

597001

PRELIMINARY ASSESSMENT OF RESOURCES AND
UTILIZATION POTENTIAL OF BROWN COAL
IN THE ROSEVALE COALFIELD
(EXPLORATION LICENCE 20/80 LAUNCESTON)

BRIEFING PAPER FOR
THE TASMANIAN GOVERNMENT

MARCH, 1983

BRIEFING PAPER OBJECTIVE

To inform the Tasmanian Government of CSR's progress in the evaluation of the brown coal deposits located in the Rosevale Coalfield which represent a potential fuel source for a conventional brown coal fired power station.

Currently, indicated reserves of 118 million tonnes have been outlined in the Loatta, Pipers Lagoons and Selbourne deposits and brown coal has also been intersected in a further five areas. Further geological and engineering evaluation work needs to be undertaken to establish measured reserves, carry out combustion testing, assess geotechnical and ground water conditions, establish infrastructure costs and assess environmental aspects.

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SUMMARY

The Rosevale Coalfield is centred approximately 25 km west by road from Launceston in the area held by CSR under Exploration Licence 20/80 (see Figure 1). The coalfield currently consists of three separate deposits (Loatta, Pipers Lagoons and Selbourne - see Figure 4). A number of coal prospects have also been identified, (including the nearby Hillcrest Prospect) in an exploration programme that has included evaluation of gravity survey data, water bore drilling records as well as drilling programmes by CSR to test specific areas of interest. A total of 106 rotary holes and 16 cored holes have been drilled to date by CSR in EL 20/80.

The Rosevale deposits lie close to the surface in fresh water sediments of Tertiary age. Tertiary basalts overlies sections of the Loatta and Selbourne deposits.

Coal occurs in four major horizons of which the three nearest the surface are considered to be economically mineable. These upper horizons, comprising up to nine seams, have been used in the calculation of geological and mining reserves. Individual seams range from 1.5m to 8.5m thick at depths from 4m to 74m. Most coal is covered by less than 60m of overburden and a significant amount by less than 30m of overburden. The coal seams are almost flat lying or dip gently at less than 2 degrees. Local increases in dip occur towards the deposit margins.

Preliminary mining studies indicate that the most suitable coal supply arrangement is to mine the Loatta deposit first and then transfer mining to the Pipers Lagoons deposit. Open cut mining by bucket wheel excavator (BWE) is the preferred option, but mining by scrapers and shovel and truck methods were also evaluated.

2.

Initially, overburden, coal and partings would be dug by the same BWE and carried out of pit by a common conveyor system. A single BWE - bandwagon arrangement would be sufficient initially but later in the project life as total overburden thickness increases, a second BWE with bandwagon and separate conveyor system would be required.

This type of mining operation would allow selective mining of coal over full seam intervals and thereby achieve maximum economic coal recovery and greatest quality control.

In situ quality determined from analysis* of drill core samples from the 3 brown coal deposits is:

Total Moisture	47%
Ash	22%
Volatile Matter	18%
Fixed Carbon	13%
Specific Energy	7.5 MJ/kg
Sulphur	0.15%

*Based on a 50% dry basis ash cut-off.

In terms of heat value the coal is similar to brown coals used for commercial power generation in Australia and overseas. A preliminary coal quality evaluation by boiler manufacturers and consultants indicates that while specific design features common for high ash brown coals will be required, a plant designed for Rosevale coal should not experience unusual design or operating difficulties. Commercially proven modern power station technology would be used throughout.

3.

Quality testing shows the coal to be a soft brown coal with typical moisture content and high ash. Sulphur, sodium and chlorine are low, indicating that during combustion the coal should not cause any major ash deposition corrosion or emission difficulties.

A conceptual power station size of 240 MW (2 x 120 MW) was selected for this study as being suitable for the Tasmanian grid. Coal requirements were estimated for such a power station to peak at 2.33 million tonnes per annum and total 53 million tonnes over a nominal project life of 30 years.

Although a 2 x 120 MW station size was chosen for the initial study, smaller units of 80 MW are technically and commercially feasible. A second study, examining the mining of coal for a 320 MW station has therefore been undertaken. In this case one 80 MW unit per annum would be added to the plant until a 4 x 80 MW power station was completed. The reserves requirements for one 80MW unit would be approximately 17 million tonnes over a 30 year period. Mining of the Pipers Lagoons deposit would therefore be required late in the mine life.

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. If a mine site station is chosen, 4,000 - 5,000 ML/a of good quality water from an existing or new supply would be required.

4.

Manning for the construction and operational phases of the project would require a significant number of skilled people. The total construction workforce is estimated to peak at 700 (110 for the mine and 590 for the power station). The operational manning would be constant at 335 over the project life (175 for mine, 160 for the power station).

There do not appear to be any environmental considerations that would prevent a mine and power station development in the area. The coal has a very low sulphur level, indicating that SO₂ emissions would not be significant.

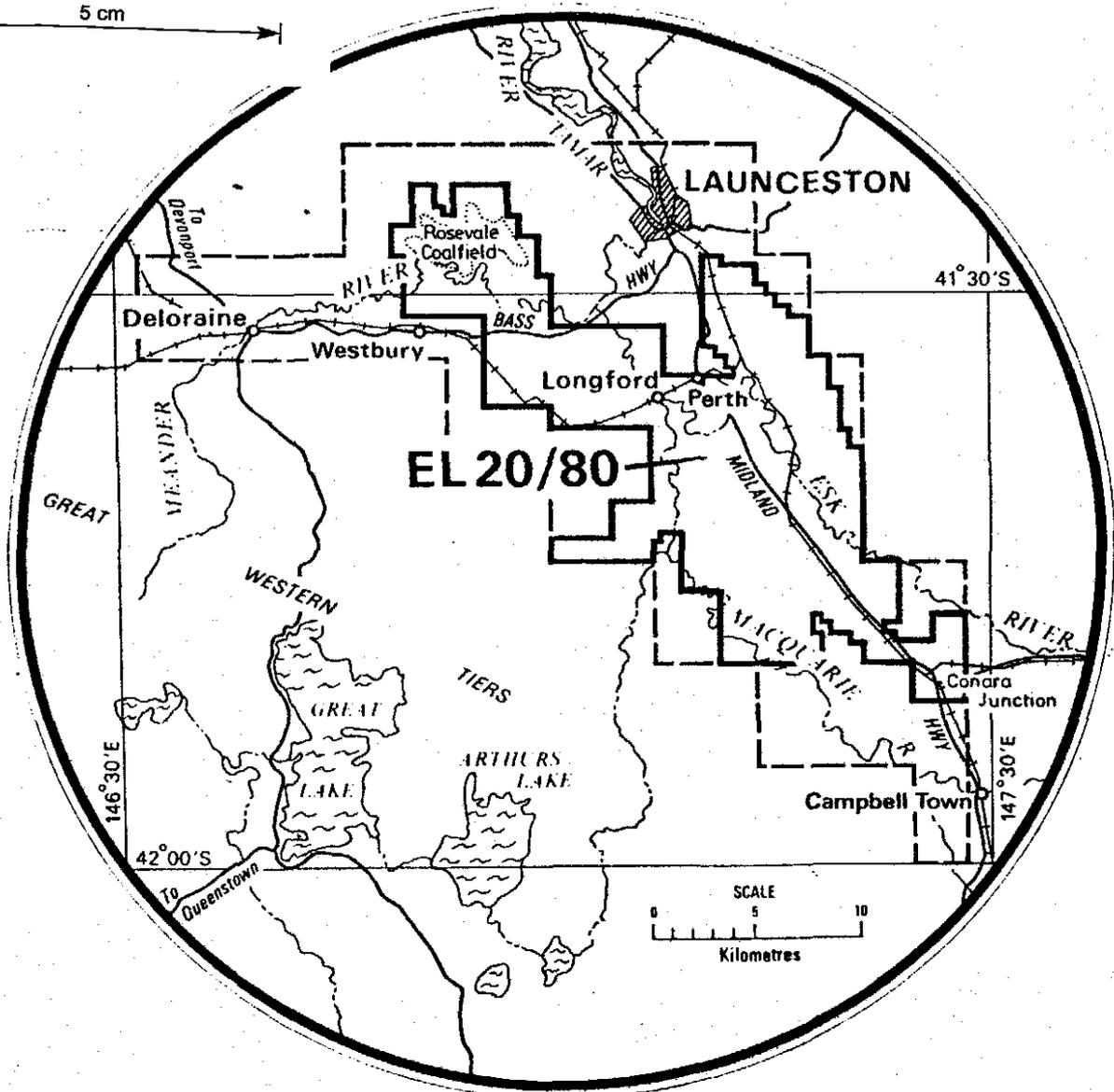
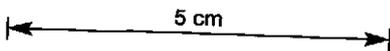
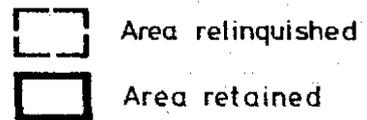
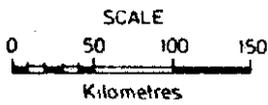
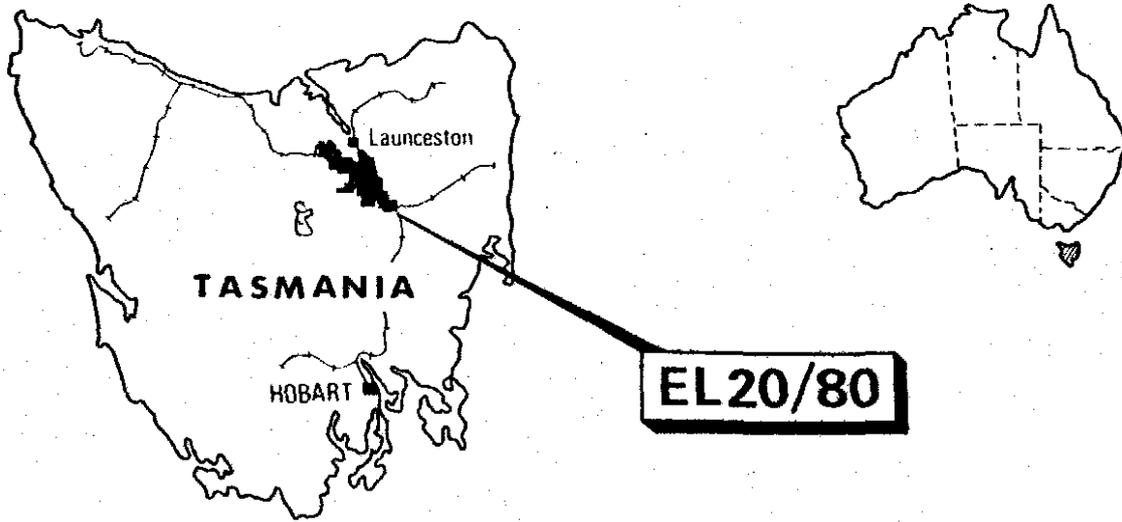
GEOLOGY & RESERVESIntroduction

The Rosevale Coalfield is located 25 km by road west of Launceston and 6 to 8 km north of the town of Westbury. (Figure 1).

Exploration title to the area is currently held by CSR Limited (100%) under Exploration Licence 20/80. The EL was originally granted to AAR Limited, a wholly owned subsidiary of CSR, on the 19th September, 1980 to explore for oil shale over a 2,339 km² area of the Launceston Basin. The licence was recently transferred from AAR to CSR following a rationalisation of exploration tenements within the group.

Exploration work carried out on the tenement to date has enabled 1,385 km² of unprospective ground to be relinquished (February, 1983) leaving a 954 km² area of interest which extends from just south of Launceston, south to Conara Junction, and west to Westbury.

Climate in the region is temperate with a rainfall average of 850mm per year, falling mostly in the winter months. The country is flat to gently undulating. Current land use includes sheep and cattle grazing and intensive cultivation.



**EXPLORATION LICENCE 20/80
TASMANIA**

Geological Setting of Tasmania's Coal Measures

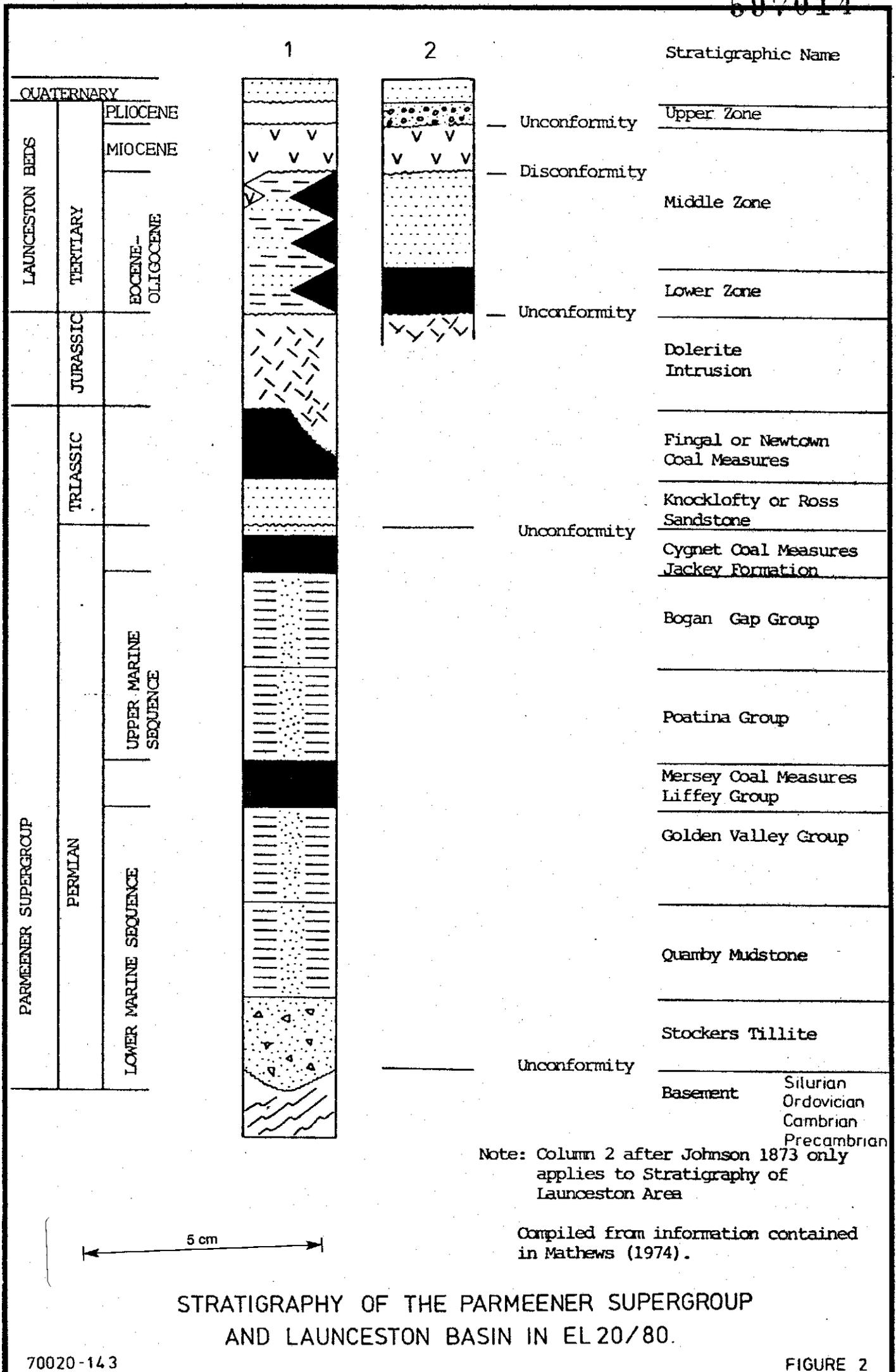
The principal coal measure sequences present in Tasmania were deposited in two geological periods (Figure 2):

1. The Permo-Triassic Parmeener Supergroup which contain black coals deposited some 200 to 250 million years ago. Coals mined in the Fingal Valley from the Duncan and Blackwood Collieries belong to this sequence, and
2. Much younger Tertiary sediments ranging from 2 to 65 million years in age which contain small irregular deposits of brown coal located principally in the northern portion of the Launceston Basin, near Launceston.

Both coal measure sequences outcrop in the area covered by EL 20/80.

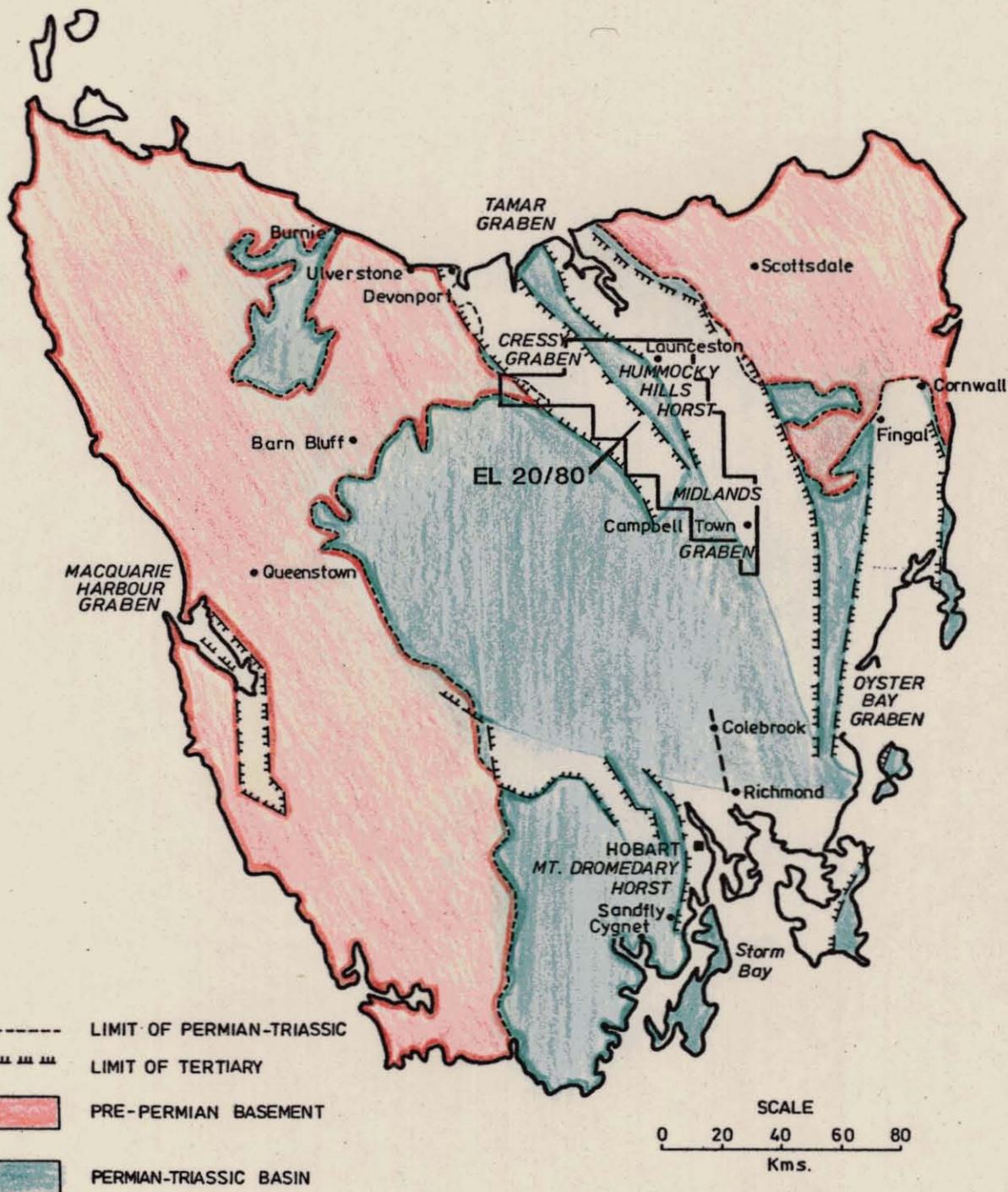
Coal Occurrences within EL 20/80

Outcrop of the Parmeener Supergroup within EL 20/80 is confined primarily to the north-westerly trending Hummocky Hills and hills to the north of Perth. (Figure 3). Coal seams are not present in this area to the same extent as in the Fingal Valley. Late last century and early this century several attempts were made to mine thin coal seams present in this sequence between Longford and Hadspen. The Pateena mine was the only mine to produce a recorded tonnage of coal, some 800 tons, during the period 1916 - 1919. The thinness of the seams, combined with the effects of erosion, weathering, dolerite intrusion and limited area of accessible coal, restricted further development.



5 cm

BASS STRAIT



- LIMIT OF PERMIAN-TRIASSIC
- ||||| LIMIT OF TERTIARY
- PRE-PERMIAN BASEMENT
- PERMIAN-TRIASSIC BASIN

SCALE
0 20 40 60 80
Kms.

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

Tertiary brown coals have previously been recorded in outcrop from several areas across the northern portion of EL 20/80, particularly in the Breadalbane - Relbia - St. Leonards area (to the east and north of Launceston airport) and in the Rosevale area, to the west of Launceston. Attempts were made to mine the coal in the bank of the North Esk River, 9 km south of St. Leonards and also at Rosevale, where limited mining was carried out early this century in shallow shafts and short tunnels. Production figures for these workings is not known.

Exploration by CSR Limited

During the 2 ¹/₂ years EL 20/80 has been in existence, AAR and CSR Coal Division geologists have collated data from previous exploration for oil, coal and uranium in the region. The results of a gravity survey and ground water resources drilling programmes carried out by the Tasmanian Department of Mines were also used in combination with aerial photo interpretation to identify exploration targets within the tenement area.

Three exploration drilling programmes totalling 106 rotary holes and 16 partly cored holes have been drilled by AAR and CSR to test the target areas. Metreages drilled in the programmes total 6,499.5m of open hole and 388.8m of 100mm and 63mm diameter core. Wireline geophysical logs were run in 100 of the drill holes.

Of these drill holes 8 rotary and 2 partly cored holes were drilled within the area relinquished in February, 1983.

To date three deposits of brown coal have been located in the Rosevale area and a further five prospective areas have been identified by scout drilling within the remainder of the EL.

11.

Monitoring of static ground water conditions at Rosevale has also been carried out in co-operation with officers from the Mines Department's Hydro-Geology and Regional Mapping Section to provide basic data for a geotechnical study of the area.

Laboratory testing and analysis of some 362 coal and non-coal ply samples and 13 composite seam samples from the deposits have been completed to date to provide information on the quality of the coal.

Rosevale Coal Deposits

The three brown coal deposits located in the Rosevale area (Figure 4) are:

- . The Loatta
- . Pipers Lagoons
- . Selbourne

The coal deposits lie close to the surface in sediments which are mainly clays with some silts, sands and gravels. Remnants of Tertiary basalt overlie part of the Loatta and Selbourne deposits.

Exploration drilling by CSR has identified four brown coal horizons (referred to as A, B, C & D) which have been tentatively identified in the Loatta and Pipers Lagoons deposits. The three stratigraphically highest horizons (A, B & C) contain up to nine coal seams ranging from 1.5m to 8.5m thick for which coal reserves have been calculated. The seams in the identified deposits are almost flat lying, typically dipping at less than 2°. Local increases in dip occur towards the margins of the deposits.

12.

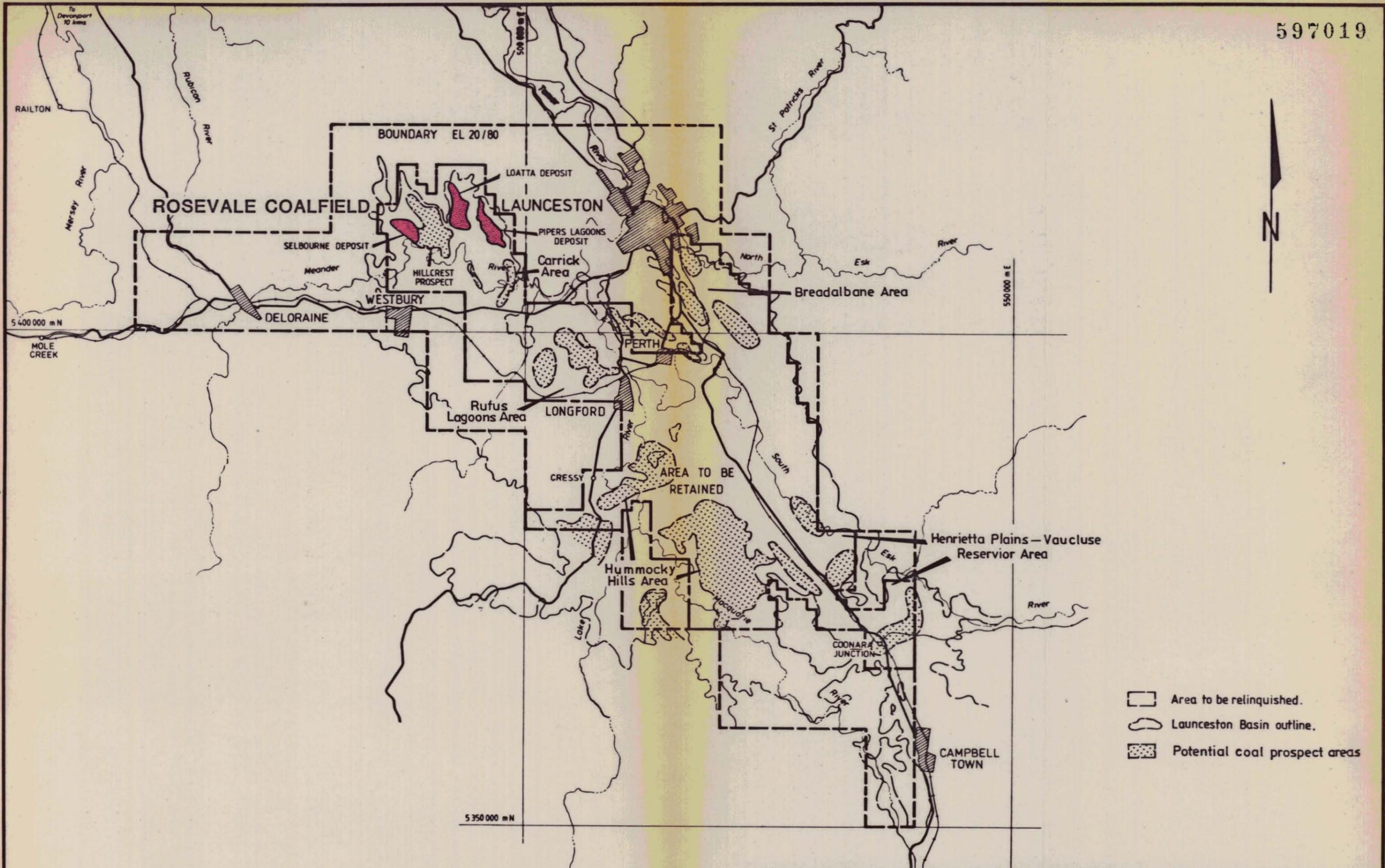
Seam correlations have been established primarily from downhole geophysical logs supported by cross-section profiles. (Figures 5 to 10). Systematic infill drilling is still required, however, to positively confirm the correlations, particularly towards the margins of the deposits.

There are generally no sharp boundaries to partings within the coal seams. The coal quality deteriorates gradually from lignite to ligneous clays. Partings consist of inferior lignite and ligneous clay with an ash content in excess of 50% (dry basis).

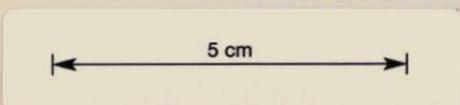
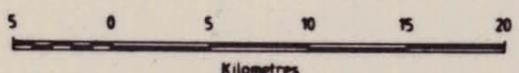
Coal Reserves

In situ coal reserves for the three coal deposits as of the 31st December, 1982, are shown in Table 1 below:

Deposit	Depth (m)	TABLE 1		Total (mt)
		Indicated Class 1 (mt)	Reserves Class 11 (mt)	
Loatta	0 - 60	33	23	56
Pipers Lagoons	0 - 60	23	20	43
Selbourne	0 - 70	14	5	19
		70	48	118



-  Area to be relinquished.
-  Launceston Basin outline.
-  Potential coal prospect areas



CSR Limited Coal Division		EXPLORATION AND EVALUATION GROUP		CSR	
DRAWING	DATE	ROSEVALE COALFIELD LOCATION AND PROPOSED RELINQUISHMENT		SCALE	
DRAWN	MRN			Dec. '82	FIGURE 4
CHECKED					DRAWING No.
REVISED	J.M.	Mar. '83		70020 - 94 'R'	

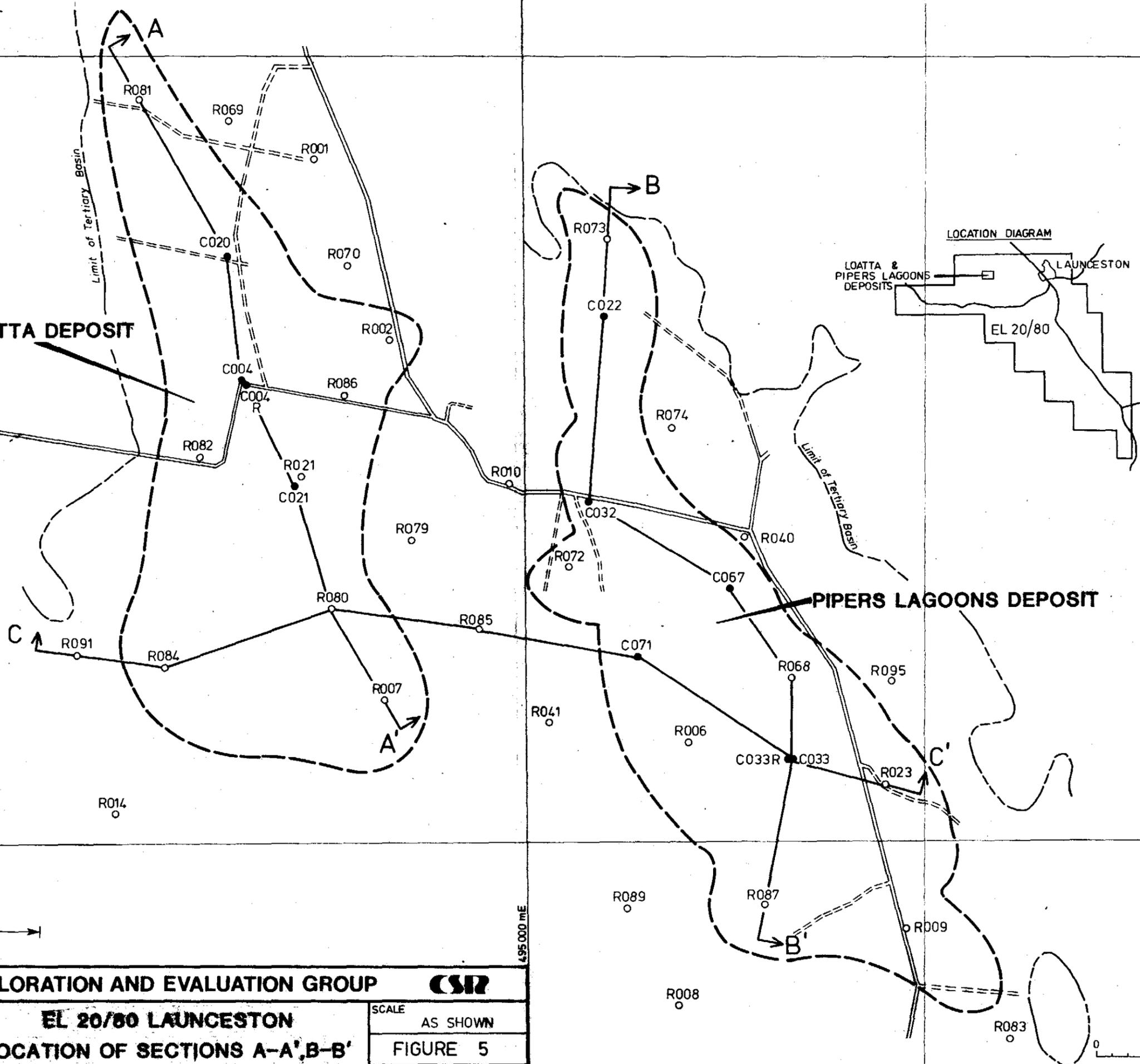
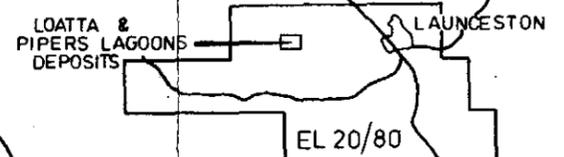
5 415 000 mN

597020

LOATTA DEPOSIT

PIPERS LAGOONS DEPOSIT

LOCATION DIAGRAM



5 410 000 mN

595000 mE

5 cm

CSR Limited Coal Division

EXPLORATION AND EVALUATION GROUP



DRAWING	DATE
DRAWN C.J.	Feb. '83
CHECKED	
REVISED	

EL 20/80 LAUNCESTON
LOCATION OF SECTIONS A-A', B-B'
AND C-C'

SCALE
AS SHOWN
FIGURE 5
DRAWING No. 700 20 - 117

SCALE
 0 0.5 1.0
 Kilometres

FIGURE 5

LIMIT OF INDICATED RESERVES
DEPOSIT BOUNDARY

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

LIMIT OF INDICATED RESERVES

LIMIT OF INFERRED RESERVES
DEPOSIT BOUNDARY

LEGEND

- v v TERTIARY BASALT
- COAL
- + + JURASSIC DOLERITE
- I INDICATED CLASS I RESERVES
- II INDICATED CLASS II RESERVES

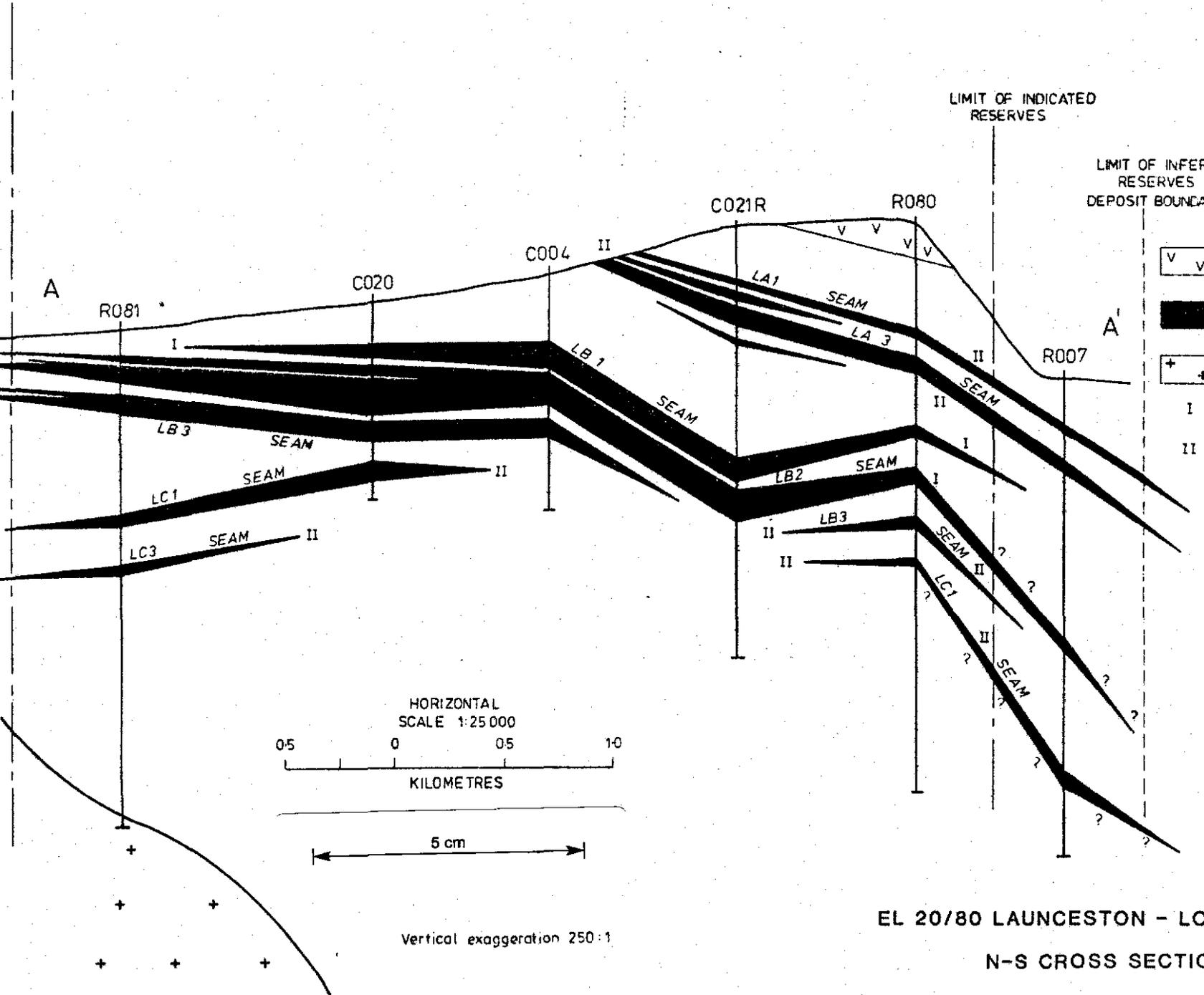
HORIZONTAL SCALE 1:25 000
0.5 0 0.5 1.0
KILOMETRES

5 cm

Vertical exaggeration 250:1

A

A'

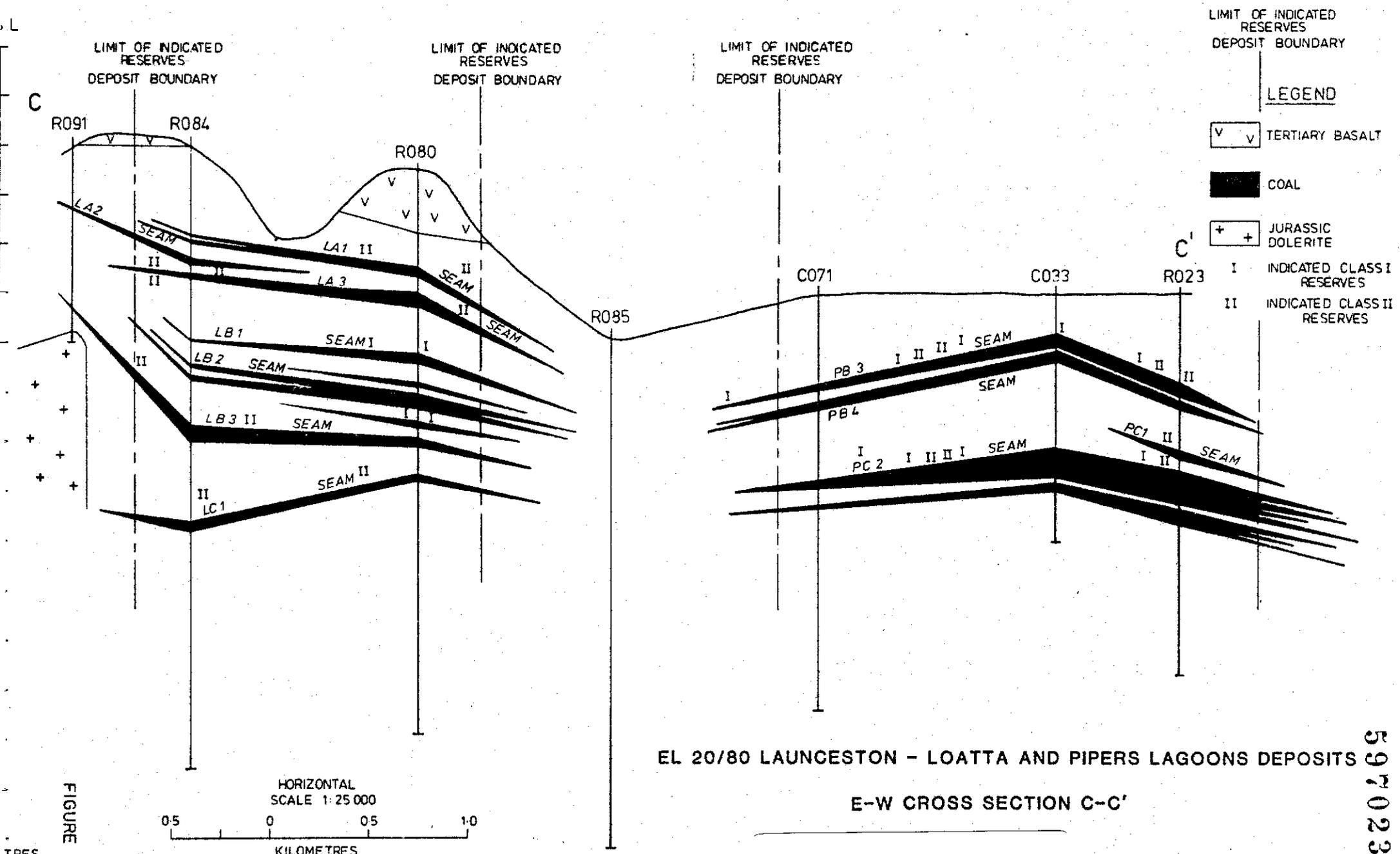


EL 20/80 LAUNCESTON - LOATTA DEPOSIT
N-S CROSS SECTION A-A'

DRAWING NO. 70020-67

597021

FIGURE 6



LIMIT OF INDICATED RESERVES DEPOSIT BOUNDARY

LIMIT OF INDICATED RESERVES DEPOSIT BOUNDARY

LIMIT OF INDICATED RESERVES DEPOSIT BOUNDARY

LEGEND

V TERTIARY BASALT

COAL

+ JURASSIC DOLERITE

I INDICATED CLASS I RESERVES

II INDICATED CLASS II RESERVES

EL 20/80 LAUNGESTON - LOATTA AND PIPERS LAGOONS DEPOSITS

E-W CROSS SECTION C-C'

HORIZONTAL SCALE 1:25 000

0.5 0 0.5 1.0

KILOMETRES

Vertical exaggeration 250:1

5 cm

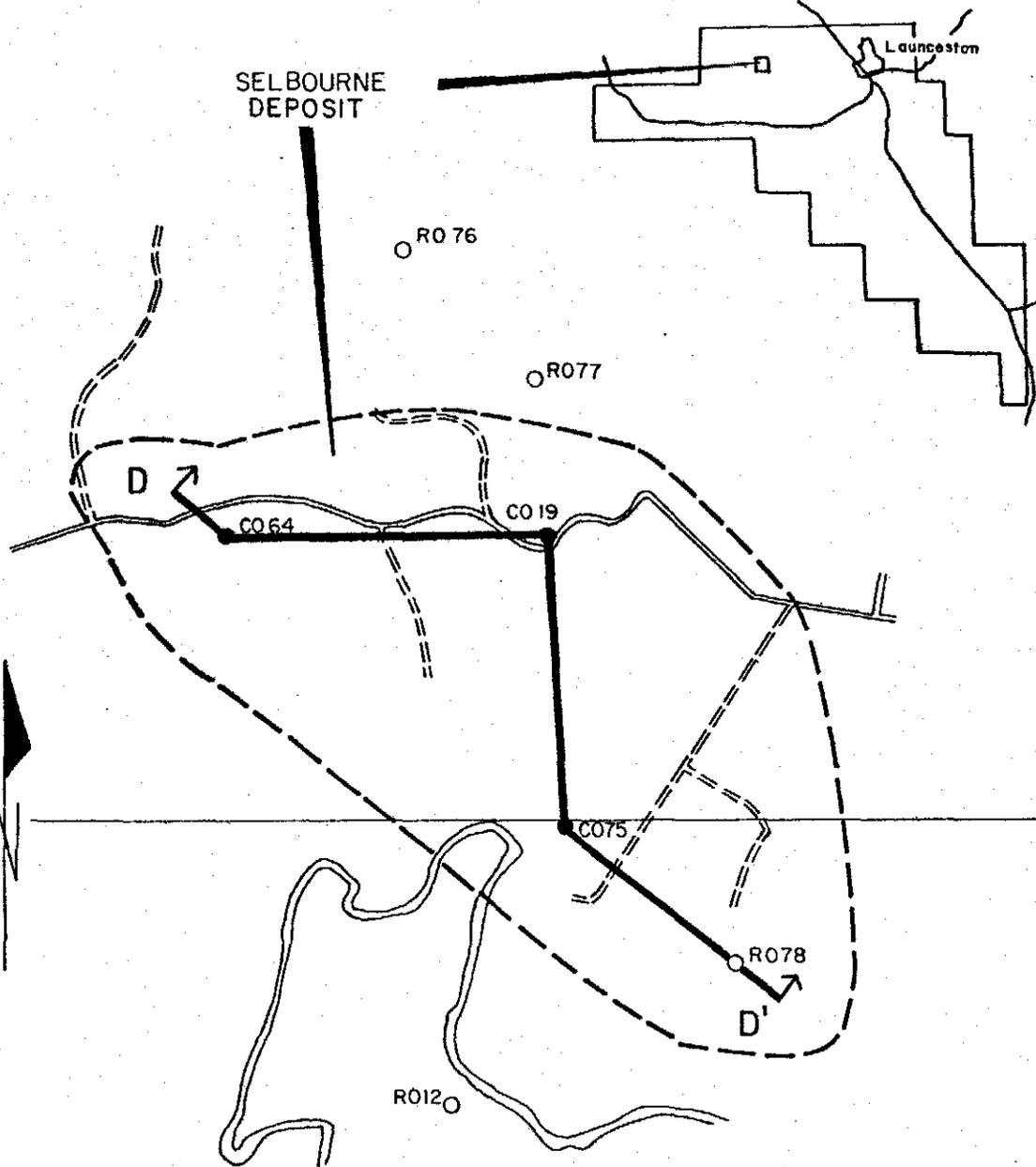
DRAWING NO. 70020-69

FIGURE 8

297023

597024

LOCATION DIAGRAM



Legend

- R068 Rotary Chip Hole (geophysically logged)
- C068 Cored Hole

5 cm

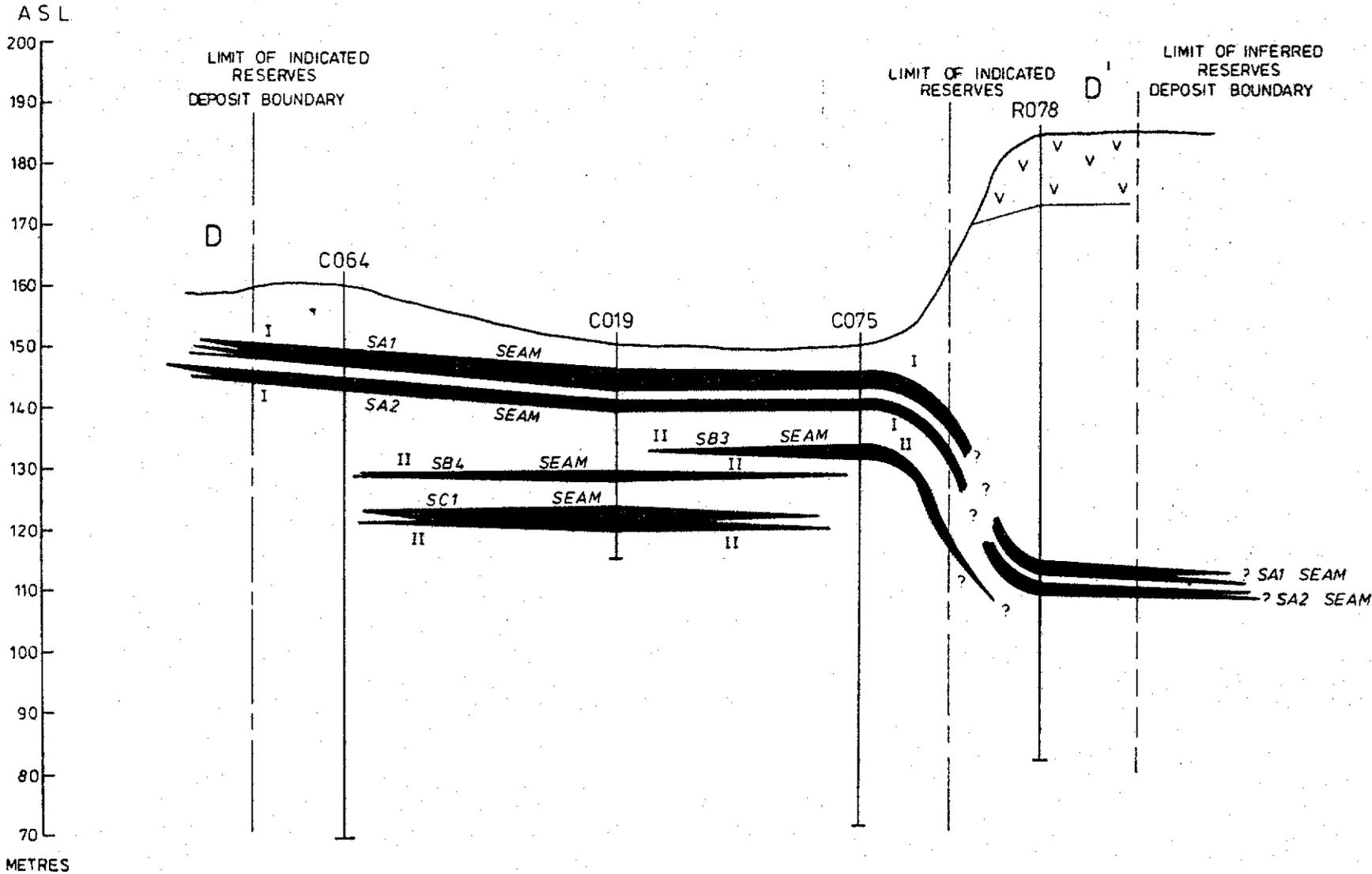
Scale 1:25000

0 1.0

Kilometres

CSR Limited Coal Division		EXPLORATION AND EVALUATION GROUP		CSR	
DRAWING / DATE		EL 20/80 LAUNCESTON SELBOURNE		SCALE 1:25000	
DRAWN Sept '82		LOCATION OF SECTION D-D'		FIGURE 9	
CHECKED				DRAWING No 70020-66	
REVISED					

490 000mE



EL 20/80 LAUNCESTON - SELBOURNE DEPOSIT

N-W - S-E CROSS SECTION D-D'

597025

The reserves have been calculated using a minimum seam thickness of 1.5m. Potential working sections were selected so that the maximum ash content did not exceed 50% (on a dry basis). Non-coal partings greater than 0.5m in thickness were excluded from working sections and from estimated reserves as it was assumed that they would be selectively mined.

Indicative range of in situ quality of the coal for the three deposits (based on analytical results to date) is:

Total Moisture	45 - 50%
Ash	19 - 26%
Fixed Carbon	11 - 15%
Volatile Matter	16 - 20%
Specific Energy	6.3 - 8.1 MJ/kg
Total Sulphur	0.13 - 0.19%

Hillcrest and other Coal Prospect Areas

In addition to the above deposits, scout drilling has intersected from 1.5m to 6.7m of brown coal in a further five areas; referred to as the Hillcrest, Carrick, Rufus Lagoon, Breadalbane and Henrietta Plains - Vaucluse Reservoir areas (Figure 4.) at depths of 15m to 90m. A Triassic black coal prospect is also present in the Hummocky Hills area. Infill drilling in these areas could outline further tonnages of coal.

Future Exploration & Evaluation

Future exploration and evaluation 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. Step out drilling will then be undertaken to test for a possible westward extension of the Loatta deposit which could connect it to the Selbourne deposit through the Hillcrest prospect. In-fill drilling will also be undertaken on the Pipers Lagoons deposit to upgrade reserves to the measured category.

The results of the drilling and analytical testing of the coal and non-coal cores will be progressively evaluated to determine the optimum ash cut-off for the delineation of seam boundaries.

The first stage of the infill drilling will be on a 500m square grid, aligned in an approximate N-S, E-W direction with additional holes as required to confirm correlations.

Future 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 design. Longer term work will include baseline environmental studies and more detailed mine planning.

PRELIMINARY MINING STUDYIntroduction

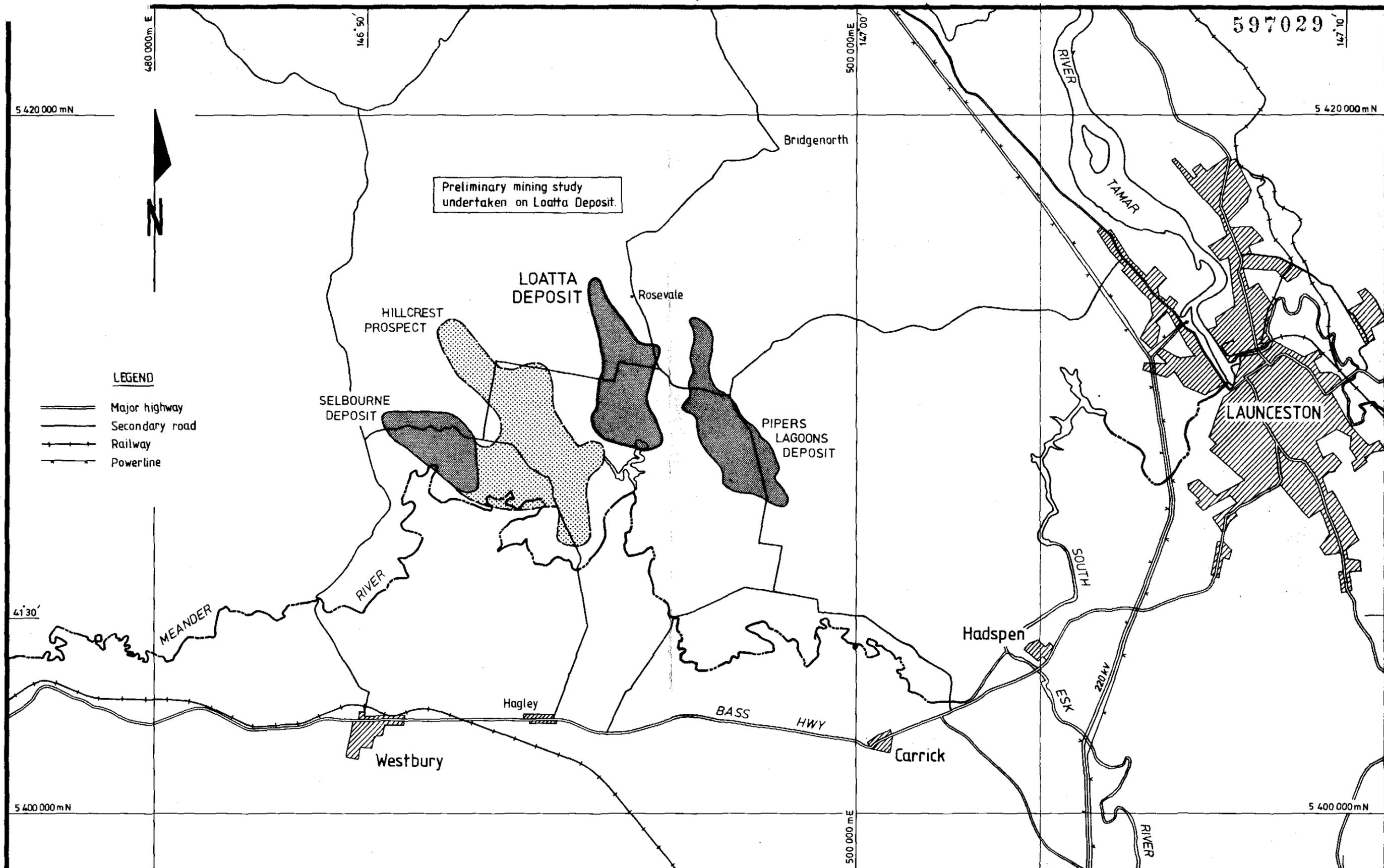
The most significant coal deposit of the three so far delineated is the Loatta deposit (see Figure 11), with significant coal thickness (see Figure 12) at shallow depth (see Figure 13). This is the deposit upon which the mining study is based. If additional coal is required, operations would continue in the Pipers Lagoons Deposit. It is considered however that there are sufficient mine reserves in the Loatta deposit to fuel a 240 MW Power Station over a nominal thirty year life.

The mining method adopted in this 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, the required output to supply a 240 MW Power Station, and the need for continuity and reliability of coal supply.

The use of draglines and truck and shovel, were considered, but soft ground conditions and high rainfall led to the conclusion that BWEs were the most suitable machines to excavate the deposit. Other factors leading to this conclusion are discussed in following sections.

A range of coal qualities at various ash cut-offs have been considered. This Preliminary Mining Study has been based on the same ash cut-off as the geological reserves, i.e. 50% dry basis. Inclusive of dilution this gives an as received gross S.E. of 7.1 GJ/t.

Later studies will progressively optimise the best ash cut-off after mine and power station economics are further evaluated.

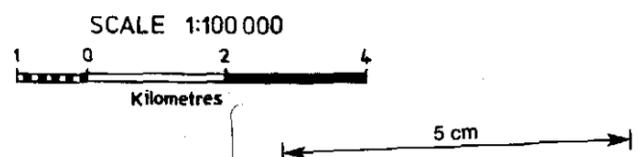


Preliminary mining study undertaken on Loatta Deposit.

LEGEND

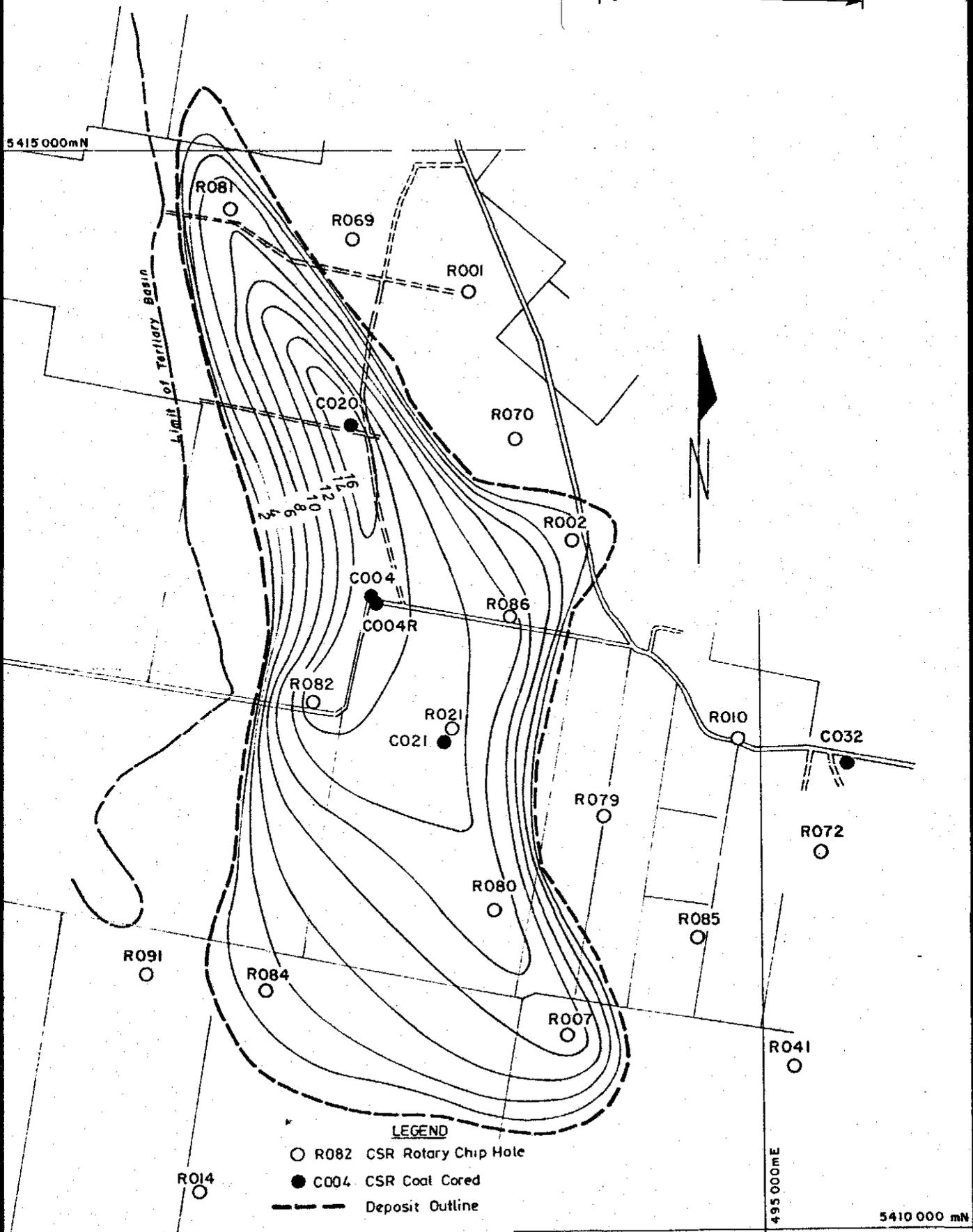
- Major highway
- Secondary road
- Railway
- Powerline

CSR Limited Coal Division		EXPLORATION AND EVALUATION GROUP		CSR
DRAWING	DATE	ROSEVALE COALFIELD LOCATION OF MAJOR COAL DEPOSITS		SCALE 1:100 000
DRAWN	J.M. Mar. '83			FIGURE 11
CHECKED				DRAWING No 70020 - 146
REVISED				



5 cm

5415 000mN



- LEGEND**
- R082 CSR Rotary Chip Hole
 - C004 CSR Coal Cored
 - - - Deposit Outline

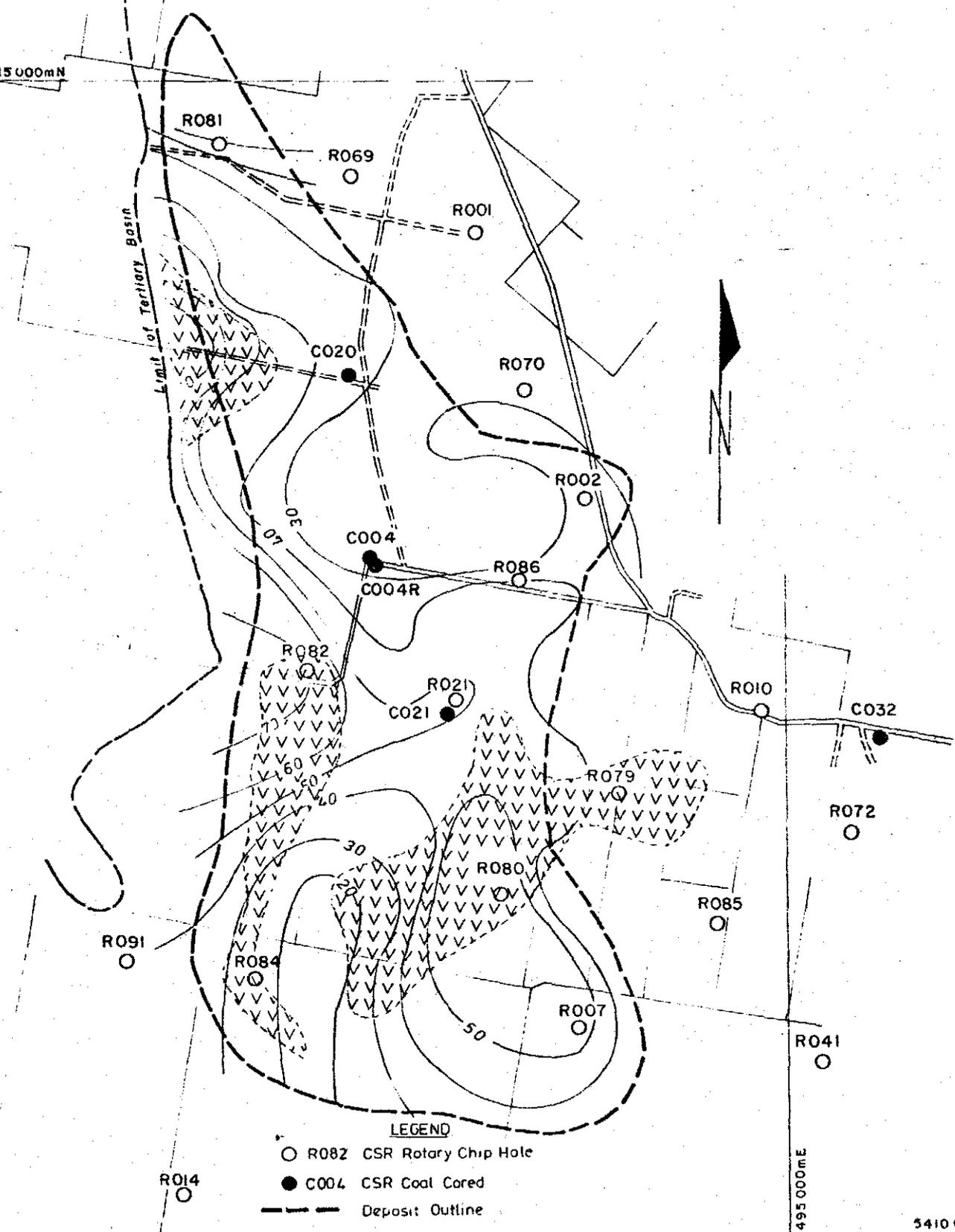
Scale 1:25000
 0 ————— 1.0
 Kilometres

CSR Limited Coal Division		EXPLORATION AND EVALUATION GROUP CSR	
DRAWING / DATE		SCALE	
DRAWN	Aug '82	1:25000	
CHECKED		FIGURE 12	
REVISED		DRAWING No	
C J Feb '83		70020 - 120	

EL 20/80 LAUNCESTON
 LOATTA DEPOSIT
 IN INSITU THICKNESS

5 cm

5415 000mN



LEGEND

- R082 CSR Rotary Chip Hole
- C004 CSR Coal Cored
- - - Deposit Outline

 Areas of Basalt

Scale 1:25000

0 1.0

Kilometres

CSR Limited Coal Division		EXPLORATION AND EVALUATION GROUP CSR	
DRAWING / DATE		Scale 1 : 25 000	
DRAWN	Aug '82	FIGURE 13	
CHECKED		0-24-82	
REVISED	Feb '83	70020 - 121	

EL 20/80 LAUNCESTON
LOATTA DEPOSIT
DEPTH TO BASE OF COAL
MINING SECTION

Preliminary Loatta Deposit Mining Reserves Assessment

Coal Quality and Dilution

Cored holes CO04, CO20 and CO21 were used to determine average coal quality for the Loatta deposit and the effect of dilution.

In situ quality determined from analyses of the three drill holes is as follows:

Total Moisture	46.8%
Ash	22.1%
Volatile Matter	18.6%
Fixed Carbon	12.5%
Specific Energy	7.8GJ/t
Sulphur	0.14%

Tests have shown that a BWE can work to a mining tolerance of 0.2m. In the case of the Loatta deposit we have assumed that we would be mining entirely outside the coal seam (leading to a dilution of 0.2m on the top and bottom of all separately mined coal seams and zero coal loss).

Taking the 0.2m dilution for each hole shown in Table 2, the as received coal quality for the Loatta deposit has been conservatively calculated as follows:

Total Moisture	45.3%
Ash	25.4%
Volatile Matter	17.8%
Fixed Carbon	11.5%
Specific Energy	7.1 GJ/t
Sulphur	0.13%

These values have been calculated as per data shown in Table 2 over.

TABLE 2

As Received Coal Quality (including dilution)

Loatta Deposit

<u>Hole and Component</u>	<u>Thickness (m)</u>	<u>Specific Energy MJ/kg</u>	<u>Moisture %</u>	<u>Ash %</u>	<u>Volatile Matter %</u>	<u>Fixed Carbon %</u>	<u>Sulphur %</u>	<u>Relative Density</u>
CO04 Undiluted coal	14.96	7.6	46.1	23.0	18.5	12.4	0.15	1.33
Dilution		2.1	33.6	50.9	12.2	3.3	0.09	1.64
CO20 Undiluted coal	17.52	7.7	46.4	22.9	18.5	12.2	0.13	1.33
Dilution		3.5	36.4	44.7	13.3	5.5	0.09	1.56
CO21 Undiluted coal	12.58	8.2	48.1	19.9	18.9	13.1	0.14	1.30
Dilution		3.0	38.4	44.0	13.0	4.6	0.10	1.54
<u>Average all Holes *</u>								
Undiluted coal	15.02	7.8	46.8	22.1	18.2	12.5	0.14	1.32
Coal including 0.1m Dilution	16.09	7.4	46.0	24.0	18.2	11.8	0.14	1.34
Coal including 0.2m Dilution	17.15	7.1	45.3	25.4	17.8	11.5	0.13	1.36

* Weighted average assuming equal areas of influence

Mining Reserves - Preliminary Assessment

In order to undertake a preliminary mining study and establish approximate mining costs, preliminary mining reserves have been calculated for the Loatta deposit.

As the geological reserves are not yet of measured status this preliminary assessment does not comply with the current code used by Tasmania for calculating and reporting coal reserves.

It is intended, however, to use this preliminary assessment only as a basis to show that further work is justified based on the costs established in this preliminary study.

The procedure for establishing mining reserves is detailed below.

The economic bottom mining horizon was established for each borehole by examining the incremental and cumulative strip ratios at each seam horizon within each hole. The results for each borehole are summarised below:

Hole	Bottom Seam	Depth to Bottom m	In Situ Coal Working Section (without dilution) m
R081	LB3	15.2	7.8
CO20	LC1	32.5	17.5
CO04	LB3	29.7	15.0
RO02	LB1	33.0	3.7
RO86	LB2	39.1	10.5
RO82	LC4	76.8	14.3
CO21	LB2	50.57	12.6
RO80	LB3	56.0	11.4
RO84	LA3	27.1	3.3
RO07	LB3	52.6	8.7

These values, in conjunction with the 1.5m thickness limit boundary defining the outer edge of the deposit, were used to produce thickness contours shown in Figure 12.

The reduced level of the base of the bottom seam in each hole was then used to determine the approximate RL of the mining floor at the deposit boundaries. These were then subtracted from surface contours to produce the contours of the depth to the mining floor in Figure 13.

The rising surface topography along the western edge of the deposit, combined with the coal seam thinning, results in high strip ratios along the western edge of the defined deposit. Areas with a strip ratio of more than 7 : 1 were excluded from the mining reserves. These are shown as shaded areas around the edges of the deposit, in Figure 14.

Areas of basalt are also shown in Figure 13. This material would probably be mined by contractor, and has been excluded from the BWE quantities.

Table 3 summarises mining block quantities. Mineable coal tonnes were obtained by multiplying in situ tonnes by 1.124 to account for dilution. Partings volume was decreased accordingly.

In summary in situ mining reserves without dilution are assessed as being 53.6 Mt. Inclusive of dilution mining reserves for the Loatta deposit are assessed at 60 Mt at an overall strip ratio of 2.24:1, (m^3 : tonne of coal). As indicated above these preliminary reserves will have to be confirmed by further drilling to bring the geological reserves to measured status.

Loatta Deposit
Preliminary Mining Reserves by Mining Block

597036

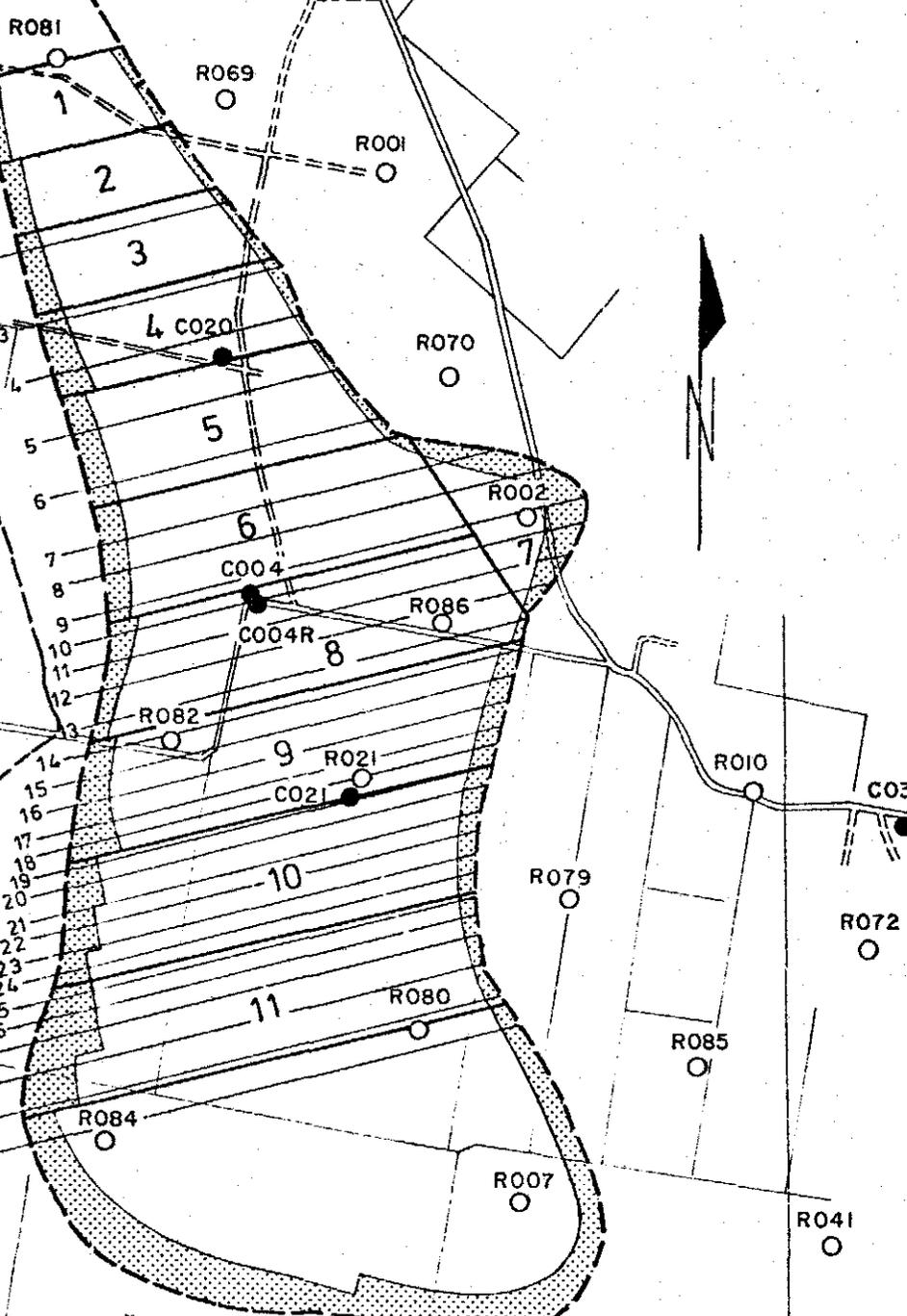
Mining Block	1	2	3	4	5	6	7	8	9	10	11	12	Total
<u>In Situ Reserves</u>													
Area (m ² x 1,000)	156.7	174.2	208.4	237.3	388.3	430.9	177.9	519.2	576.9	592.2	619.8	1460.7	5,542.5
Av. coal thickness (m)	5.90	7.29	8.40	9.08	9.0	10.7	3.5	10.4	10.5	8.8	6.5	5.2	-
In situ Tonnes (RD 1.32) (MT)	1.22	1.68	2.31	2.84	4.61	6.09	0.82	7.13	8.0	6.88	5.32	10.03	56.92
In situ Cumulative (MT)	1.22	2.90	5.21	8.05	12.66	18.75	19.57	26.70	34.70	41.57	46.89	56.92	-
<u>Margins Rejected</u>													
Area excluded (> 7 : 1 S.R.)	22.2	25.9	31.1	42.9	50.5	32.5	74.0	30.6	83.2	69.9	87.2	407.0	957.0
Av. coal thickness excluded (m)	1.9	3.0	3.0	3.0	2.5	2.7	1.75	3.8	4.0	3.2	2.7	2.2	2.6
Tonnes excluded (MT) (RD 1.32)	0.06	0.10	0.12	0.17	0.17	0.12	0.17	0.15	0.44	0.30	0.31	1.18	3.29
<u>Mineable Coal (MT)</u>													
Tonnes In Situ	1.16	1.58	2.19	2.67	4.44	5.97	0.65	6.98	7.56	6.58	5.01	8.85	53.63
As Mined Including (0.2m dilution on top and bottom of seam)	1.30	1.78	2.46	3.00	4.99	6.71	0.73	7.85	8.50	7.40	5.63	9.95	60.28
Area (m ² x 1,000)	134.5	148.3	177.3	194.4	337.8	398.4	103.9	488.6	493.7	522.3	532.6	1053.7	4585.5
<u>Overburden & Partings (m)</u>													
Depth to base of mining	25.0	35.0	36.0	40.0	33.0	30.0	30.0	40.4	53.0	47.0	35.0	40.0	-
Av. coal thickness (in situ)	6.5	8.1	9.4	10.4	10.0	11.4	4.7	10.8	11.6	9.5	7.1	6.4	8.9
O/B & partings thickness (in situ)	18.5	26.9	26.6	29.6	23.0	18.6	25.3	29.6	41.4	37.5	27.9	33.6	-
O/B & partings thickness (mined)	17.8	26.0	25.6	28.5	21.9	17.4	24.8	28.4	40.2	36.5	27.1	32.9	-
O/B & partings volume (mined) (MBCM)	2.39	3.86	4.54	5.54	7.40	6.93	2.58	13.88	19.85	19.06	14.43	34.67	135.13
Ratio Waste m ³ /coal T.	1.84	2.17	1.85	1.85	1.48	1.03	3.53	1.77	2.33	2.57	2.56	3.48	2.24
Basalt Area (m ² x 1,000)	-	-	10.0	31.9	-	-	-	-	140.0	205.0	336.0	238.0	-
Basalt Thickness (m)	-	-	3.0	5.0	-	-	-	-	10.0	6.0	14.0	8.0	-
Basalt Volume (MBCM)	-	-	0.03	0.16	-	-	-	-	1.40	1.23	4.70	1.90	9.42
BWE Waste Volume (MBCM)	2.39	3.86	4.51	5.38	7.40	6.93	2.58	13.88	18.45	17.83	9.73	32.77	125.71
Batters (45°)	0.25	0.46	0.47	0.62	0.58	0.46	0.48	0.87	1.50	1.18	0.69	1.70	9.26
Total BWE Waste	2.64	4.32	4.98	6.00	7.98	7.39	3.06	14.75	19.95	19.01	10.42	34.47	133.17

5 cm

5415 000mN

Limit of Tertiary Basin

YEAR
1
2
3
4
5
6
7
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9
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30



LEGEND

- R082 CSR Rotary Chip Hole
- C004 CSR Coal Cored
- - - Deposit Outline
- ▨ Strip ratio > 7:1 (excluded from mining reserves)

495 000mE

5410 000 mN

Scale 1:25000
Kilometres

CSR Limited Coal Division		EXPLORATION AND EVALUATION GROUP CSR	
DRAWING / DATE DRAWN C.J. Feb. '83 CHECKED RECEIVED		LOATTA DEPOSIT MINING RESERVES BLOCKS & 270 MW SCHEDULE	
		CASE 1:25000 FIGURE 14 DRAWING No 3000 111	

Power Station Coal Requirements

A conceptual power station size of 240 MW (2 x 120 MW) was selected for this study as being suitable for the Tasmanian grid. Coal requirements were estimated for such a power station to peak at 2.33 million tonnes/annum and total 53 million tonnes over a project life of 30 years.

Although a 2 x 120 MW station size was chosen for the initial study, smaller units of 80 MW are technically and commercially feasible. A second study, examining the mining of coal for a 320 MW station has therefore been undertaken. In this case one 80 MW unit per annum would be added to the plant until a 4 x 80 MW power station was constructed. The reserves requirements for one 80MW unit would be approximately 17 million tonnes over a 30 year period. Mining of the Pipers Lagoons deposit would therefore be required late in the mine life.

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.

Ground & Groundwater Conditions

Initial hydrogeological studies have shown a number of aquifers in sandy strata below the coal, in brown coal seams confined by impervious clays, in the Tertiary clay/Tertiary basalt interface and in the Tertiary basalt. The high water table and moderately high rainfall suggest that a considerable amount of in-pit water could be expected.

The groundwater table lies at or within 6m of the surface, commonly within 3m. Results of monitoring piezometers installed in April 1982 revealed some artesian groundwater conditions associated with sand rich (fluvial) interburden.

Thus saturated overburden and interburden conditions can be expected with artesian groundwater pressures associated with porous, sand rich beds which may penetrate but lens out at proposed mine limits. The high standing water levels and pressurised aquifers present conditions similar to those found in the Latrobe Valley in Victoria.

The major geotechnical issues for stable slope design include:

- . determining representative effective strength parameters for clay rich strata,
- . delineating the location and extent of aquifers relative to initial pit slopes and
- . measuring groundwater pressures and pressure source (particularly artesian conditions).

Flood protection structures will be required for mine development, and due to the near surface water table, roads, hardstand areas and building foundations need to be elevated. The tertiary basalt from the top of the deposit could be used as fill.

Apart from the influence pressurised aquifers may have on pit design, pit inflow rates need to be evaluated and schemes devised to control and dispose of collected drainage.

Disposal by other than controlled release to local drainage does not appear feasible. The shallow groundwater table excludes re-injection, whilst a mean average evaporation rate of 750mm is likely to be insufficient, to evaporate all the mine water but this will depend on the quantities for disposal and availability of stored water area.

Material descriptions indicate that excavation by large scale stripping machines is possible without the need for blasting. However the likely saturated condition of clay sediments may mean some materials handling problems will arise, particularly with bucket and/or conveyor chute blockages should the moist clays be sticky.

Detailed analysis of batter slopes less than 20m high would need to be undertaken to ensure face angles exceeding 45° to 50° can be maintained for efficient BWE operation.

Mining Method Selected

The most significant geological factors affecting the mining method are:

- . the shallow depth of a significant proportion of the coal indicates that BWEs are the most economical means of removing overburden and winning coal.
- . the softness of most of the sediments lends itself to excavation with BWE,
- . basalt caps will need to be removed by frontend loaders and trucks, after blasting,

- . As the reasonable seam thickness and the flat nature of the deposit allows large equipment to be used to mine the coal and
- . there is significant groundwater in the area which could cause difficulties with truck and shovel operation.

Considering the above factors an open cut mining method was chosen utilising BWEs for both overburden removal and coal winning. The coal and overburden will be transported out of the pit on a conveyor system.

Mine Development

Initial mine stripping will be at the northern end of the Loatta Deposit (see Figures 15 & 16). The conveyors will be erected on the surface and the BWE and bandwagon will be used to excavate along the line of conveyor to a depth of 10m. The conveyors will then be relocated down into these gullets. The openings would then be deepened to 20m and again conveyors relocated. (Figure 17).

This will allow for the development of two "topside" benches with overall height 20m and permit further excavation of a "bottom side" cut up to 10m. This total development will allow selective mining over the full coal interval. (Figures 16, 17 & 18).

The required outputs and low strip ratios in the early years make it possible to supply the total mine requirements with one BWE. Output requirements increase as the mine develops and by Year 3, a second BWE with a bandwagon would be required to extend the trunk conveyor gullet, and then a second face conveyor would be installed on the topside bench. The second BWE would dig mainly overburden, and coal as required, as it would have the ability to dig bottomside (Figure 18).

POWER STATION
CONVEYOR

597042

DUMP CONVEYOR ← COAL DELIVERY EX-MINE

5 415 000 mN

FACE CONVEYOR

R081

Advance of Face

LINE OF

C020

SECTION

C004

LOATTA
DEPOSIT



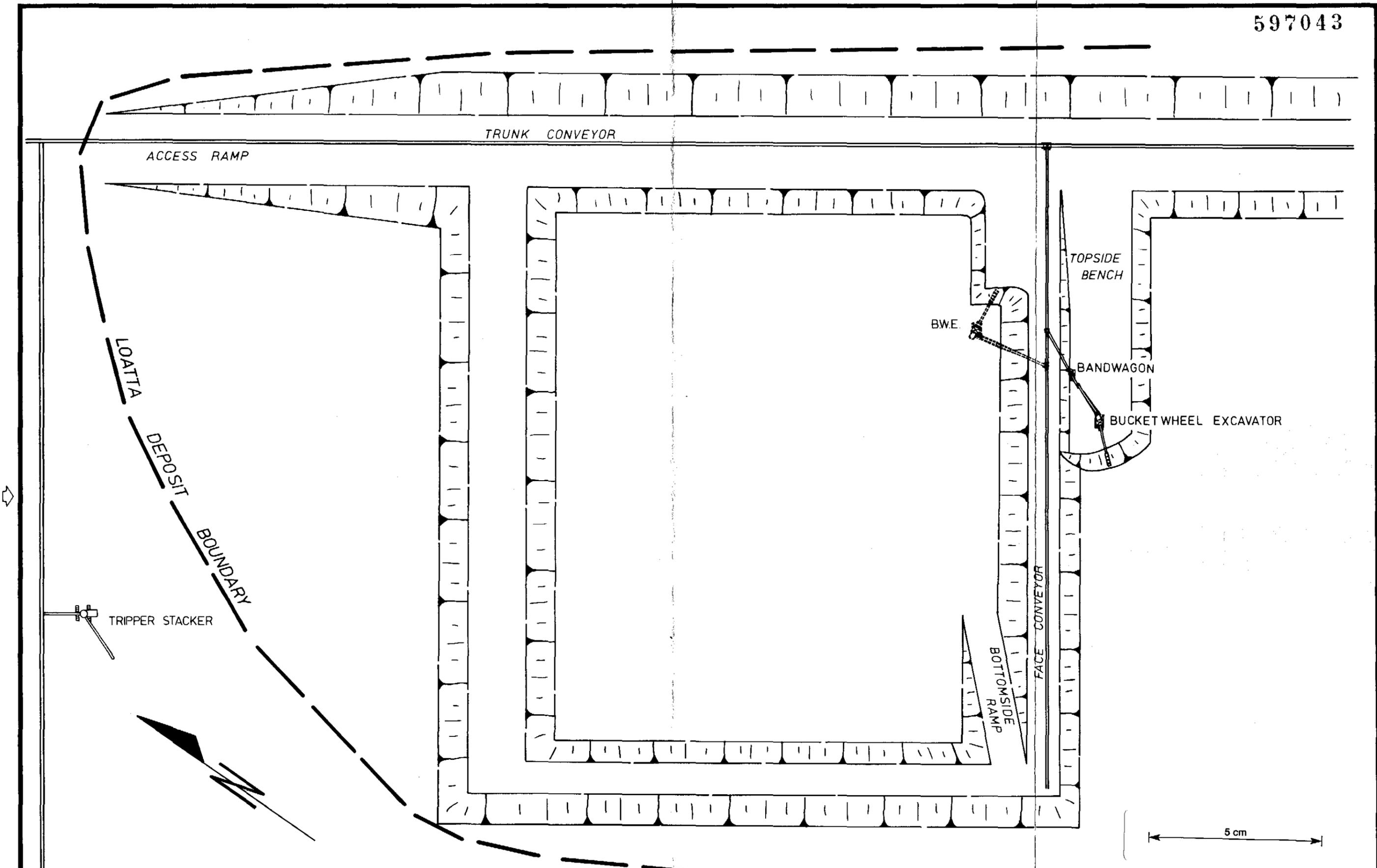
5 cm

495 000 mE

5 410 000 mN

SCALE 1:25 000
0 10
Kilometres

CSR Limited Coal Division		EXPLORATION AND EVALUATION GROUP		CSR	
DRAWING / DATE		EL 20/80 LAUNCESTON		SCALE 1:25 000	
DRAWN C J Feb '83		LOATTA DEPOSIT		FIGURE 15	
CHECKED		CONVEYOR LAYOUT		DRAWING NO 70020-140	
REVISED					



CSR Limited Coal Division		EXPLORATION AND EVALUATION GROUP		CSR	
DRAWING	DATE	EL 20/80 LAUNCESTON - LOATTA DEPOSIT PROPOSED PIT LAYOUT STAGE 1		SCALE	
DRAWN	J.M. Feb. '83			FIGURE 16	
CHECKED					DRAWING No 70020-118
REVISED					

NORTH WEST

SOUTH EAST

VERTICAL SCALE
1:100

Direction of Mining



0

2

4

6

8

10

12

14

16

18

Metres

R081

C020

C004

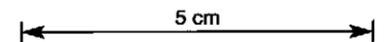
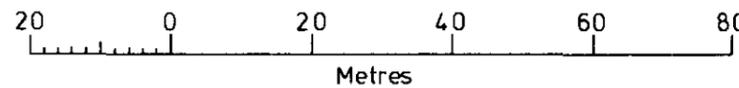
ACCESS RAMP

B.W.E. 2

B.W.E. 1 or B.W.E. 2

B.W.E. 1

HORIZONTAL SCALE 1:1000



CSR Limited
Coal Division

EXPLORATION AND EVALUATION GROUP



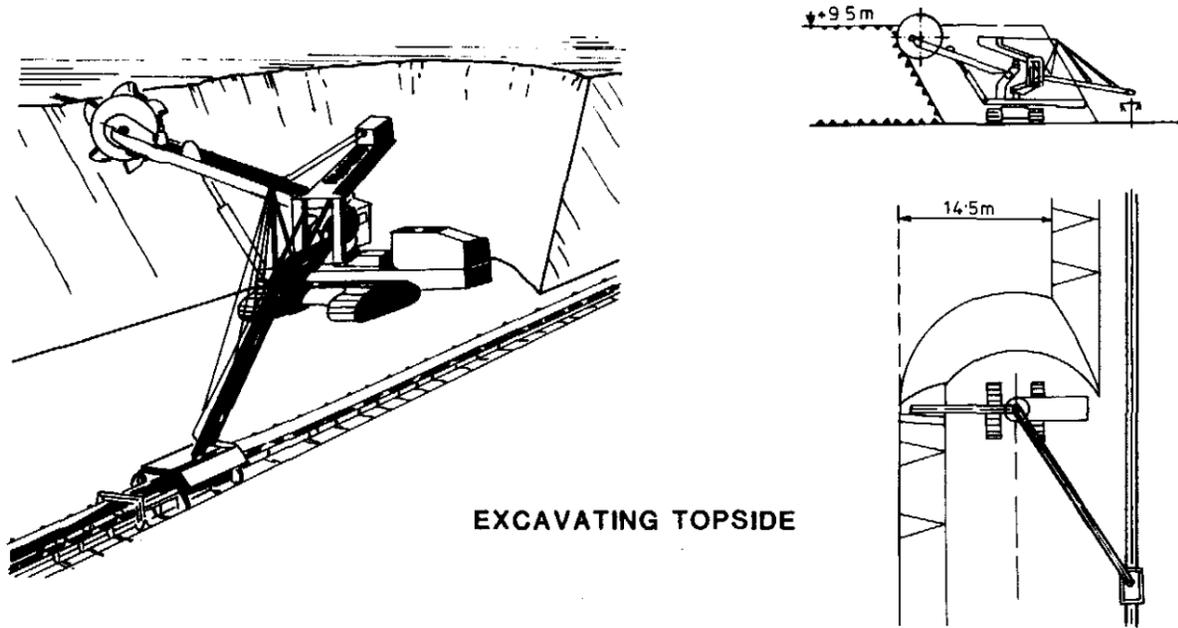
DRAWING	DATE
DRAWN C.J.	Feb. '83
CHECKED	
REVISED	

LOATTA DEPOSIT
OPERATING LEVELS FOR
BUCKET WHEEL EXCAVATORS

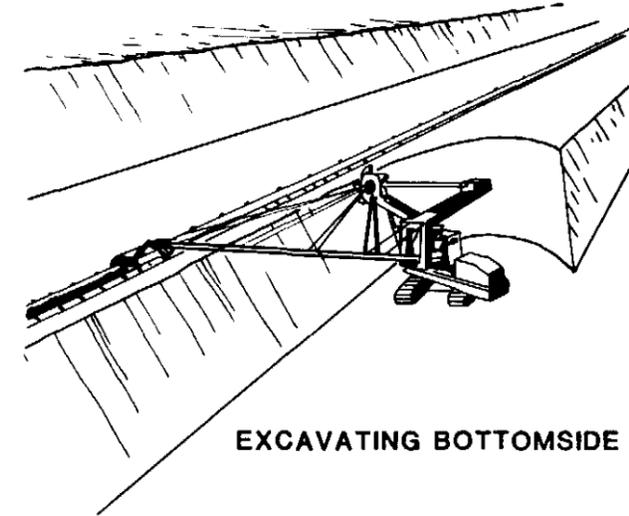
SCALE 1:1000 H
1:100 V

FIGURE 17

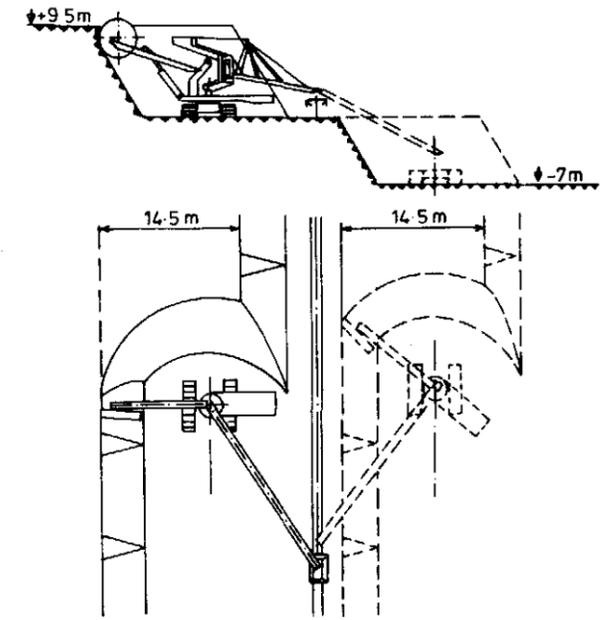
DRAWING No
70020-142



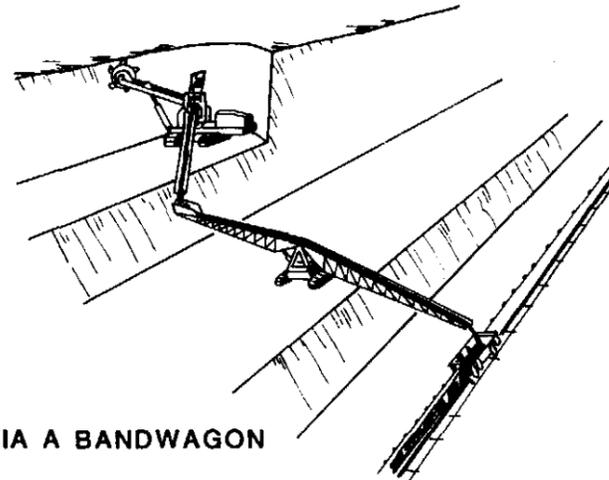
EXCAVATING TOPSIDE



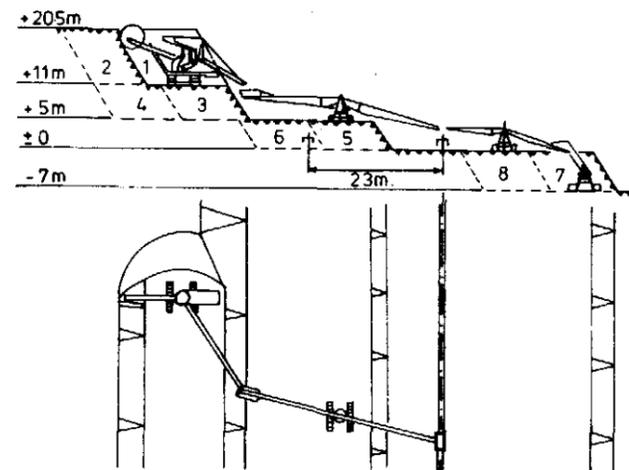
EXCAVATING BOTTOMSIDE



EXCAVATING RANGE TOPSIDE AND BOTTOMSIDE



EXCAVATING TOPSIDE VIA A BANDWAGON



EXCAVATING RANGE TOP AND BOTTOMSIDE VIA A BANDWAGON

5 cm

CSR Limited Coal Division		EXPLORATION AND EVALUATION GROUP		CSR
DRAWING	DATE	EL 20/80 LAUNCESTON OPERATING MODES WITH A BUCKET WHEEL EXCAVATOR		SCALE
DRAWN	C. J. Feb. '83			FIGURE 18
CHECKED				DRAWING No 70020 - 139
REVISED				

Overburden Removal

Overburden will be dug by the BWE and loaded onto the conveyors for transport out of the pit. It will be stacked externally by a tripper stacker. As the mine advances the overburden dump will cover the worked out areas of the pit.

Coal Mining

Coal would be mined selectively from the topside or lower benches and carried out of pit by the conveyors. The seams are separated by clay partings and it is envisaged that these will be removed during the mining of the coal. As these partings are ligneous clays and there is not a sharp boundary between coal and parting, it has been decided that partings will be mined in such a way that will minimise coal losses at the expense of some dilution.

For the base case development two BWE's will be of the O & K SH630 type loading onto 1,200mm wide conveyors. The dump conveyor would be 1,600mm wide to accept the overburden from both BWE's loading through an overburden stacker of 4500 cubic metres capacity.

Mine Schedule

Based on the preliminary mining reserves and mining method a mining schedule has been formulated. This schedule was used as the basis for assessing both mine manning and equipment requirements. More detailed work based on measured reserves will incorporate both a quantity and quality schedule.

POWER STATION ASPECTS

Brown coal similar to that in CSR's Rosevale deposits is used for electric power generation in thermal power stations in many parts of the world. In Germany, Greece and Turkey commercial coal deposits with similar properties including high ash are used, while in Victoria, low ash but much higher moisture brown coals are used. In all these places, operating experience with these low energy coals has shown high reliability and competitiveness with other sources of energy, due to low mining cost

Rosevale coal is a high ash brown coal. Moisture content and energy are typical of coals of this type and while the ash is high, it is within an acceptable, commercially proven range. The sulphur, chlorine and other compounds in the coal are low and not likely to impose significant design, emission or operating problems.

A preliminary evaluation undertaken for CSR by consultants and boiler manufacturers indicates that Rosevale coal is suitable for fueling a modern, thermal power station, similar to stations already in operation.

Table 4 (over) compares Rosevale coal with some commercial brown coal operations, in Australia and overseas.

TABLE 4

Comparison of Rosevale Coal with Brown Coal
Based Power Generation Operations

Location	Installed Power Plant Capacity MW (approx) *	COAL QUALITY (As Fired Conditions)		
		Moisture (%)	Ash (%)	Specific Energy MJ/kg
Rosevale, Tasmania	** -	43-48	21-29	6.5-7.7
Schwandorf, W. Germany	+300 MW (1 x 200 MW)	40-48	15- 36	6.5-9.4
Megalopolis, Greece	550 (2 x 125 MW) (1 x 300 MW)	57-63	14-18	5.0-6.0
Afsin-Elbistan, Turkey	1200 (4 x 300 MW)	50-64	8-23	5.7-8.4
Frimmorsdorf, W. Germany	2600	50-60	2-20	7.2-9.2
Niederaussem, W. Germany	2700 (2 x 150 MW) (4 x 300 MW) (2 x 600 MW)	46-59	5-28	7.2-9.2
Yallourn, Victoria	2000 (approx) (3 x 25 MW) (4 x 50 MW) (2 x 120 MW) (2 x 350 MW) (2 x 375 MW)	64-70	1-3	8.0-9.0

* Individual generating units shown in brackets.

** Quality based on an ash cut-off of 50% (dry basis)

Description and Plant

The conceptual 240 MW power plant comprises 2 x 120 MW units consisting of a pair of identical boiler/tubo generator sets with common ancillaries, services and stack. The boilers would use a pulverized coal firing system; they would be designed specifically to burn Rosevale coal and would incorporate the commercially proven features necessary for burning a low grade coal of this type. In other respects, the plant would be similar to modern power plant operating on black and brown coals, in Australia and overseas.

120 MW unit size is chosen because this is a standard size which may be suitable for the Tasmanian electricity grid.

Smaller nominal 80 MW units which use modern power plant technology are also commercially available. A second study based on a 320 MW station incorporating four of these units has also been undertaken.

At the other end of the scale, units of 200 MW or larger would be feasible depending upon the ultimate proven size of the resource and the capability of the state's power grid to accept such a unit size.

Nominal life of such plant is 30 years however in practice it is usually much longer as demonstrated in Victoria and South Australia, where units installed during the period 1954 - 1958 are scheduled to remain in service beyond 1990.

Location

The final power station location will be dependent upon a detailed siting study which will consider such items as plant requirements, coal and water supply, topography and the natural and social environment.

However, it is considered that subject to a satisfactory resolution of these items, a mine site station will be the most economic. This is consistent with the experience in Australia and overseas that, subject to environmental, water supply and other considerations, a mine site station is preferred. This is particularly so with brown coals, because of the relatively low energy in each tonne of coal and consequent high transport cost.

Water Supply

One of the major considerations in siting the station is water supply, in particular the provision of condenser cooling water. At a mine site station, water supply is likely to be limited and a closed circuit cooling system would be used. Such a system would incorporate a modern natural draft cooling tower or cooling pond through which cooling water would be recycled. Total requirements for the station would be some 4,000 ML/a of potable water which could be supplied from an existing supply system or, if necessary, from a new reservoir. A seaboard power station or one located on a large, mobile body of water would favour a "once through" cooling system. Such a system would also require 1,000 ML/a of potable water for domestic and station use.

Power Station Stack Emissions

Stack emissions consist of products of combustion from the boiler which are made up of water vapour, permanent gases and a very small amount of particulate matter. Initial investigations suggest that the particulate matter will be controlled by conventional electrostatic precipitators or bag filters. The nature and composition of the coal indicate that nitrogen and water vapour will be the major components of the stack emissions and that other gases, notably oxides of sulphur, oxides of nitrogen and carbon monoxide will be within acceptable limits. Experience in Victoria and Germany indicates that there are no adverse impacts from the discharge of water vapour.

Ash

Initial data indicates that this ash should be very suitable for use in the cement industry. It will, therefore, be a potentially saleable product. Estimated production capacity is 500,000 t/a with that ash not sold being passed to an ash disposal system, for which two major options exist.

The first option is a wet ash disposal system (as is used on most power stations in Queensland, N.S.W. and Victoria). The alternative is a dry system where the collected ash returned to the mine and dumped under controlled conditions, this system is used successfully in Germany on brown coal power stations.

Capital Cost

Budget capital cost for a 240 MW mine site power station to use Rosevale coal is estimated to be \$380 million. (June, 1982 prices).

Development Schedule

The minimum lead time for a power station project based on Launceston coal deposits is estimated to be:

Deposit evaluation and environmental studies leading to an E.I.S.	1 1/2 years
Coal testing and evaluation.	1 1/2 years
Tendering & Government approvals	1 year
Design and construction	5 years
	<hr/>
	9 years
	<hr/>

MANNING REQUIREMENTS

A total mine and power station project can be considered to have two phases - a construction phase which merges with and is then replaced by an operating phase. The construction phase would span approximately 10 years. The operational phase while dependent upon future developments in power generation economics would be at least 30 years. Manning levels and accommodation requirements for both phases will differ.

Construction Phase

The total construction workforce will build up to a peak of 700 men over a 5 year period, remain stable for 2 to 3 years and then decline. 110 men would be required for the mine and the balance for the power station.

Operational Phase

The permanent, directly employed workforce for the operational phase is estimated:

Mine	175
Power Station	160
	—
Total	335
	—

INFRASTRUCTURE REQUIREMENTS

Water Supply

Water is required for both the mine and the power station. If a mine site power station is selected, total project requirements are estimated to be 4,000 - 5,000 ML/a. This water would be of good quality and may be obtained from an existing major supply or by construction of a suitable reservoir. The use of mine water for power station use will also be assessed.

A seaboard station drawing coal from the Loatta deposit would need much less good quality water as the major requirements would be pumped from the sea. In this case good quality water requirements would be 1,000 - 1,500 ML/a with at least 1,000 ML/a being required by the power station. A temporary supply for general domestic purposes and construction purposes would be required.

Waste Water Disposal

Waste water from the project area will include domestic sewage and power station wastes. Conventional treatment methods will be used and if feasible, the water will be re-used. In general, the project will attempt to maximise the re-use of water within economic and technical limits and in this way, will minimise both water requirements and waste water discharges.

Power Supply

Construction phase power supply would be required for both the mine and the power station and for any construction camp. Depending upon existing transmission lines this supply could be drawn locally. In the operational phase, the mine would require a 22 kV supply for BWE and lower voltages for other equipment and general services. It is envisaged that a permanent supply would be drawn either from the power station itself or from the H.V. transmission system.

Roads

During the construction period, a major "heavy load" road will be required for the transport of heavy, pre-fabricated items of equipment. At the conclusion of construction, it is likely this road would become the major operational access. Such a road would probably branch off the Bass Highway. Some upgrading and sealing of other roads in the area of the mine and power station would also be required to give suitable access.

Accommodation

During construction, a high proportion of the workforce will be contractor-employed and likely to be relatively mobile. Based on experience with similar projects, it can be expected that the greater proportion would be accommodated in the Launceston area, in local caravan parks or in a construction camp near the project area.

The major proportion of the operational workforce would be drawn from the inhabitants of Launceston and surrounding communities. It is envisaged that only minimal new housing will be required for mine and power station personnel.

ENVIRONMENTAL ASPECTS

Ultimately, the environmental impacts of both the mine and the power station will need to be assessed interactively and their significance evaluated for the northern Tasmanian locality, against Tasmanian standards, legislative and otherwise. At this preliminary stage, the most likely significant effects have been identified, and ameliorative measures proposed.

The mine environmental impacts are well understood for this type of operation and procedures for their minimisation well established. They include topographic, soil and land use impacts caused by the physical presence of the mining operation; noise and dust emissions caused by the operations and some disturbance of existing groundwater, surface water, flora and fauna.

The relative importance of the environmental impacts of the power station will be dependent upon siting and the major considerations are expected to be stack emissions, water supply and ash disposal. Other factors such as ground and surface water influences, visual and acoustic impacts, the effect on land use and the impact on local flora and fauna are expected to be minimised by satisfactory siting and design procedures.

Before finalisation of design and the commencement of site work, a comprehensive environmental monitoring programme would be undertaken as follows:

1. A three year duration meteorological survey to establish atmospheric conditions at ground level and at altitude. The survey would establish local precipitation, temperature, humidity, prevailing winds, the frequency and duration of inversion conditions and any local atmospheric anomalies.
2. Surveys to establish the "baseline" biological, economic and social environment including flora and fauna, land use, ground water quality and the presence of sites of archeological interest.

ALTERNATIVE UTILIZATION POSSIBILITIES

Three alternative utilization prospects for Rosevale coal are discussed in this section. Coal requirements for these projects have not been estimated and it is assumed that they would only proceed if sufficient reserves were available for the optimum development.

Dried Brown Coal

Another possible utilization prospect for Rosevale coal is the production of dried brown coal powder for use as a fuel.

Run of mine coal would be crushed and dried to about 10% moisture, then pulverized to a fine powder which would be sold as a fuel. This operation could be integrated with a power station or run as a completely separate venture. It could use proven commercial technology throughout or could be based on solar drying or one of the newer brown coal dewatering processes now under development.

Likely markets would be as a fuel for cement manufacture, power generation or in other industries. No detailed market surveys have been carried out but there is the potential to replace at least some of the 80,000 t/a of black coal now used in the cement industry and to replace some oil or black coal now used for steam raising or process heating in other industries. It could also be used as auxiliary fuel for a power station or as the main fuel for a peak load or stand by power station.

The technology for producing and utilizing dried brown coal is well developed in Europe where 2,500,000 t/a are produced from German brown coal and sold all over Europe. The major user is the cement industry.

Gasification

The initial evaluation of the coal indicates that it is likely to be suitable for gasification. The technology is available for both large and small scale gasification to supply gas for either a large user (eg., town gas supply) or for smaller industries (ie., individual operators such as cement industries). The latter, utilizing relatively small gas producer type plant which could be retro-fitted to an existing process could be attractive to some established industries in Tasmania.

Briquettes

Rosevale coal is potentially suitable for the manufacture of briquettes for use as industrial and domestic fuel. The high ash content of the coal is likely to be a limitation and a detailed feasibility study would need to consider this along with the other technical and marketing aspects.