSEALED

RAILWAY

POWER TRANSMISSION LINE

CSR Limited Coal Division	EXPLORATION AND EVALUATION GROUP	CSR
DRAWN C.J.	DATE Dec '82	
CHECKED		
REVISED		

EL 20/80 LAUNCESTON

PROSPECTIVE NON COAL RESOURCES AND AREAS WHICH CAN BE RELINQUISHED

SCALE 1:100 000

FIGURE 6

DRAWING No 70020-116

587190