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CSR

ROSEVALE COALFIELD - TASMANIA

Response to the Hydro Electric Commission, Tasmania

Power Station Coal Enquiry

PRELIMINARY MINING STUDY

400 MW CASE

EXPLORATION & EVALUATION GROUP
CSR COAL DIVISION

OCTOBER, 1983

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GLOSSARY

Bm^3	bank cubic metres
Bm^3/hr	bank cubic metres per hour
BWE	bucketwheel excavator
EL	Exploration Licence
EIS	Environmental Impact Statement
FC	fixed carbon
GJ/t	gigajoules per tonne
HECT	The Hydro-Electric Commission, Tasmania
km	kilometre
kV	kilovolts
m	metre
m^3/hr	cubic metres per hour
ppm	parts per million
mm	millimetre
mg/l	milligrammes per litre
MBm^3	million bank cubic metres
MJ/kg	megajoules per kilogramme
ML/a	megalitres per annum
Mt	million tonnes
Mtpy	million tonnes per year
MW	megawatt
NATA	National Association of Testing Authorities
RD	relative density
RL	reduced level
SE	specific energy
VM	volatile matter

1. SUMMARY

The Rosevale Coalfield is centred approximately 15 km west of Launceston in the area held by CSR under Exploration Licence 20/80 (Figure 1-1). Three separate deposits (Loatta, Pipers Lagoons and Selboure) and a number of promising prospects have been found 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.

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

Coal occurs in four major horizons of which the three highest, comprising up to nine seams, have been used in the calculation of reserves and are considered potentially mineable. Seams range from 1.5m to 9m 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 cover. The coal seams are almost flat lying or dip gently at less than 2 degress, increasing to 5 degrees near the deposit margins.

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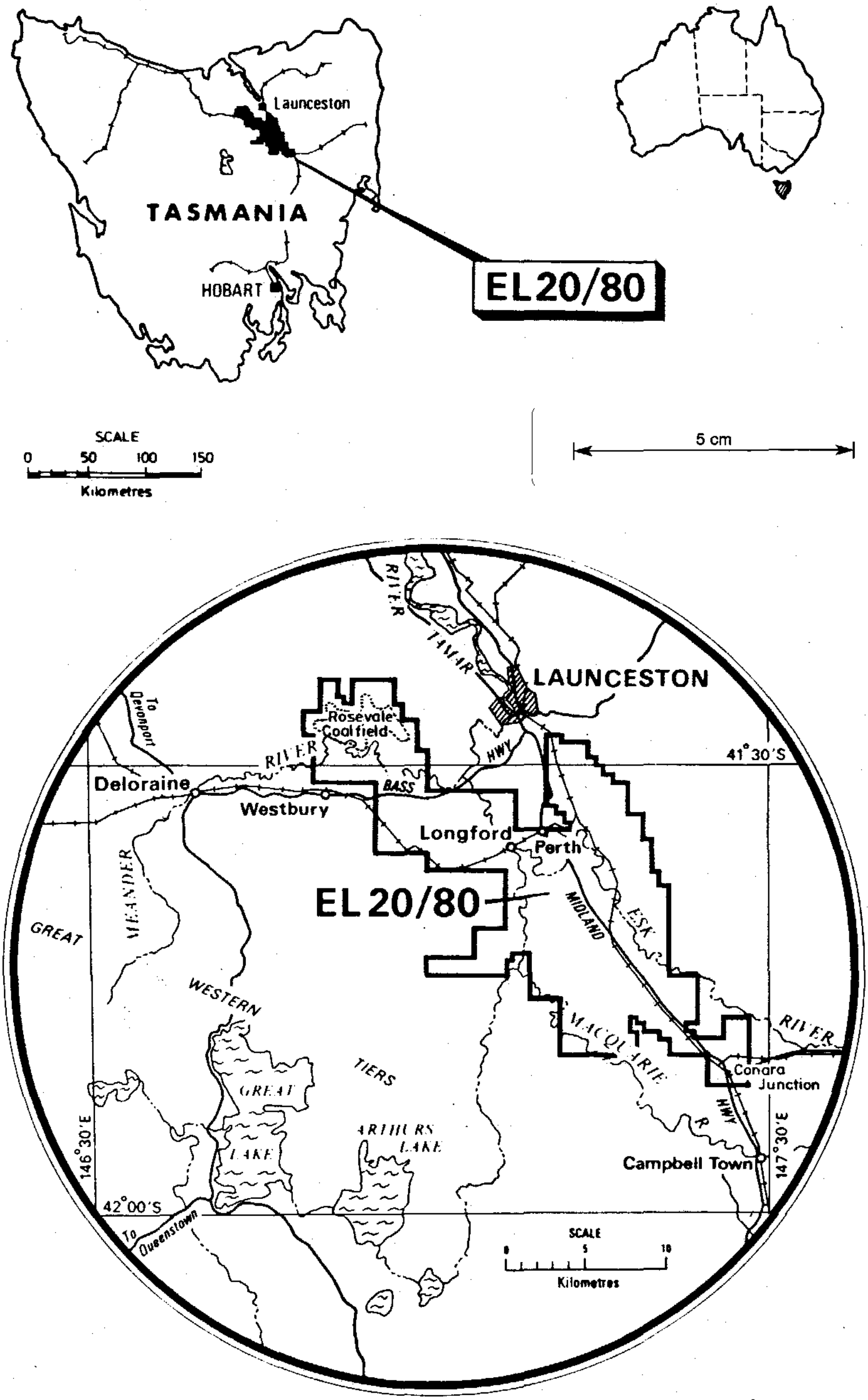

EXPLORATION LICENCE 20/80 TASMANIA

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FIGURE 1-1

This study indicates that the most suitable coal supply arrangement is to commence mining in the Loatta deposit and later, when additional coal is required, to transfer operations to the Pipers Lagoons deposit. It is estimated that sufficient reserves exist in the Loatta deposit to supply a 400 MW power station for 17 years, and with Pipers Lagoons deposits, reserves are sufficient more than 30 years of power generation.

Based on the limited geological information available, it has been assumed that coal and overburden will be mined with Bucketwheel Excavators (BWEs), loading via bandwagons when necessary, to conveyors which will transport the coal to the power station and the overburden to the overburden dump. As there is not a great depth of overburden in this mine, each Bucketwheel Excavator will mine coal, overburden and partings material. The required outputs and low strip ratios in the first two years make it possible to supply the total mine requirements with one BWE. As the output requirements get too high for one BWE a second BWE will be introduced together with a second face conveyor, trunk conveyor, dump conveyor and tripper stacker. Each BWE will operate on a separate system. The overburden dump will be initially located external to the pit but as mining advances, overburden will be placed in the pit behind the mining operation.

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.

A 400 MW power station would consume 70 million tonnes of coal, with a heat content of 7.1 MJ/Kg, over the first 20 years, and about another 28 million tonnes from years 21 to 30, a total of 98 million tonnes over 30 years.

The construction and operational phases of the project would reqire a significant number of skilled people. The construction workforce is estimated to be 120. The mine operational manning would reach 237 by Year 9.

A high voltage power supply for normal construction purposes would be required by both the mine and the power station while the operating mine would require a 22 kV supply. This could be drawn from the power station itself or if suitable, from the existing high voltage transmission system. Some upgrading and relocation of roads will be required in the area.

While the permanent operational labour force would be accommodated within existing cities and towns in the area, it is likely that some good quality temporary accommodation such as a construction camp or caravan park would be required during construction.

There do not appear to be any environmental considerations that would prevent a mine from being developed in the area.

2. STUDY BACKGROUND AND OBJECTIVES

2.1 Study Background

This study is in response to the HECT Coal Enquiry in October 1983. It is based on exploratory drilling in the area in 1981 and 1982 which delineated three brown coal deposits and one brown coal prospect in the Rosevale, Westwood and Selbourne areas. Exploration Licence 20/80 - Launceston is held by A.A.R. Limited, a subsidiary of CSR Limited. Exploration to date has delineated 118 million tonnes (in-situ) of indicated Class I and Class II brown coal reserves.

This report outlines a mine plan for the Loatta and Pipers Lagoons Deposits in the Rosevale Prospect. The mine plan presented is conceptual, in line with the limited geological and quality information available. It has been assumed that the lignite would be used to supply a nearby thermal power station operated by the HECT.

This study has been conducted by the Exploration and Evaluation Group, Coal Division, CSR Limited, and includes manning, equipment types and numbers, production schedules and costs.

Exporation history, detailed bore logs and coal isopachs have been submitted to the HECT in another volume of this enquiry response, and are not repeated in this report.

2.2 Study Objectives

The objectives of this study are:

- To establish a conceptual mine plan for the supply of coal to a 400 MW power station at Rosevale.

- To delineate the costs and manpower requirements associated with the development of such a mine.

3. MINING STUDY INPUT PARAMETERS

3.1 Location and Physiography

The Loatta, Pipers Lagoons and Selbourne brown coal deposits, known collectively as the Rosevale coal deposits are situated 15km to 20km West of Launceston and approximately 10km northeast of Westbury. Towns within a 60km radius of the Rosevale coal deposits include Devonport, Deloraine, Beaconsfield and Longford. The Rosevale brown coal deposits are located up to 6km north of the Meander River, which flows along the southern boundary of the Selbourne Deposit. (Figure 1.1).

Local access to the coalfield is via sealed and good quality unsealed shire roads linking Westwood and Rosevale settlements with Carrick, Hagley and Westbury. Farm tracks provide dry weather access to the greater part of the three deposits. During the wet winter and spring months local pastures become boggy and restrict the movement of vehicles off farm roads.

The climate of the area is temperate, with cold winters in which low-level snowfalls are occasionally recorded and warm, drier summers. Annual rainfall averages 750mm, falling principally in the winter months. January through March is generally dry and is the ideal time for exploration activity.

Topography of the Rosevale area is a reflection of the local geology, with the soft, coal-bearing, Tertiary Launceston Beds expressed as physiographic lows, and the more erosion-resistant Jurassic dolerites and Permo-Triassic sediments occurring as hills around the northern, eastern and western margins of the coal deposits. Late Tertiary basalts cover isolated areas of the Launceston Beds, forming low flat-topped hills and ridges. Total relief in the immediate environs of the coalfield is of the order of 50m. However, a major range of hills separates the Rosevale basin from Launceston, and encircles it to the north.

Southerly flowing ephemeral streams drain the coalfield area, through various low gradient marshy zones (e.g. Pipers Lagoons) into the Meander River, which is the major water course around Westbury and is the source of Westbury's reticulated water supply. The river crosses the Tertiary basin just south of the coal deposits, though it does pass over the southern limit of one coal area, before joining the South Esk River close to Hadspen. Landowners around Rosevale draw their water supplies largely from spring-fed dams, and rely more on surface run-off than ground water for domestic and stock use.

The principal land use over the Rosevale Coalfield is sheep and cattle raising, with small areas being under cultivation. With the exception of the most easterly of the coal deposits, Pipers Lagoons, which is largely covered with light forest, the land on and around the coalfield has been cleared and improved to varying degrees. Little prime quality pastoral land exists in the area.

Power is reticulated throughout the Rosevale Coalfield area to farms and small communities from distribution centres along the Bass Highway. High voltage transmission lines are located south-west of Westbury and adjacent to launceston, 17 km and 14 km, respectively, from the centre of the area of interest.

3.2 Basis for Study

The basis of the mining study has been the assumption that a 400 MW Power Station will be constructed on site.

Coal requirements for the Power Station have been based on the H.E.C.T. Coal Enquiry document dated 3rd October, 1983, Table 1. The tonneages in this table were for a 21GJ/t coal with 10% total moisture, and reached a peak of 1.22 Mtpy in Year 7. The required tonneages for Rosevale, which has a heat content of 7.1 GJ/t and a total moisture content of 45.3% have been calculated to be :

Year	1	1.02 Mtpy
	2	1.62
	3	2.07
	4	2.41
	5	3.20
	6	3.68
	7	4.25
	8	4.59
	9	3.91
	10	3.31
	11	4.06
	12	4.06
	13	4.44
	14	3.95
	15	3.65
Years 16-20		3.95
Sub Total		69.97
Years 21 to 30		2.77 (estimated)
TOTAL		97.67

The conversion assumes :

	Rosevale	Black Coal
SE.	7.1	21.0
Boiler Efficiency	70%	89%

The required maximum delivery rate is 5.0 Mtpy. The lifetime requirement of recoverable reserves is 128.0 mt.

It has also been assumed that over periods of several weeks, the Power Station may work at its full 400 MW capacity, burning coal at the rate of 6.25 Mtpy.

3.3 Structural Geology and Stratigraphy

The Rosevale coal deposits occur in the north of the Tertiary Launceston Basin. No formal stratigraphic nomenclature exists for the Launceston Basin and a basin wide correlation of brown coal horizons has not been established.

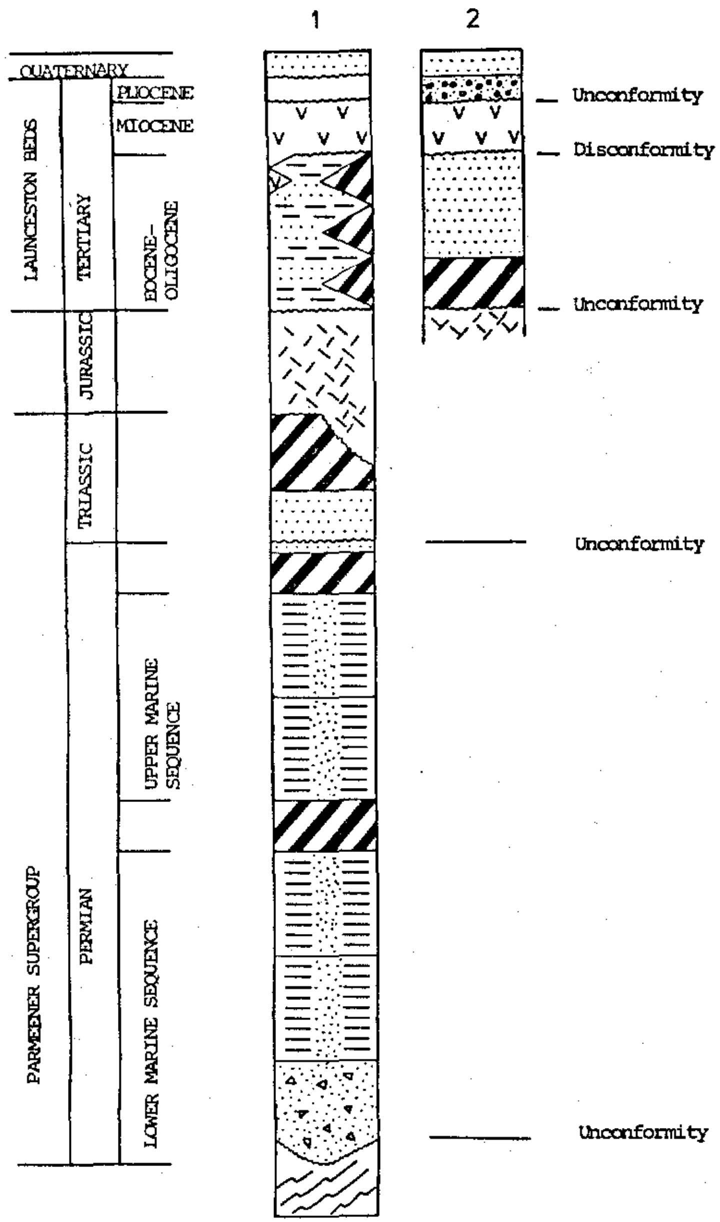
The Tertiary sediments of the Launceston Basin are predominately clays, sand and silt, with carbonaceous clay, ligneous clay and brown coal.

Drillhole information is scant, with information available from 27 holes within the mining areas. Of these eleven holes have been cored and chemically analysed. All holes have been geophysically logged. Seventy nine additional holes have been drilled in the licence area.

Up to four major brown coal horizons, referred to as A, B, C and D, comprising up to twelve individual coal seams have been intersected. The typical stratigraphy of the deposit is shown in Figure 3.1.

Typical Cross sections are shown in Figures 3.2 to 3.5.

The coal seams are generally flat lying and range in thickness from 1.5 metres to 9.0 metres and occur at depths ranging from 4 to 74 metres.



Stratigraphic Name	Lithological Description	Prospective Area in EL 20/80	Thickness Range
	Alluvium		
Upper Zone	Gravel, boulder beds		
Middle Zone	Alkali – Olivine basalts		Up to 60m
	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 — CSR

DRAWING	DATE
DRAWN C. J.	Nov. '82
CHECKED	
REVISED	

STRATIGRAPHY OF THE PARMEENER SUPERGROUP AND LAUNCESTON BASIN IN EL 20/80

SCALE

FIGURE 3-1

DRAWING No 70020 - 90

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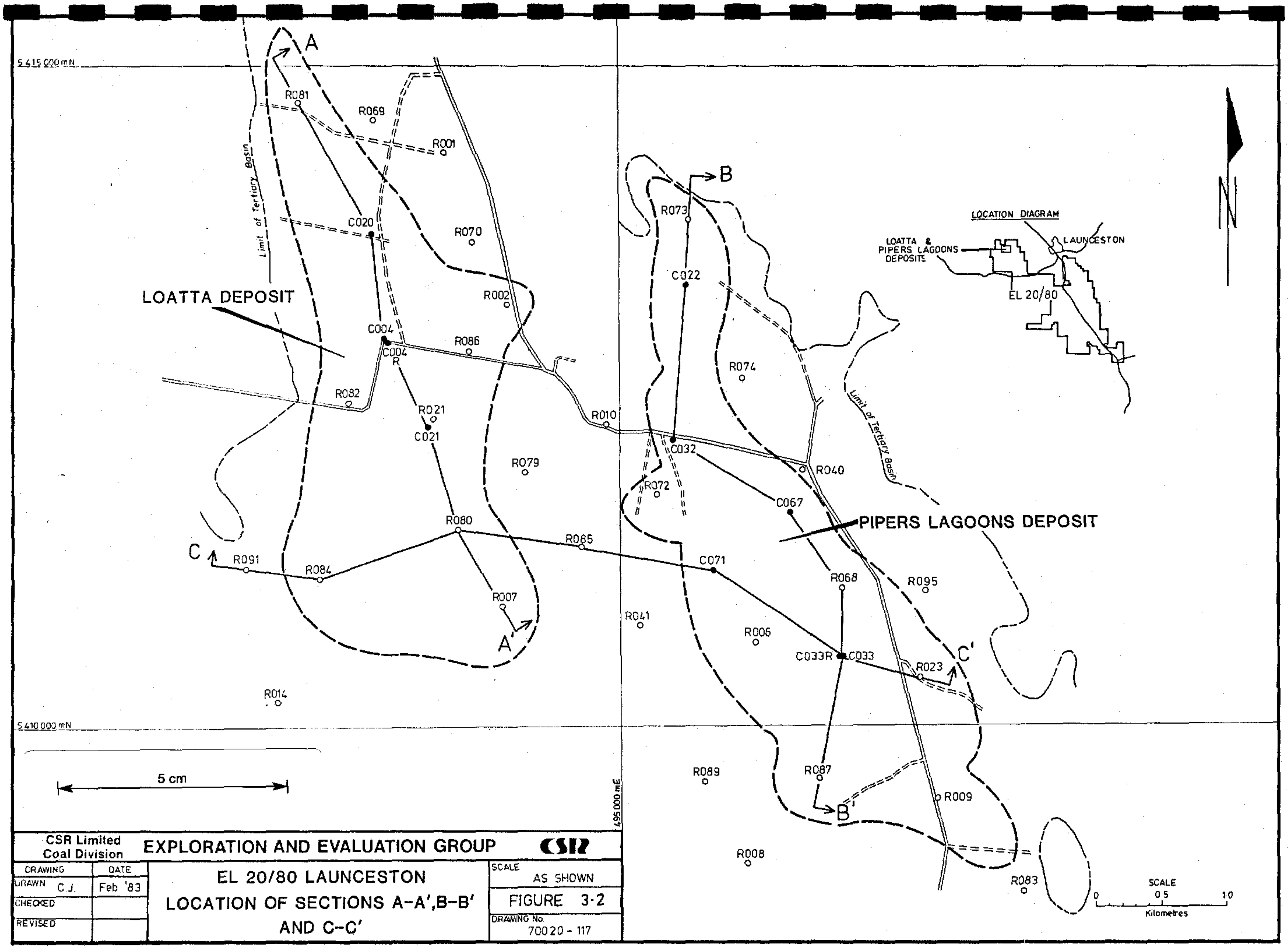

CSR Limited
Coal Division

EXPLORATION AND EVALUATION GROUP

CSR

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 3-2

DRAWING No. 70020 - 117

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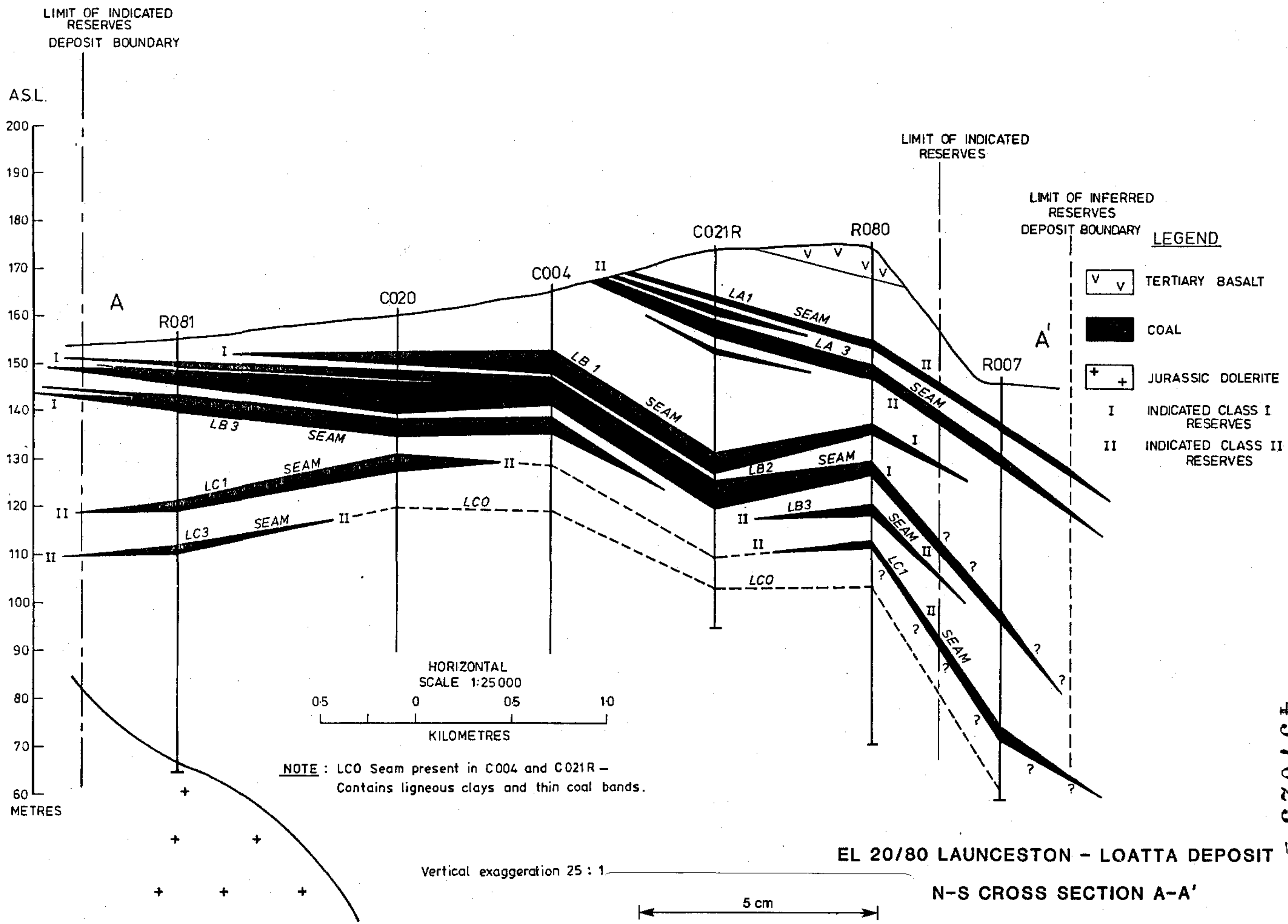

EL 20/80 LAUNCESTON – LOATTA DEPOSIT

N-S CROSS SECTION A-A'

FIGURE 33

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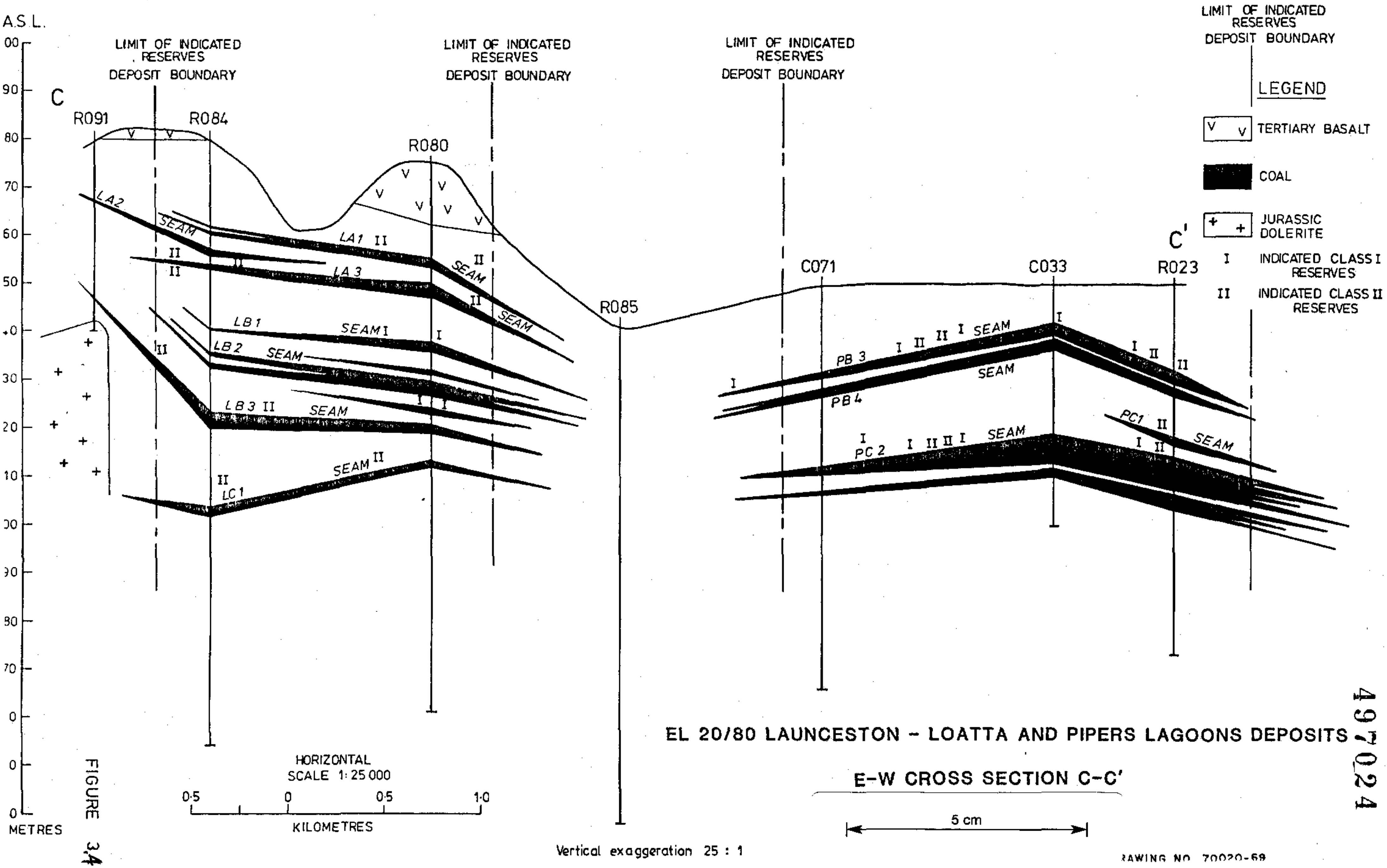
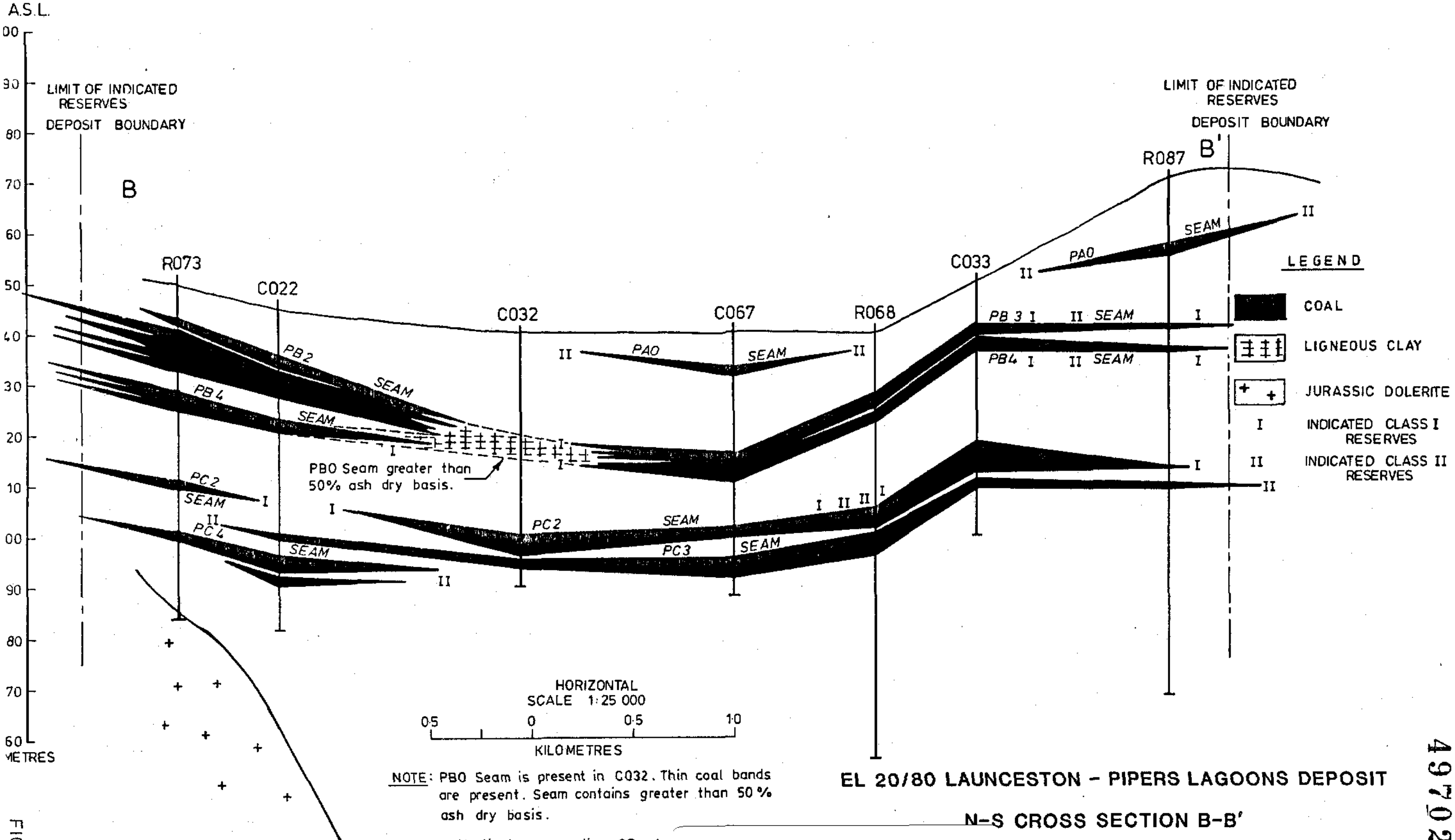


FIGURE 34

EL 20/80 LAUNCESTON - LOATTA AND PIPERS LAGOONS DEPOSITS

E-W CROSS SECTION C-C'



NOTE: PBO Seam is present in C032. Thin coal bands are present. Seam contains greater than 50 % ash dry basis.

Vertical exaggeration 25 : 1

5 cm

EL 20/80 LAUNCESTON – PIPERS LAGOONS DEPOSIT

N–S CROSS SECTION B–B'

FIGURE 3

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Cumulative seam thickness in the Loatta deposit ranges from 1.5m to 15.0m and averages 7.8m. In Pipers Lagoons, it ranges from 2.7m to 17.0m and averages 7.9m. In situ coal mining thickness isopachs are shown in Figures 4.1 and 4.2.

The seam correlations and reserve calculations used in this study require further drilling on a closer spacing to confirm that the assumptions are correct. The concepts developed and conclusions drawn from this study may be substantially altered by subsequent drilling.

Basalt capping exists in some parts of the Loatta Deposit.

3.4 Geotechnical Factors

Ground Conditions

In contrast with the Permo-Triassic coal-bearing strata of Tasmania, the Tertiary Launceston Beds in the Rosevale Coalfield are essentially undisturbed. Coal seams are flat-lying, except toward the margins of the coal basins where dips of up to a few degrees are in evidence. Whereas the distribution of coal may, in part, have been fault controlled through basinal subsidence on early Tertiary structures, no faulting has been demonstrated within the Tertiary sediments themselves. Occasional anomalous borehole results may indicate that some faulting is present, but other explanations (compactional effects, slumping) could equally be applicable.

Lignitic horizons occur between depths of 4 and 74m with the overburden dominated by ferruginous to mottled clays and sandy/silty clay. Interburden sediments in turn are dominated by ligneous clay with minor inferior lignite. The three deposits designated to date (Selbourne, Loatta, Pipers Lagoons) appear to be separated by elongate areas of sand rich interburden with much reduced lignite. The sands may represent fluvial sediments associated with coal deposition and hence may interfinger and lens out in the vicinity of the deposit boundaries.

Geotechnical issues concern rock strength and groundwater considerations. Apart from the basalt capping, virtually the entire Tertiary section is only weakly consolidated. The strength of the dominant clay rich strata will be a major determinant to successful opencast mining of the Rosevale coal deposits.

Groundwater

Groudwater lies at or within 6m of the surface, averaging around 3m.

Preliminary hydrological studies (monitoring of piezometers in boreholes) have confirmed that there are several aquifers in the sequence:

- sandy strata beneath the main coal-bearing section;
- coal seams confined by impervious clay;
- the interface between the Launceston Beds and the overlying Tertiary basalt;
- the Tertiary basalt.

High groundwater pressure, resulting in artesian flows from some sandy aquifers, coupled with the high water table (lying at or within 6m of surface and commonly at less than 3m) and moderately high rainfall, suggest that systematic pre-production and pit dewatering will be necessary to minimise the effects of overburden and interburden saturation.

The ground conditions indicate that artesian aquifers exist, and that saturated overburden and interburden conditions can be expected with artesian groundwater pressures associated with porous, sand-rich beds.

Mathews (1979) reports artesian pressures approaching 6m of head above ground surface. There is some speculation as to whether the artesian condition relates to recharge of confined aquifers outcropping elsewhere at higher elevations, or that primary consolidation of the sediment stack is still an active geological process.

Implications for mine design is for the former to represent a regional groundwater condition, for which a continuous pumping operation around the mine perimeter may be required to control flow rate and pressure. For the latter, a more local groundwater condition is indicated, requiring dewatering to control pressure, not flow volume. It is considered however, that the artesian aquifers are the major source of water.

Dewatering Requirements

Mathews (1979) describes confined aquifers in Tertiary sediments which when pumped at 150 to 300 l/min resulted in a 30 to 50m drawdown. A similar pump rate should be adequate for conceptual mine design.

The perimeter dewatering system will be designed to dewater the sediments such that artesian pressure and water inflow are controlled to allow relatively dry and stable mining conditions. Further testing is required to determine the degree of dewatering achievable in the overburden.

There may also be a need to dewater specific areas in order to relieve localised groundwater pressures within the pit.

<u>Stability Conditions</u>

The high standing water levels and pressurised aquifers are comparable to deeper conditions found in the Latrobe Valley in Victoria. Here the pit configuration includes 15m high benches, 50m wide to a depth approaching 85m for an overall slope of 2.5 to 3.1 (18^{o} to 22^{o}). Individual batter angles are about 65^{o} in lignite, 50^{o} in overburden.

Using saturated strength parameters for an undrained slope as would be encountered in either of the three deposits, overall slope angle could vary between 35^{o} to 15^{o} for 20m to 60m slopes respectively at a design factor of safety of 1.2. For this study, sidewall slopes of 22.5 degrees were used.

The major geotechnical issues for stable slope design include:

(i) determining representative effective strength parameters for clay rich strata

(ii) delineating the location and extent of acquifers relative to initial pit slopes

(iii) measure groundwater pressures and pressure source, particularly artesian conditions.

Due to the near surface water table, roads, hardstand areas and building foundations will need to be elevated unless sited on elevated areas such as those shown in Figure 5.1. A source of suitable fill may need to be located, but the local basalt would probably be suitable.

Excavatability

Material descriptions found in issued reports to date suggest excavation by large scale stripping machines such as Bucketwheel Excavators is possible without the need for blasting.

However, the likely saturated condition of clay sediments may mean some materials handling problems, particularly with bucket and/or conveyor chute blockages should the moist clays be sticky, but adequate design will minimise the effects of this.

Detailed analysis of batter slopes less than 20m high would need to be undertaken to ensure face angles exceeding 45^{o} to 50^{o} can be maintained for efficient bucketwheel operation. Analysis would also need to be undertaken to determine the safe slope angles on the overburden dump.

3.5 Mining Concept

The factors affecting the mining method are:

- Depth of deposit. The shallow depth of much of the coal indicates that Bucketwheel Excavators or Truck and Shovel may be the most economical means of removing overburden and winning coal.

- Based on experience drilling the sediments, it is expected that they will be suitable for excavation by Bucketwheel Excavators.

- The bearing strength of the sediments may be insufficient for shovel and truck operations.

- A shovel and truck operation would, because of the poor ground bearing strength, have to limit the number of working horizons, thereby reducing the number of partings horizons which could be mined separately from coal. This reduces the mined specific energy from 7.1 GJ/t to about 6.8 GJ/t.

- It is considered that a BWE would achieve better mining accuracy at coal/waste boundaries than shovel and truck, particularly when the poor trafficability of shovel/truck is taken into account.

- Blasting is not expected to be required, except in the basalt cap rock which has been regarded as a separate mining operation.

- The reasonable seam thickness and the flat nature of the deposit allows large equipment to be used to mine the coal, particularly if the thinner partings are mined as coal.

- The material is considered unsuitable for scrapers, and the quantities to be handled too great.

- There is significant groundwater in the area.

Considering the above factors an open cut mining method was chosen, utilising Bucketwheel Excavators (BWEs) for both overburden removal and coal mining.

BWEs provide a continuous supply of coal of a sizing suitable for feed to the power station, without any need for benefication on the mine site.

The coal seams are separated by clay partings and it is envisaged that these will be removed during the mining of the coal. As most of the partings are ligneous clays and there is not a sharp boundary between coal and parting, but rather a gradational boundary, it has been decided that partings will be mined exclusively outside the coal seam.

The lack of detailed knowledge about the deposit at this time has meant that assumptions have been made in the mining method and further work is required to determine the following:

- the planar nature and lateral continuity of the coal seams
- the economic cut-off boundary on the edge of the deposit
- correlation of the coal seams
- nature and engineering properties of the materials

- excavatability of materials
- pit floor conditions
- groundwater control and disposal

3.6 Coal Quality & Dilution

In Situ Quality

The insitu quality of the Loatta deposit determined from analysis of drill core samples is:

Total Moisture	47%
Ash	22%
Volatile Matter	18%
Fixed Carbon	13%
Specific Energy	7.8 MJ/kg
Sulphur	0.15%

Ash fusion temperatures	Deformation	1290
(reducing atmosphere ^{o}C)	Spherical	1600 +
	Hemisphere	1600 +
	Flow	1600 +

As Mined Quality

Based on the data available, it is not possible to nominate a firm product coal specification. Confidence in the data that is available is high but data is limited in quantity. Therefore typical "as mined" qualities are nominated in the expectation that further work will enable upgrading to specification standard.

Typical "as mined" quality is:

Specific Energy	7.1 MJ/kg
Moisture	45.3%
Ash	25.4%
Volatile Matter	17.8%
Fixed Carbon	11.5%
Sulphur	0.13%

This quality is calculated by combining the analyses of individual coal and non coal plies to incorporate dilution factors used in the study.

Cored holes C004, C020, C021 were used to determine average coal quality and the effect of dilution for Loatta deposit and C022, C067 and C033 were used for Pipers Lagoons.

Tables 3.1 and 3.2 show the sumamrised results, and Appendix Tables A1 to A6, show details of coal plies included in working sections.

In determining the amount of diluting material it has been noted that tests on BWEs in the Gulf States in the USA have indicated that the unwanted vertical movement when excavating with a BWE is 0.2m. Therefore mining exclusively outside the seam leads to an average dilution of 0.2m per seam boundary and zero coal loss, as shown below:

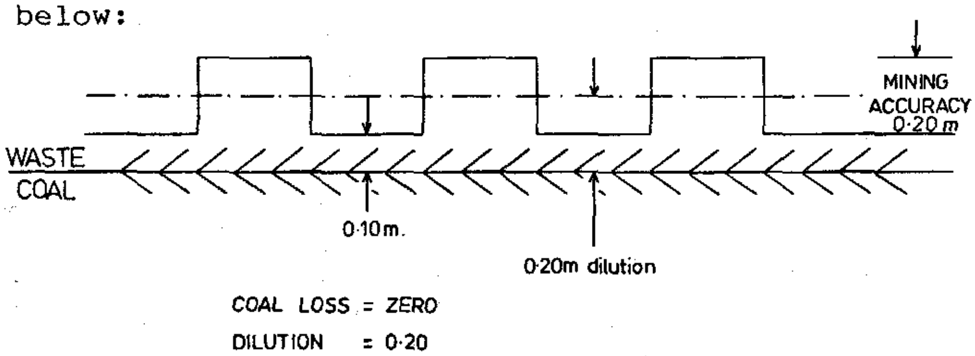


TABLE 3.1

Coal Quality and Dilution Analysis

Loatta Deposit

(In Situ Qualities)

Hole and Component		Thickness (m)	Specific Energy MJ/kg	Moisture %	Ash %	Volatile Matter %	Fixed Carbon %	Sulphur %	Relative Density
4	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
20	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
21	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
Average all Holes *									
	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.

TABLE 3.2

Coal Quality and Dilution Analysis

Pipers Lagoons

DEPTH	THICKNESS	AIR DRIED					IN SITU		
		RD	ASH	S.E.	IM	TM	R.D.	Ash	SE
COAL ONLY:									
CO22	17.06	1.58		11.35	20.1	47.6			
CO67	13.56	1.71		13.21	9.8	45.4			
CO33&33R	12.20	1.62		13.14	14.3	49.3			
Average	14.27	1.63		12.47	15.0	47.4	1.31		7.72
DILUTION:									
CO22	1.60	1.85		6.06	14.4	39.3			
CO67	1.60	2.10		5.83	5.1	39.3			
CO33&33R	1.60	1.99		5.81	11.8	39.3			
Average	1.60	1.98		5.89	10.1	39.3			
COAL & DILUTION:									
CO22	18.66	1.60		10.83	19.5	46.8			
CO67	15.16	1.75		12.27	9.2	43.2			
CO33&33R	13.80	1.66		12.12	14.0	47.9			
Average	15.87	1.67		11.68	14.5	45.9	1.34		7.39

Tonneage increase: 13.94%

Heat increase: 6.72%

Dilution with 0.2 metres of partings material from directly above and below each working section has been included in the mining schedule. It was assumed that there would be no coal loss to partings or overburden material. (However, coal around the margins of the Loatta deosit with a strip ratio greater than 7 : 1 was excluded from reserves, and an overall mining recovery of 95% was assumed.)

If later studies indicate that it is preferable to mine to the coal/waste boundary, then this is possible, with a consequent reduction in dilution to 0.1m.

The effect of dilution in the Loatta Deposit is to reduce specific energy from 7.79 GJ/t to 7.10 GJ/t, increase tonnage by 14.0%, and to increase the overall heat available from the deposit by 3.9%. The in situ ash content increases from 22.1% to 25.4%.

In Pipers Lagoons, specific energy reduces from 7.72 GJ/t to 7.39 GJ/t, the tonnage increases by 13.9% and overall heat available increases by 6.7%.

Sensitivity to Dilution Assumptions

In order to evaluate the sensitivity of coal quality to mining selectivity and dilution assumptions, the effect of reducing the number of partings horizons selectively removed from the coal was studied. If a shovel/truck operation were to be considered, for example, it would be desirable to minimise the number of mining horizons, both because of trafficability problems, and because of reduced mining accuracy at coal/waste interfaces. With the proposed BWE operation, it may still be desirable to reduce the number of coal/waste boundaries to increase machine productivity, and to improve total heat recovery from the deposit. The three cored holes in Loatta deposit were used for this comparative study. Tables A1 to A3 show the partings plies which are to be selectively removed from coal as part of the coal supply proposal. The effect of including these as coal is shown in Table 3.3. The as mined specific energy decreases from 7.1 MJ/kg to 6.8 MJ/kg, tonnage increases by 11.1% and heat recovery from the deposit increases by 5.9%.

This demonstrates that the as mined quality is not particularly sensitive to the dilution assumptions made, and that in future studies, it may be worth considering a less selective and more productive BWE operation.

Variation in Quality

Data available shows consistent coal quality with no major variations apart from ash content. Normal controls on mining should maintain ash content within acceptable tolerances and provide a relatively consistent coal feed for the power station. Reference to Appendix Tables A1 to A6 will give some idea of coal quality variation from ply to ply.

TABLE 3.3

Effect of Mining Partings as Coal and Minimising Number of Coal Zones

	Thickness	Relative Density (m)	Specific Energy	No. of Partings MJ/kg	No. of Coal Horizons
SELECTIVE MINING ZONES USED IN BASE STUDY					
004	14.96	1.33	7.62	2	3
020	17.52	1.33	7.66	6	7
021	12.58	1.30	8.19	5	6
Av./Total before Dilution	15.02	1.32	7.80	-	-
after 0.2m Dilution	17.15	1.36	7.10	-	-
PARTINGS IF TAKEN AS COAL					
004	1.39	1.60	2.51	2	-
020	3.90	1.55	3.78	5	-
021	4.78	1.49	3.97	4	-
DILUTANT TO BE TAKEN					
004	0.40	1.62	2.13	-	1
020	0.80	1.57	2.09	-	2
021	0.80	1.49	3.10	-	2
NEW MINING ZONES WITH DILUTION					
004	16.75	1.36	6.96	Nil	1
020	22.22	1.37	6.67	1	2
021	18.16	1.36	6.73	1	2
Total/Average	19.05	1.36	6.77	-	-

Increase in Tonnage (%) = 11.1%
Increase in Total Heat (%) = 5.9%
(per square metre)

4. MINING RESERVES ASSESSMENT

Table A4 in the Appendix was used to determine the bottom mining horizon at each borehole, with incremental and cumulative strip ratios at each seam horizon within each hole being used as a basis.

Table 4.1 summarises the results. These values, in conjunction with the 1.5m thickness limit boundary defining the outer edge of the deposit, were used to produce thickness contours in Figures 4.1 and 4.2.

The reduced level (RL) 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 contour of the depth to the mining floor in Figures 4.3 and 4.4.

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 4.1.

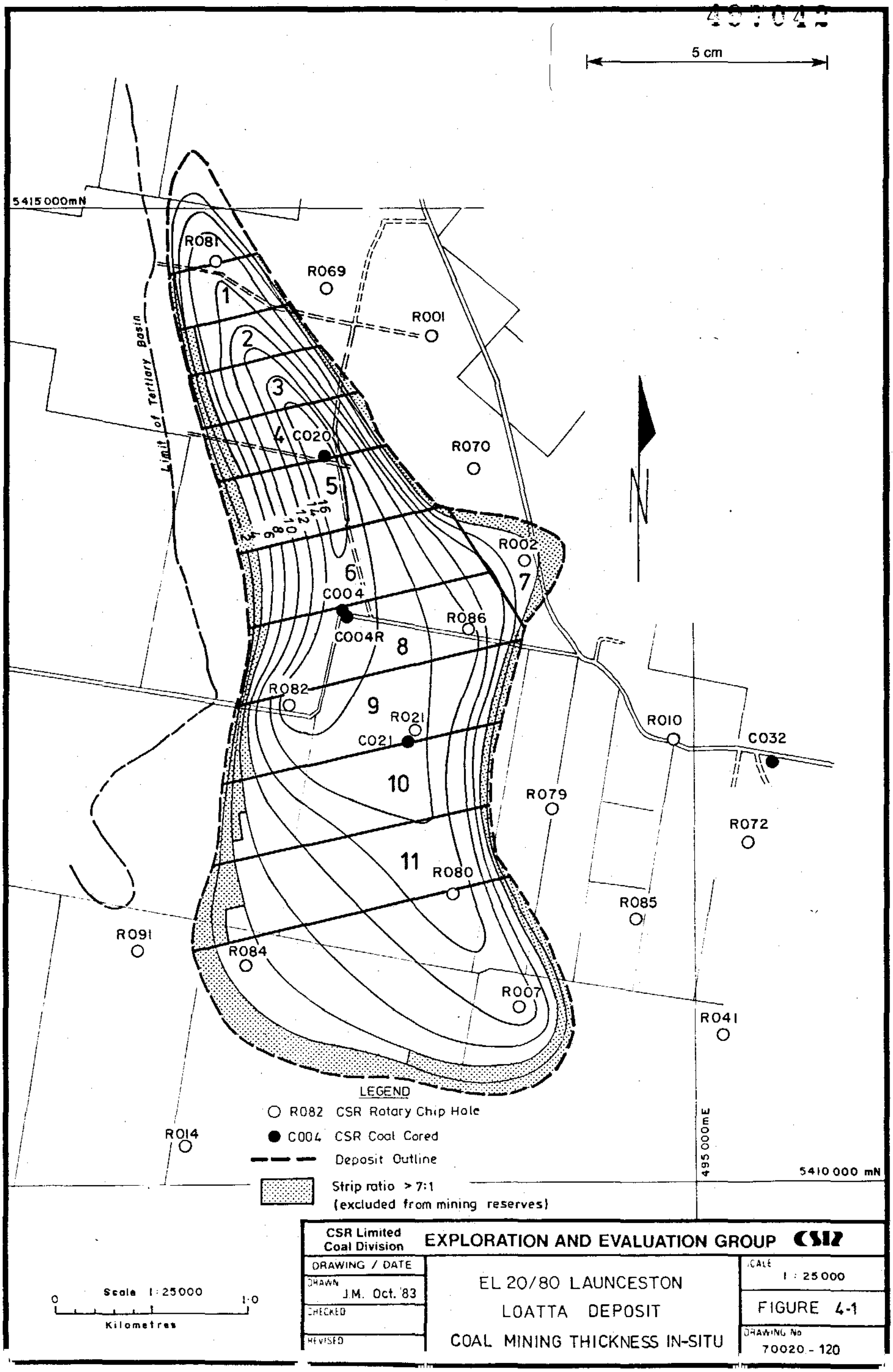
Areas of basalt are also shown in Figure 4.3. It has been assumed, for convenience of preliminary costing, that this material would be mined by contractor and it has been excluded from the BWE quantities. In practice, industrial relations as well as economic aspects would determine how the basalt would be removed. The intermittent quantities involved would have a bearing on the course taken. There may be a market for crushed basalt in northern Tasmania.

TABLE 4.1

In Situ Coal Thickness Used In Mining Reserves

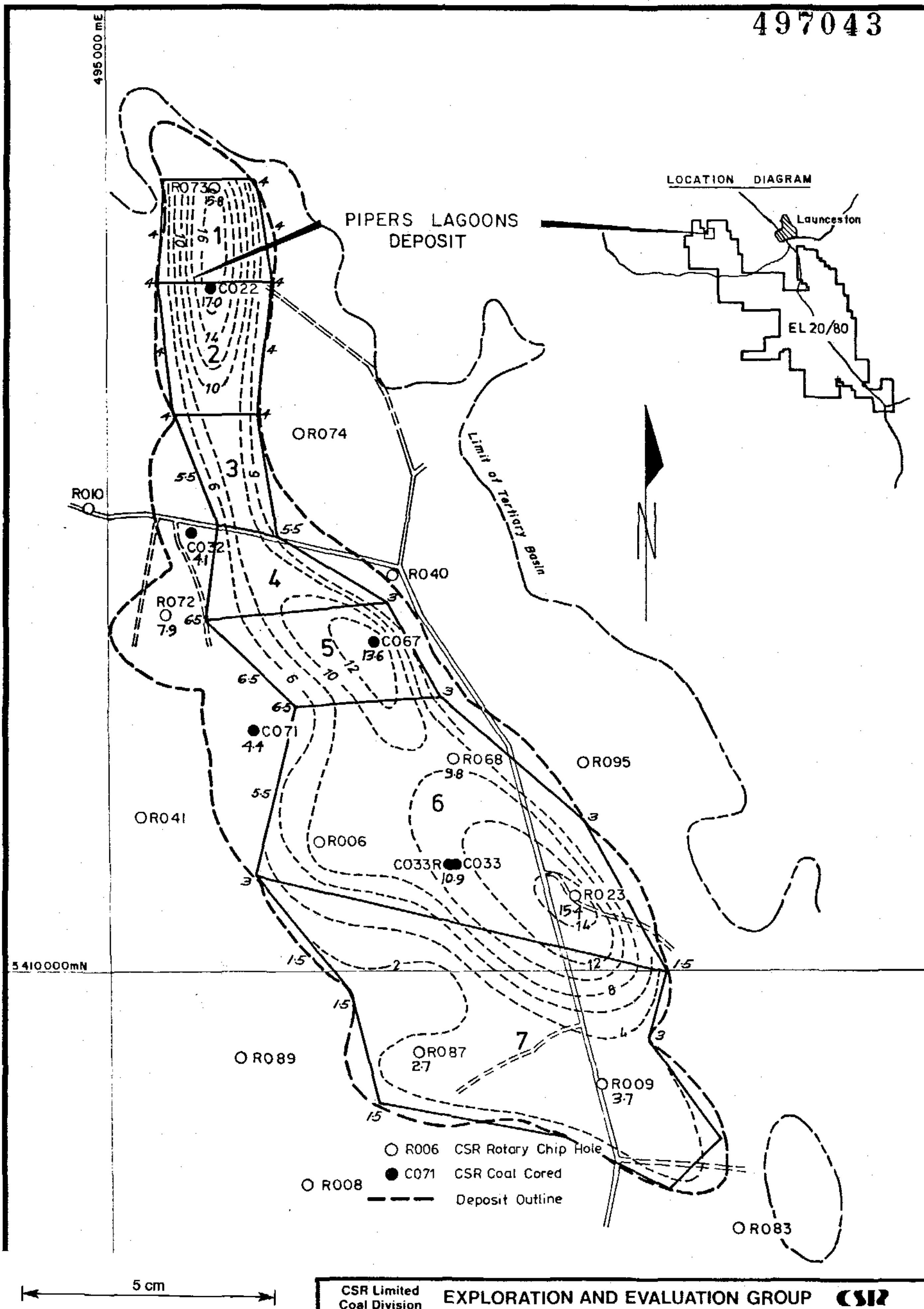
Hole	Bottom Seam Selected	No. of Seams	Depth to Bottom	In Situ Coal Thickness
RO81	LB3	2	15.2	7.8
CO20	LC1	4	32.5	17.5
CO04	LB3	3	29.7	15.0
RO02	LB1	1	33.0	3.7
RO86	LB2	3	39.1	10.5
RO82	LC4	7	76.8	14.3
CO21	LB2	4	50.6	12.6
RO80	LB3	5	56.0	11.4
RO84	LA3	2	27.1	3.3
RO07	LB3	4	52.6	8.7
RO73	PC4	3	54.0	15.8
CO22	PC4	5	53.6	17.0
CO32*	PC2	1	43.9	4.1
RO72*	PC4	4	58.4	7.9
CO67	PC3	5	48.6	13.6
CO71*	PB4	2	24.0	4.4
RO68	PC2	3	38.1	9.8
ROO6	PC3	3	56.0	8.7
CO33/ 33R	PC3	4	37.6	10.9
RO23	PC3	5	47.0	15.4
RO87	PAO	1	10.4	2.7
ROO9	PB3	3	26.3	3.7

* Outside selected mining zone.



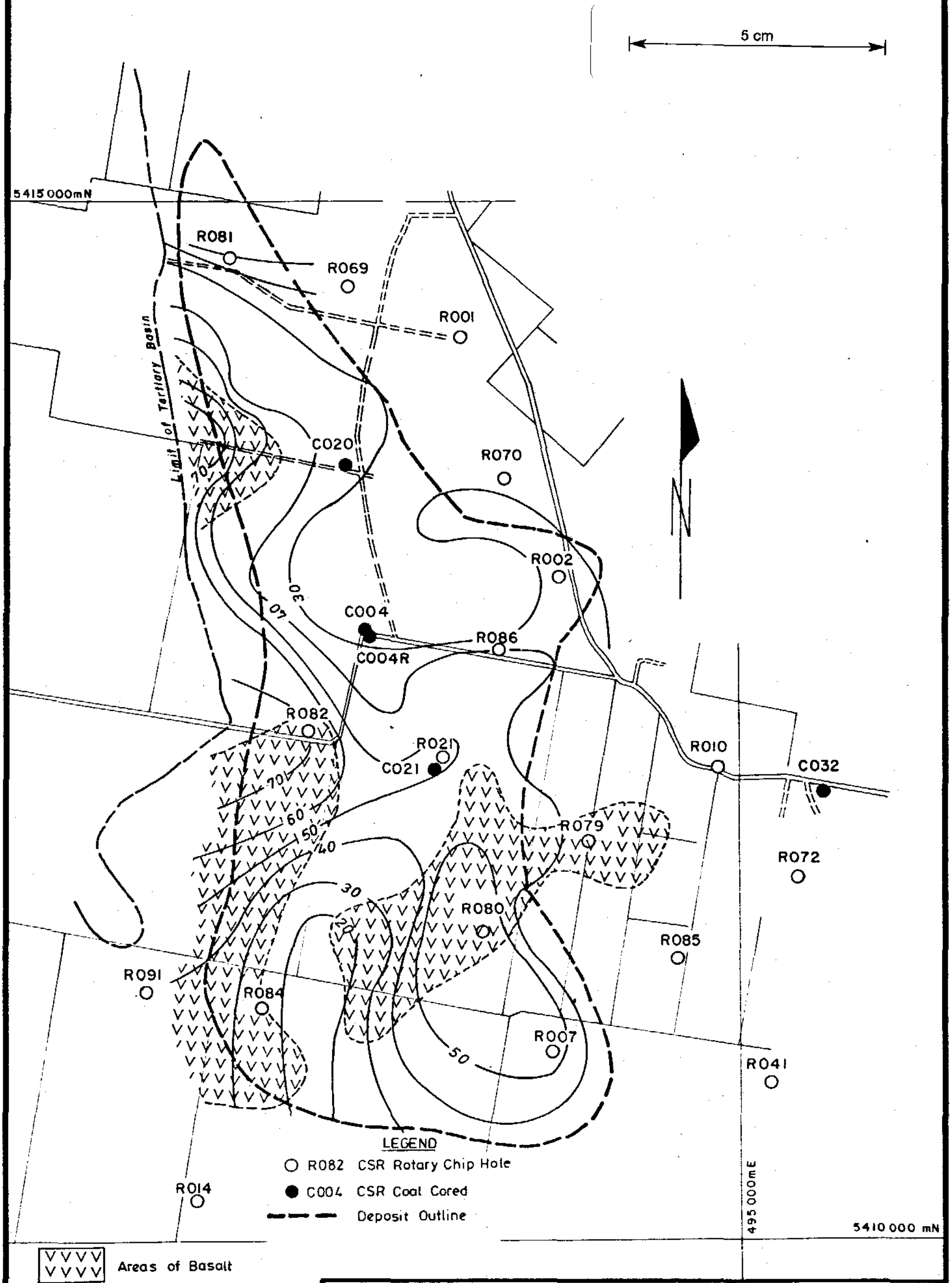
5 cm
5415 000mN
5410 000 mN
495 000mE
Limit of Tertiary Basin
N
R081
R069
R001
R070
R002
R086
R082
R021
R010
C032
R079
R072
R080
R085
R091
R084
R007
R041
R014
C020
C004
C004R
C021
1
2
3
4
5
6
7
8
9
10
11
16
14
12
10
8
6
4
2
LEGEND
R082 CSR Rotary Chip Hole
C004 CSR Coal Cored
Deposit Outline
Strip ratio > 7:1
(excluded from mining reserves)
Scale 1:25000
0
1·0
Kilometres
CSR Limited
Coal Division
EXPLORATION AND EVALUATION GROUP
DRAWING / DATE
DRAWN J.M. Oct. '83
CHECKED
REVISED
EL 20/80 LAUNCESTON
LOATTA DEPOSIT
COAL MINING THICKNESS IN-SITU
SCALE 1 : 25000
FIGURE 4-1
DRAWING No 70020 - 120

497043

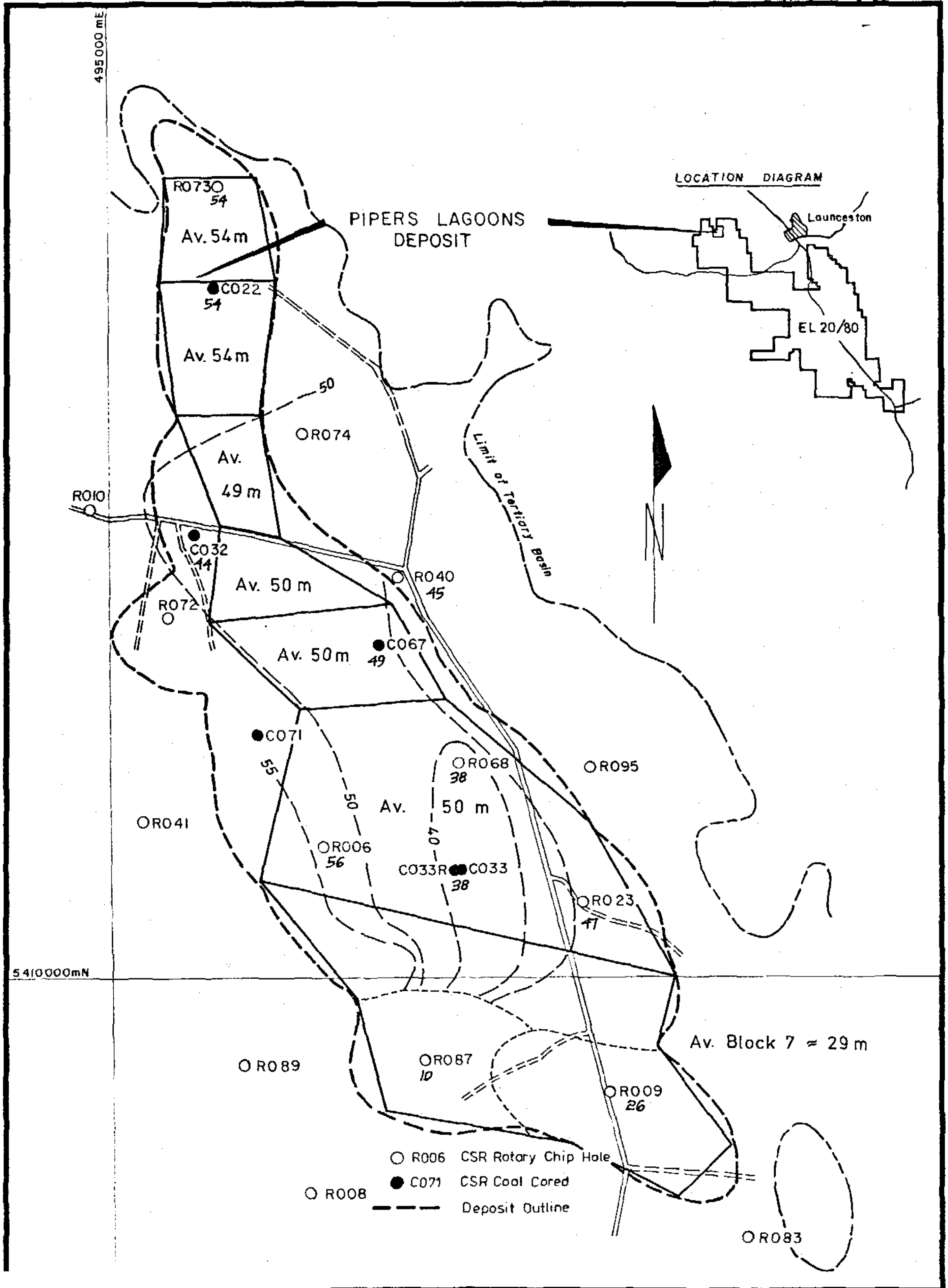


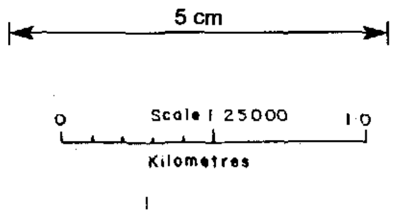
CSR Limited Coal Division	EXPLORATION AND EVALUATION GROUP	CSR
DRAWING / DATE	EL 20/80 LAUNCESTON	SCALE 1 : 25 000
DRAWN IW. Oct '83	PIPERS LAGOONS DEPOSIT	FIGURE 4-2
CHECKED	COAL MINING THICKNESS	DRAWING No 70020 - 172
REVISED		

497044



CSR Limited Coal Division	EXPLORATION AND EVALUATION GROUP CSR	
DRAWING / DATE		
DRAWN Aug '82	EL 20/80 LAUNCESTON LOATTA DEPOSIT DEPTH TO BASE OF COAL MINING SECTION	SCALE 1 : 25000
CHECKED		FIGURE 4-3
REVISED C J Feb '83		DRAWING No 70020 - 121





CSR Limited Coal Division

EXPLORATION AND EVALUATION GROUP CSR

DRAWING / DATE		SCALE 1 : 25000
DRAWN IW Oct.'83	EL 20/80 LAUNCESTON	FIGURE 4.4
CHECKED	PIPERS LAGOONS DEPOSIT	
REVISED	DEPTH TO BASE OF MINING	DRAWING No 70020-173

Tables 4.2 and 4.3 summarise mining block quantities. In Loatta mineable coal tonnes were obtained by multiplying in situ tonnes by 1.176 to account for dilution. (From Table 3.1 the ratio of thickness multiplied by specific gravity before and after dilution is 1.176.) Partings volume was decreased accordingly.

Based on information from Table 3.2, Pipers Lagoons in situ tonnes were multiplied by 1.139 to give mineable tonnes, which were then multiplied by 1.041 to give equivalent tonnes at a specific energy of 7.1 GJ/t.

Mineable resources after allowing for dilution are:

Loatta	60.0 Mt
Pipers Lagoons	48.0 Mt
Total	108.0 Mt

TABLE 4.2

Loatta Mining Block Quantities

	1	2	3	4	5	6	7	8	9	10	11	12	Total
IN SITU													
Area (m^2 x 1,000)	156.7	174.2	208.4	237.3	388.3	430.9	177.9	519.2	576.2	592.2	619.8	1460.7	5542.5
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	7.8
In situ Tonnes (sg 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	-
MARGINS REJECTED													
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. coa 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) (sg 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
MINEABLE COAL													
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
Recoverable In Situ Tonnes *	1.10	1.50	2.08	2.54	4.22	5.67	0.62	6.63	7.18	6.25	4.76	8.41	50.96
Mined (0.2m dilution)(sg 1.36)	1.29	1.76	2.45	2.99	4.96	6.67	0.73	7.80	8.45	7.35	5.60	9.89	59.94
Area (m^2x 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
OVERBURDEN & PARTINGS													
Depth to base of mining (m)	25.0	35.0	36.0	40.0	33.0	30.0	30.0	40.4	53.0	47.0	35.0	40.0	39.8
Av. coal thickness (in situ) (m)	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)	17.6	25.8	25.3	28.1	21.6	17.0	24.6	28.1	39.8	36.2	26.9	32.7	-
Batters (22.5^o) (MBm^3)	0.82	0.84	0.92	1.12	1.16	0.41	1.30	0.79	2.85	2.32	1.26	3.81	17.60
O/B & partings volume (mined) (MBm^3) (includes Basalt)	3.19	4.83	5.41	6.58	8.46	7.18	3.86	14.52	22.50	21.23	15.59	38.27	151.62
Ratio Waste m^3/coal T.	2.47	2.74	2.21	2.20	1.71	1.08	5.28	1.86	2.66	2.88	2.78	3.86	2.53
Basalt Area (m^2 x 1,000)	-	-	10.0	31.9	-	-	-	-	140.0	205.0	336.0	238.0	-
Basalt Thickness	-	-	3.0	5.0	-	-	-	-	10.0	6.0	14.0	8.0	-
Basalt Volume (MBm^3)	-	-	0.03	0.16	-	-	-	-	1.40	1.23	4.70	1.90	9.42
BWE Waste Volume (MBm^3)	3.19	4.83	5.38	6.42	8.46	7.18	3.86	14.52	21.10	20.00	10.89	36.37	142.20

* 95% overall mining recovery

TABLE 4.3

Pipers Lagoons Mining Block Quantities

		1	2	3	4	5	6	7	TOTAL
IN SITU COAL									
Area	(m^2x1000)	243	295	195	233	383	1548	1650	4547
Av. Coal Thickness	(m)	10.1	8.8	6.9	7.2	9.0	9.1	4.2	7.91
In Situ Tonnes (sg.1.31)	(Mt)	3.22	3.40	1.76	2.20	4.52	18.45	9.08	42.63
MINEABLE COAL									
Recoverable In Situ Tonnes [1] (Mt)		3.06	3.23	1.67	2.09	4.29	17.53	8.63	40.50
Mined (0.2m dilution)(sg 1.34 and equivalent SE 7.10)[2]		3.63	3.83	1.98	2.48	5.09	20.80	10.24	48.05
Cumulative Mineable Tonnes (Mt)		3.63	7.46	9.44	11.92	17.01	37.81	48.05	-
OVERBURDEN AND PARTINGS									
Depth to Base of Mining (m)		54.0	54.0	49.0	50.0	50.0	50.0	29.0	-
O/B & Partings thickness (in situ)(m)		43.90	45.2	42.1	42.8	41.0	40.9	24.8	-
O/B & Partings thickness mined (m)[3]		42.8	44.2	41.3	42.00	40.0	40.0	24.3	-
Batter volume (22.5deg.)(MBm^3)		5.00	4.58	3.48	3.32	3.32	8.15	3.40	-
Total Overburden & Partings (MBm^3)		15.40	17.62	11.53	13.11	18.64	70.07	43.50	189.87
Strip Ratio m^3/coal T.		4.24	4.60	5.83	5.28	3.66	3.37	4.25	3.95

NOTES: 1. 95% overall mining recovery.

2. To obtain Loatta equivalent tonnes (SE=7.1 MJ/kg), Pipers Lagoons tonnes (SE=7.39) multiplied by 1.041
Tonneage increase due to dilution=1.139
Total increase = 1.041*1.139=1.186

3. Coal mined thickness increases by 1.112

5. MINE DEVELOPMENT

5.1 Introduction

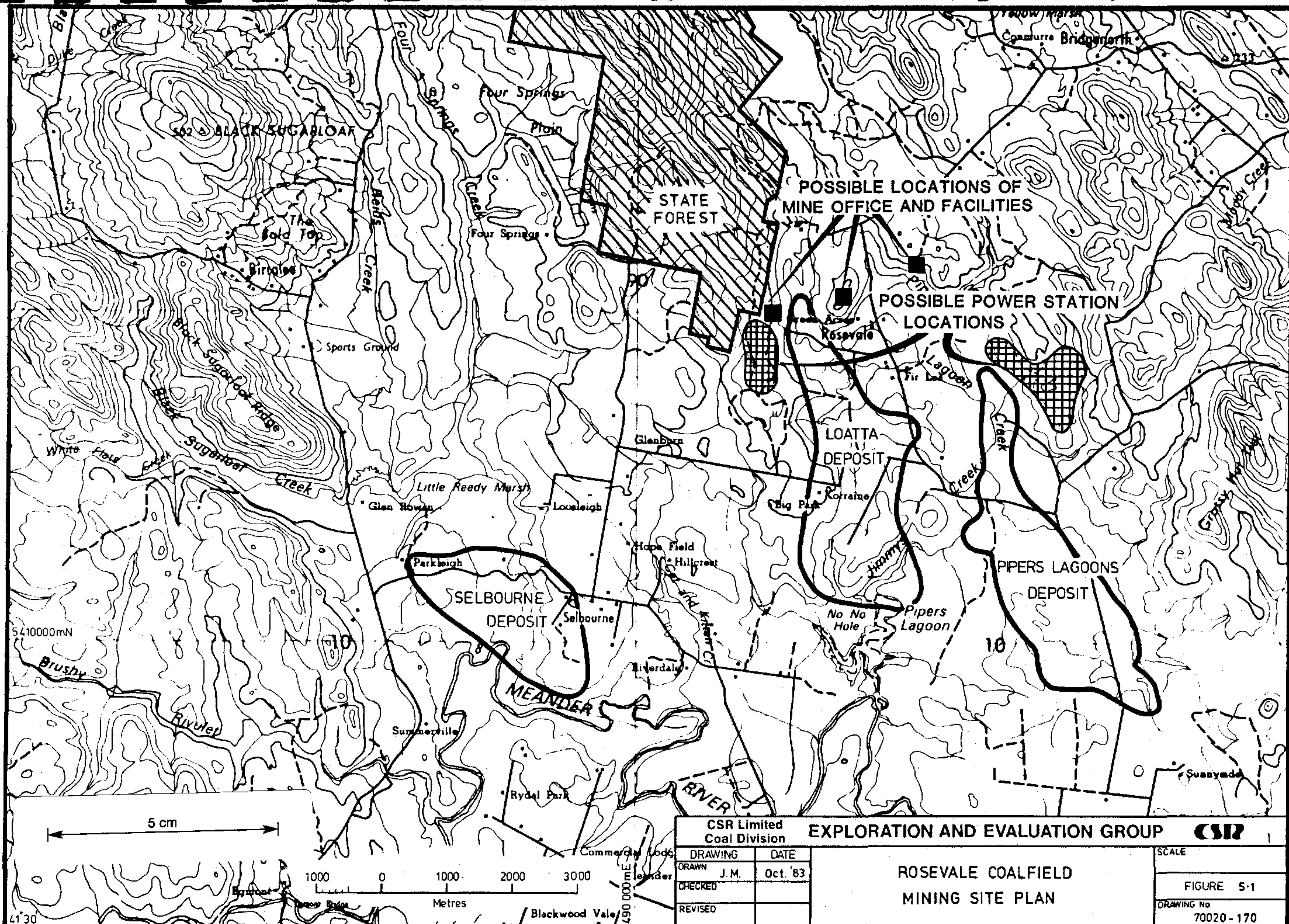
This section describes the main features of an open cut brown coal mine at Rosevale to supply the proposed quantities and quality of coal listed in Section 3.2. The objective is to establish a cost effective and viable mining plan to provide a low cost, reliable supply of coal for power generation.

This study assumes coal supply to a power station over its assumed life of 30 years.

Information available indicates that the most suitable mine plan is to commence mining in the Loatta deposit and then transfer operations to the Pipers Lagoons deposit. It is estimated that sufficient reserves exist in the Loatta deposit to supply a 400 MW power station for the first 17 years, with Pipers Lagoons providing the balance.

A layout of the mining area is shown in Figure 5.1.

These mineable tonnages, and the specific energy of 7.1 MJ/kg, take into account the tonnage and heat content of diluting material mined at coal/parting interfaces.


BLACK SUGARLOAF
562
Four Springs
Plain
STATE FOREST
POSSIBLE LOCATIONS OF MINE OFFICE AND FACILITIES
POSSIBLE POWER STATION LOCATIONS
Bridgenorth
Rosevale
Fir Lea
LOATTA DEPOSIT
PIPERS LAGOONS DEPOSIT
Pipers Lagoon
No No Hole
SELBOURNE DEPOSIT
Selbourne
Parkleigh
Glen Rowan
Little Reedy Marsh
Glenburn
Hope Field
Hillcrest
Riverdale
Big Park
Korraine
The Bald Top
Birralee
Black Sugarloaf Ridge
Sugarloaf Creek
White Flats Creek
Sports Ground
Four Springs
Brushy Rivulet
MEANDER
RIVER
Summerville
Rydal Park
Sunnyside
Blackwood Vale
Commercial Lodge
Egmont
5410000mN
490 000mE
41°30'
5 cm
1000 0 1000 2000 3000
Metres
CSR Limited
Coal Division
EXPLORATION AND EVALUATION GROUP
CSR
DRAWING
DATE
DRAWN J.M.
Oct. '83
CHECKED
REVISED
ROSEVALE COALFIELD
MINING SITE PLAN
SCALE
FIGURE 5·1
DRAWING No. 70020-170

497050

The major items of mining equipment required for the proposed mine, and their functions, are:

Bucketwheel Excavator (BWE)	Digging coal, overburden and partings
Bandwagon	Provide a mobile link between the BWE and the conveyor systems which transport coal, overburden and partings out of the pit.
Face Conveyor	Movable conveyor near the advancing face for collecting coal, overburden and partings.
Trunk Conveyor	Conveyors for transferring coal between the face conveyors and the power station feed conveyors. Also, used for transferring overburden to the overburden stacker.
Tripper stacker	Mobile overburden stacker for placing overburden.

Coal and overburden will be mined with BWEs, loading via bandwagons (when necessary), to conveyors. These conveyors will transport both coal to the power station and overburden to the overburden dump. The required outputs and low strip ratios in the first two years make it possible to supply the total mine requirements with one BWE over this period. However as production requirements increase after Year 2, a second BWE will be introduced together with a second conveyor system.

Initially, overburden will be placed external to the pit but as mining advances, overburden will be placed in the pit behind the mining operation. In this way, the mine will, in effect, be a "travelling void" moving forward with the area behind the mining operation backfilled and rehabilitated.

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

5.2 Mine Development

The initial opening will be at the northern end of the Loatta Deposit. A trunk conveyor and face conveyor will be erected on the surface and the BWE with the bandwagon will commence excavation to a depth of 10 metres.

Later, the conveyors will be relocated into the pit.

During this early phase of the operation, overburden will be delivered to a tripper stacker external to the pit.

The mode of operation in the pit is described in Section 5.3.

As coal requirements increase, a second BWE will be required after Year 2. Both machines will operate on separate systems and each has the capability to supply in excess of power station coal requirements.

5.3 Overburden And Coal Mining

5.3.1 Mining Method

Excavation utilising two BWEs, each capable of mining both coal and waste, and each with its own bandwagon, conveyors, and tripper stacker, provides flexibility, continuity and reliability of coal supply. It is assumed that:

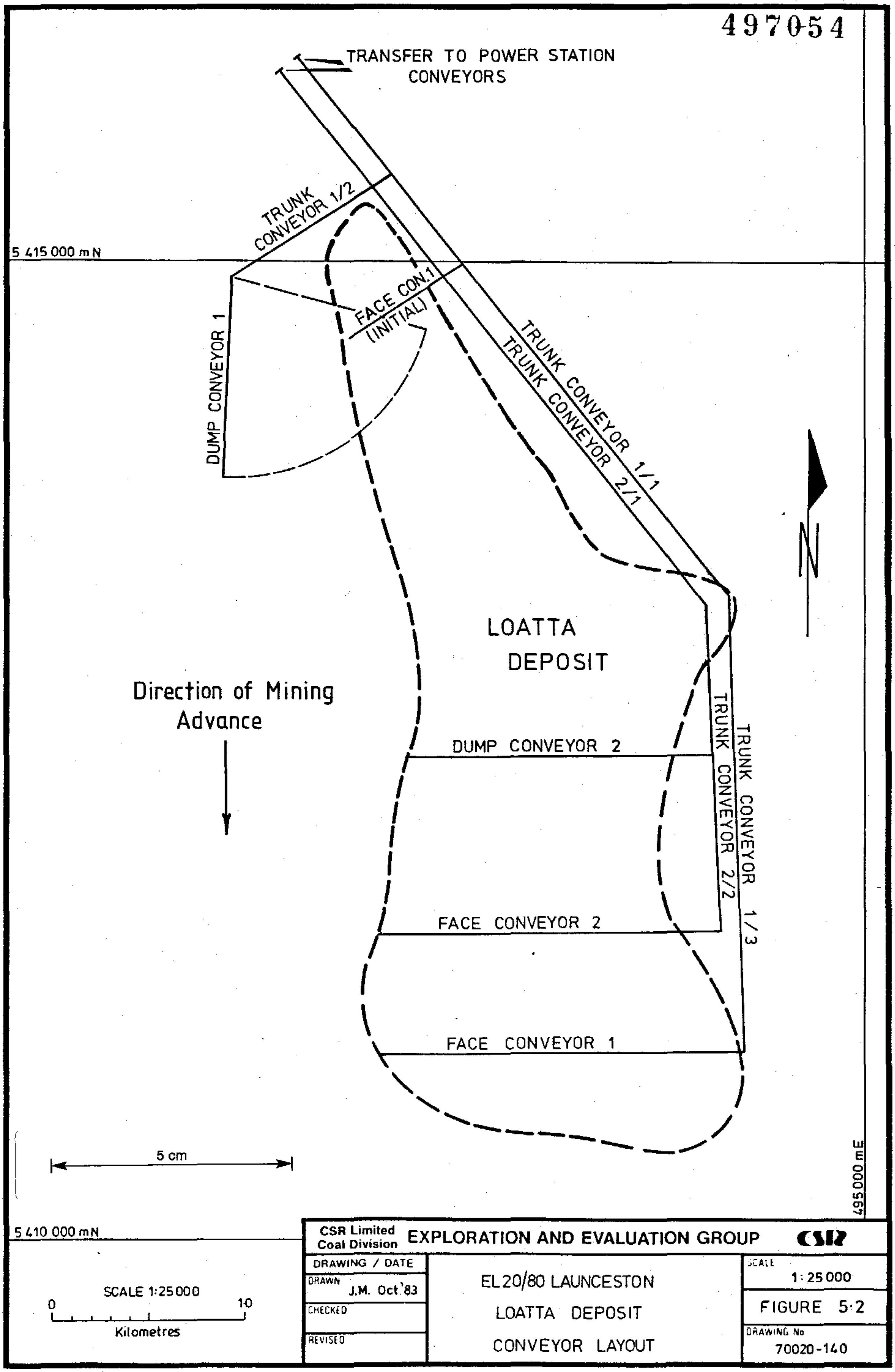
- the sediments can be dewatered
- the BWE can operate on all strata.

5.3.2 Description of Operation

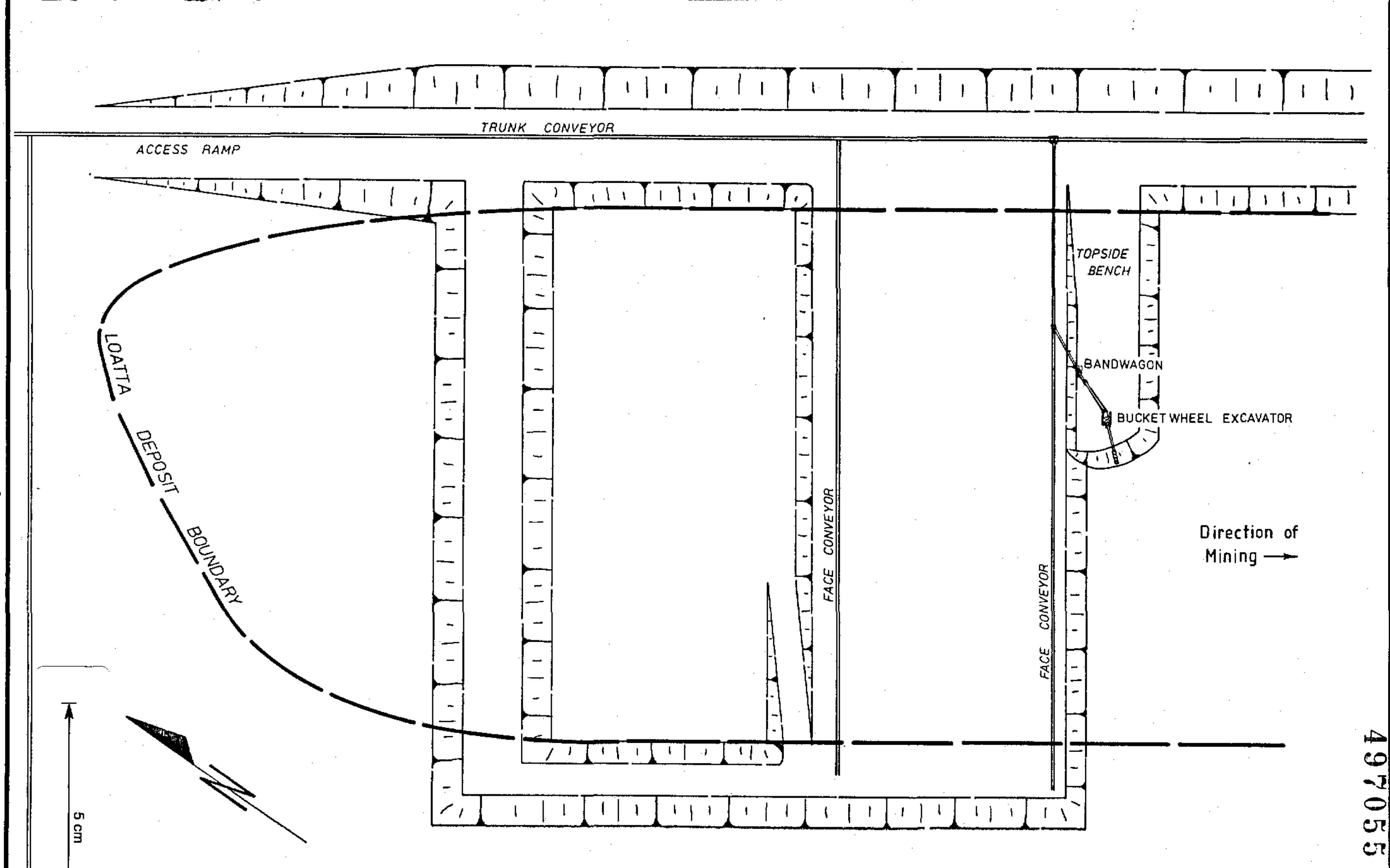
Stage 1 (Years -1, 1, 2)

The first BWE (No. 1) will load coal and waste to conveyors laid out as shown in Figures 5.2 and 5.3.

BWE No. 1 will excavate on three faces. It will initially ramp up from the conveyor level and excavate the overburden overlying the coal, utilising the bandwagon to reach the face conveyor from the upper bench (Figure 5.4).



497054
TRANSFER TO POWER STATION
CONVEYORS
TRUNK
CONVEYOR 1/2
5 415 000 m N
FACE CON.1
(INITIAL)
DUMP CONVEYOR 1
TRUNK CONVEYOR 1/1
TRUNK CONVEYOR 2/1
LOATTA
DEPOSIT
Direction of Mining
Advance
DUMP CONVEYOR 2
TRUNK CONVEYOR 2/2
TRUNK CONVEYOR 1/3
FACE CONVEYOR 2
FACE CONVEYOR 1
N
5 cm
495 000 mE
5 410 000 mN
SCALE 1:25 000
0
1·0
Kilometres
CSR Limited
Coal Division
EXPLORATION AND EVALUATION GROUP
CSR
DRAWING / DATE
DRAWN J.M. Oct.'83
CHECKED
REVISED
EL 20/80 LAUNCESTON
LOATTA DEPOSIT
CONVEYOR LAYOUT
SCALE 1:25 000
FIGURE 5·2
DRAWING No 70020-140



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

DRAWING	DATE
DRAWN J.M.	Feb.'83
CHECKED	
REVISED J.M.	Oct.'83

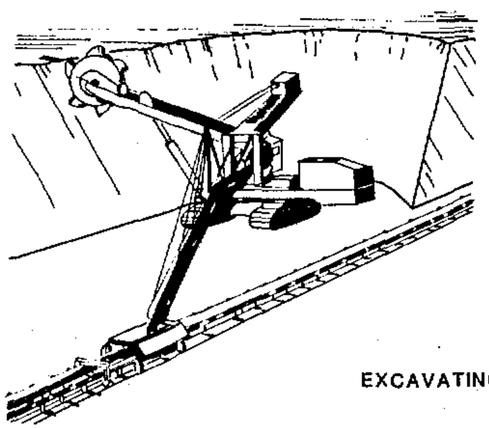
EL 20/80 LAUNCESTON – LOATTA DEPOSIT

PROPOSED PIT LAYOUT
STAGE 1

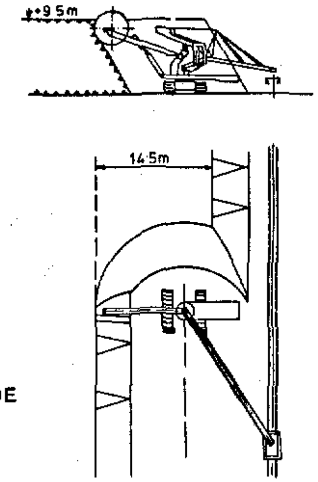
SCALE

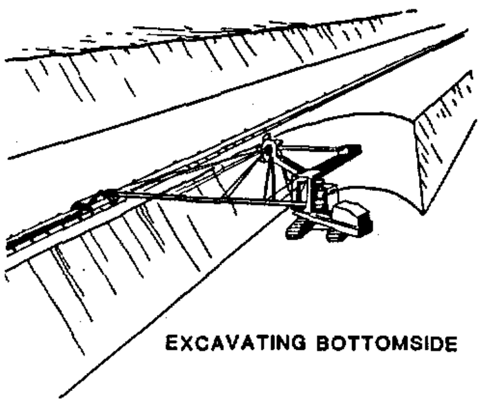
FIGURE 5·3

DRAWING No 70020-118

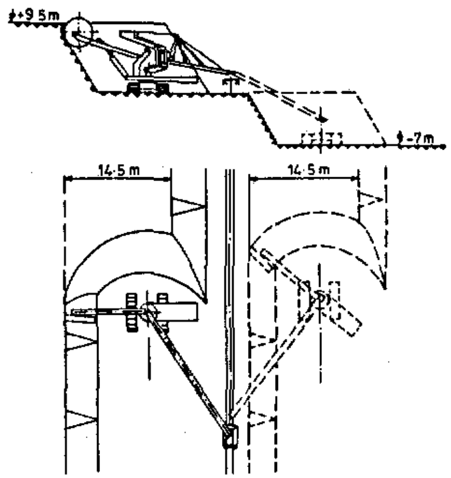


EXCAVATING TOPSIDE

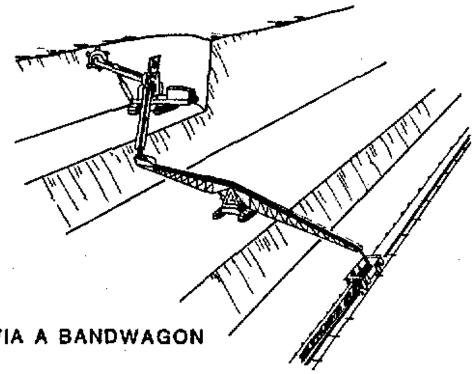




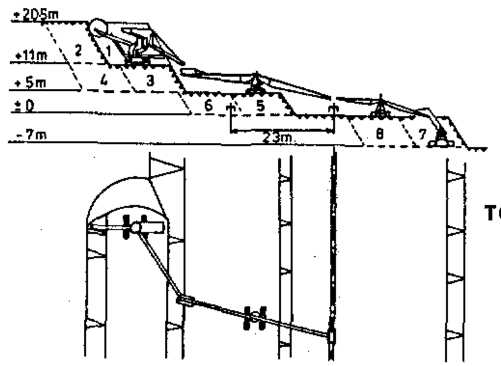
EXCAVATING BOTTOMSIDE



EXCAVATING RANGE TOPSIDE AND BOTTOMSIDE



EXCAVATING TOPSIDE VIA A BANDWAGON



EXCAVATING RANGE

TOP AND BOTTOMSIDE VIA A BANDWAGON

497056

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 5·4
CHECKED			
REVISED			DRAWING No 70020 - 139

After the upper bench has been excavated the machine will then excavate the topside bench at the conveyor level, supplying coal to the power station and delivering any overburden or parting material to the overburden dump. After this pass has been completed the BWE will travel bottomside and excavate the coal and partings on the level below the conveyor - either loading directly on to the conveyor or via the bandwagon, depending on the depth of the seam.

After this level has been excavated the BWE will travel topside, the face conveyor will be beltshifted and the sequence of operation repeated. When required the BWE will extend the trunk conveyor gullet, loading via the bandwagon.

The seasonal nature of the operation (with lower coal outputs required in spring and summer) and the necessity to build up an adequate in-pit coal inventory means that the overburden stripping will advance some distance in front of the coal mining. This separation will require the introduction of a second face conveyor so that the BWE can travel back to excavate coal when the demand rises (Figure 5.3). There will always be some coal in the overburden face, hence there will always be coal mining taking place but not at as high a rate as when in a full coal face.

This sequence of operation will be carried out during the first three years of the mine's operation. After this time increased production requirements will necessitate the introduction of a second BWE, in Year 3.

Overburden Dumping - Stage 1

Initially, the overburden will be transported out of pit to a dump on high ground to the west of the deposit (Figures 5.2, and 5.5). The dump will pivot towards the worked out section of the pit and then commence filling the void left by mining. Stage 1 of the overburden dump will be coincident with Stage 1 of mining.

Stage 2 (Commencing Year 3)

To facilitate the introduction of BWE No. 2, a second trunk conveyor, dump conveyor, and tripper stacker will be introduced. The level for BWE No. 1 will be graded up to create a new level. (see Figure 5.6 and 5.7). BWE No. 2 will operate on the second face conveyor (Figure 5.8) and primarily on coal.

The sequence of operation would then be as follows:

- BWE No. 1 will excavate overburden from the top bench loading directly onto its face conveyor. After each pass along the face, the conveyor is beltshifted and the BWE repeats the operation.

- when overburden becomes too thick to allow removal in one pass, BWE No. 1 would ramp up and load via a bandwagon to the face conveyor.

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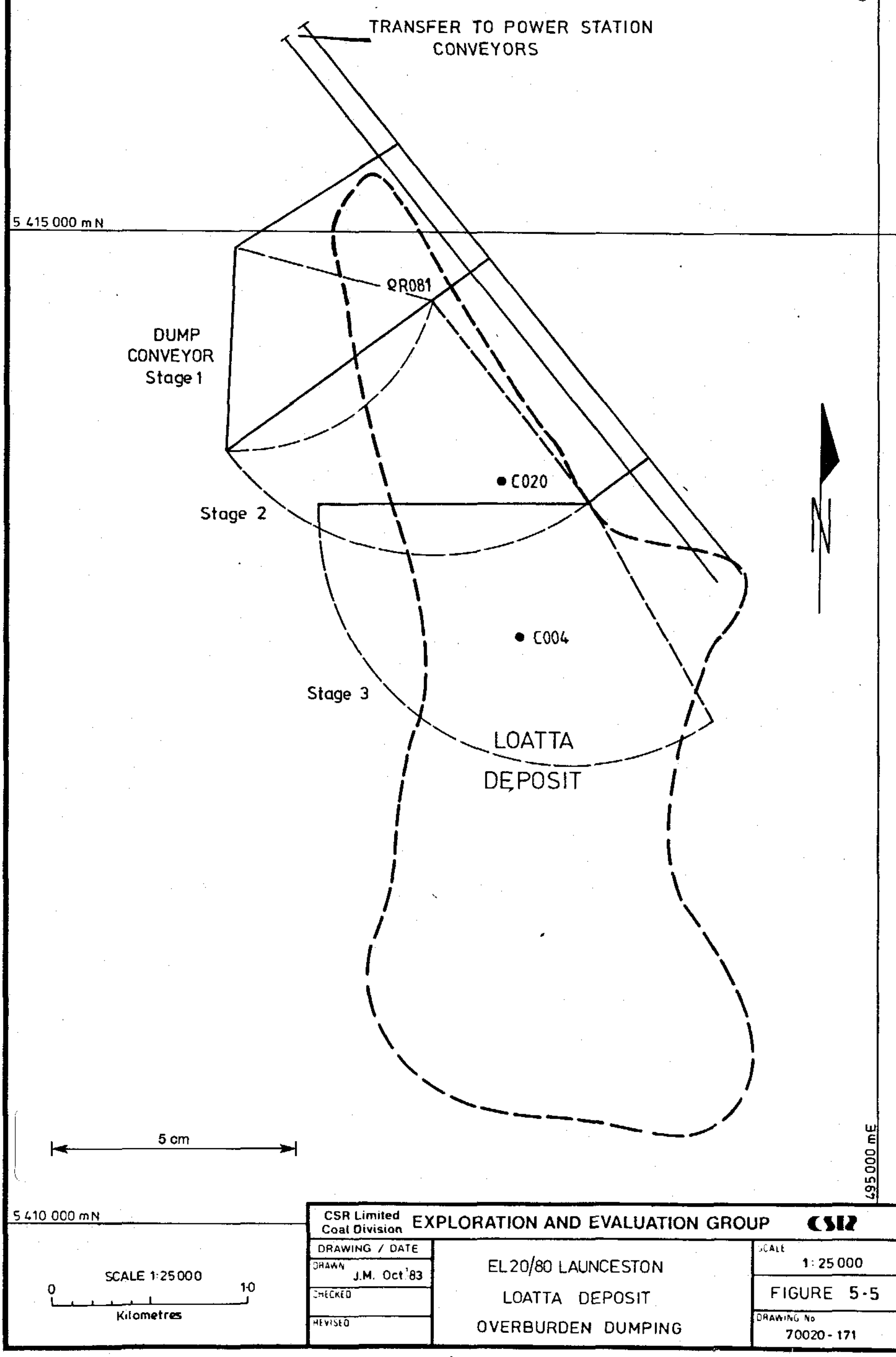
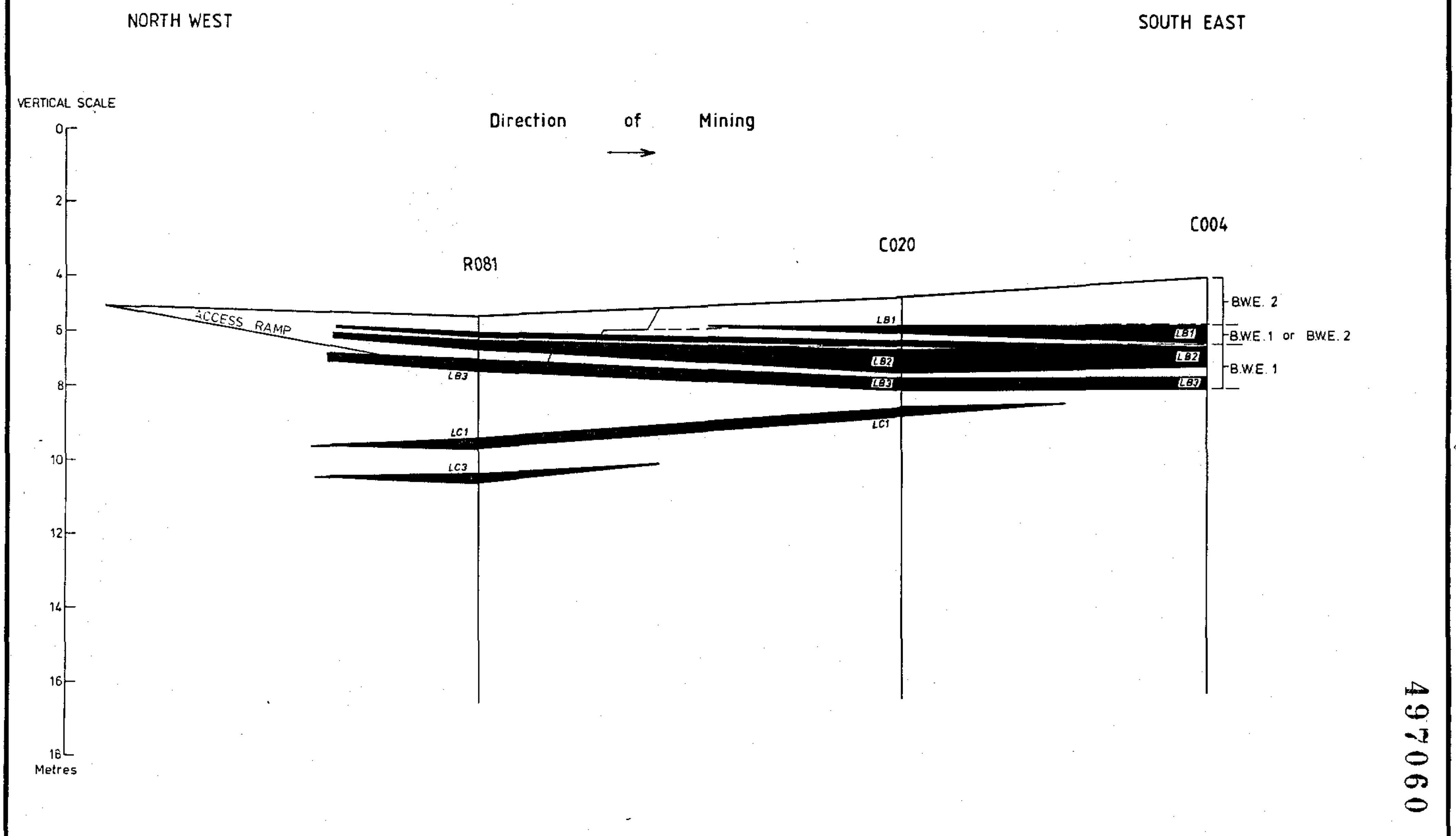
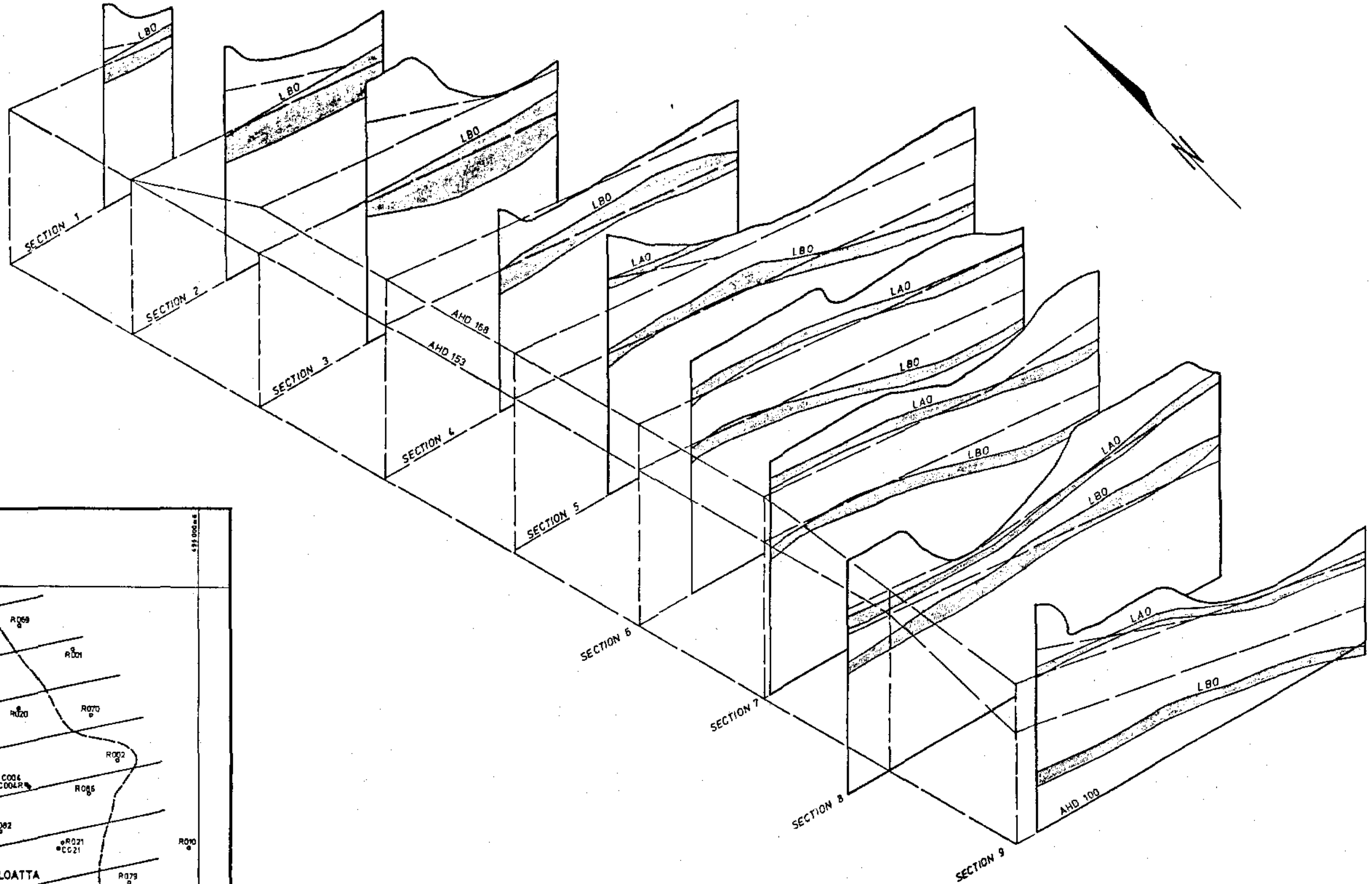
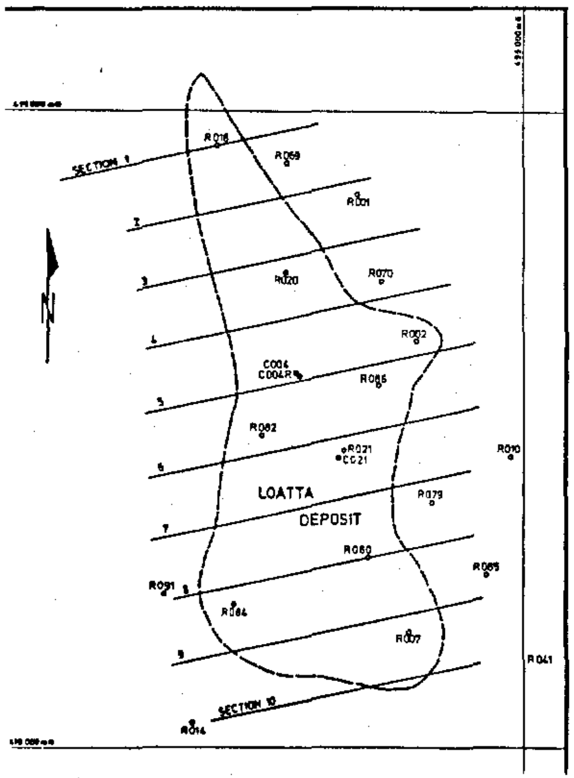


CSR Limited Coal Division	EXPLORATION AND EVALUATION GROUP		CSR
DRAWING / DATE	EL 20/80 LAUNCESTON		SCALE 1: 25 000
DRAWN J.M. Oct '83	LOATTA DEPOSIT		FIGURE 5-5
CHECKED	OVERBURDEN DUMPING		DRAWING No 70020 - 171
REVISED			



CSR Limited Coal Division		EXPLORATION AND EVALUATION GROUP	CSR
DRAWING	DATE	LOATTA DEPOSIT	SCALE
DRAWN C.J.	Feb. '83	OPERATING LEVELS FOR	FIGURE 5·6
CHECKED		BUCKET WHEEL EXCAVATORS	DRAWING No 70020 - 142
REVISED			





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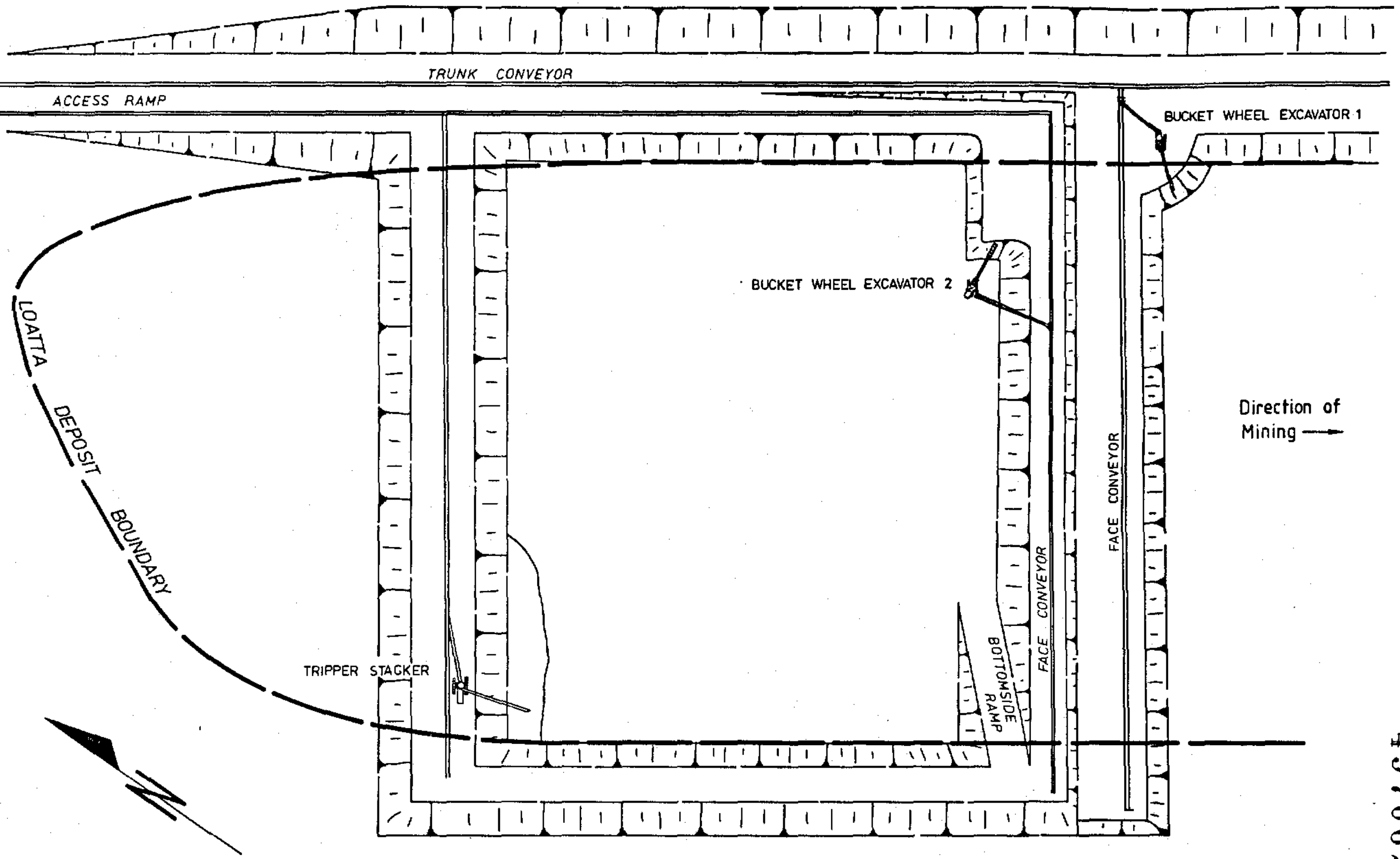
CSR Limited Coal Division	EXPLORATION AND EVALUATION GROUP		CSR
DRAWING	DATE		SCALE
DRAWN J.M.	Oct '83.	EL 20/80 LAUNCESTON	
CHECKED		LOATTA DEPOSIT	FIGURE 5·7
REVISED		CROSS SECTIONS	DRAWING No



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CSR Limited Coal Division		EXPLORATION AND EVALUATION GROUP CSR	
DRAWING	DATE		SCALE
DRAWN C.J.	Feb.'83	EL 20/80 LAUNCESTON – LOATTA DEPOSIT	FIGURE 5·8
CHECKED		PROPOSED PIT LAYOUT	DRAWING No
REVISED J.M.	Oct.'83	STAGE 2	70020-141

- during times of high coal demand, BWE No. 1 will excavate a 10m bottomside bench. This reduces the amount of overburden to be excavated by BWE No. 2.

- BWE No. 2 will excavate the topside bench on its face conveyor level. This is the same bench which BWE No. 1 would excavate if it travelled bottomside and excavated that bench. It would do this either loading directly to the face conveyor or via a bandwagon depending on the depth of the bottomside bench.

This mode of operation allows the full depth of the seams to be excavated by the both BWEs. (Figures 5.6 and 5.7).

As mining progresses through the deposit, BWE No. 1 works predominantly on overburden until it reaches the LAO seam, when it then excavates both overburden and coal. However, prior to reaching the LAO seam, it would have the ability to go down to the lower LBO seam coal and excavate this coal if the other BWE is inoperative.

BWE No. 2 will predominantly excavate coal and the remaining overburden left by BWE No. 1 until the LAO seam is reached. Then it will excavate interburden and the LBO seam.

This mode of operation will continue until Year 10 when BWE No. 1 will transfer to the Pipers Lagoons Deposit.

Overburden Dumping - Stage 2

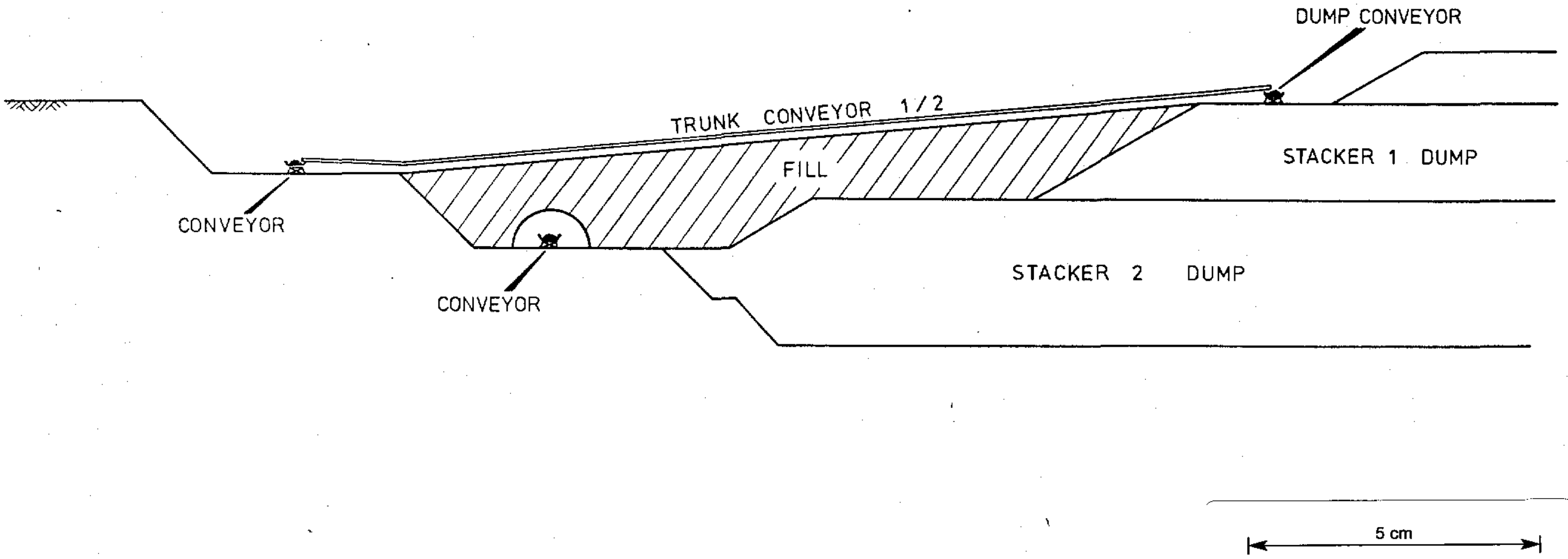
After the completion of Stage 1 dumping, the conveyors will be relocated to commence a second pivot to advance fill into the void left by mining. The dump then develops as shown in Figure 5.5.

The tripper stacker which will operate with BWE No. 2, will be located, together with its trunk conveyor on the batter remaining after the initial opening up of the deposit (Figure 5.8). The tripper stacker will then fill the void left by coal mining with partings material, and advance through the pit in unison with BWE No. 2. The dumping advance will be controlled by adjusting the amount of topside dumping undertaken. Figure 5.9 shows how the dump conveyor bridges over the truck conveyor.

5.3.3 Coal Mining Capacity

The productivities of the BWEs are discussed in Section 9.2. It can be seen that there is considerable mining capacity to draw upon in the event of a coal shortage. Each BWE has the capacity to supply the total power station requirements by itself, therefore, the conveyors have been designed to convey the output of one BWE. If one BWE is unavailable for coal mining, the other BWE will be scheduled to supply coal.

These aspects of coal supply are further discussed in Section 6.



CSR Limited Coal Division	EXPLORATION AND EVALUATION GROUP CSR	
DRAWING / DATE	EL 20/80 LAUNCESTON	Scale 1 : 1250
Drawn J.M. Oct.'83	LOATTA DEPOSIT	FIGURE 5·9
Checked	CONVEYOR EMBANKMENT	Drawing No. 70020-165
Revised		

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6. PRODUCTION SCHEDULE AND SECURITY OF SUPPLY

6.1 Production Schedule

Tables 6.1 and 6.2 show the production schedules for a mine planned to meet the 400 MW Power Station burning schedule given in Section 3.2 of this volume.

The first line in Table 6.1 shows the burn schedule. From this, the following lines show how coal stockpiles and pit inventory were taken into account to arrive at the coal exposed schedule. The HECT enquiry specified a 0.5 Mt surface stockpile. However for Rosevale coal the equivalent tonnage is 1.88 Mt, which for a brown coal operation such as this, is considered unrealistically high. It would be desirable to carry most of this as coal exposed pit inventory, so the schedule allows for a 0.4 Mt surface stockpile and 1.48 Mt working pit inventory. In addition to the working pit inventory, the schedule also shows 0.28 Mt of "minimum pit inventory" which is unavailable for mining because of working bench width requirements.

The mining block reserve quantities, while allowing for 22.5 degree batters, are essentially quantities within the area projected vertically below the surface boundaries of the blocks. For this reason they do not allow for the very flat working angle of the advancing mining faces. Once a "steady-state" mining profile has been reached, the effect of this on the accuracy of the schedule is minimal, but it is necessary to allow for "overburden in advance" in establishing the initial mining face profile. This is shown in Table 6.1 under the major heading of "WASTE".

TABLE 6.1

MINING SCHEDULE FOR 400 MW CASE

		-1	1	2	3	4	5	6	7	8	9	10
COAL SOLD:												
Power Station Consumption	(Mt)	-	1.02	1.62	2.07	2.41	3.20	3.68	4.25	4.59	3.91	3.31
Surface Stockpile	(Mt)	0.15	0.15	0.15	0.20	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Stockpile Change	(Mt)	0.15	-	-	0.05	0.20	-	-	-	-	-	-
Coal Mined/Sold	(Mt)	0.15	1.02	1.62	2.12	2.61	3.20	3.68	4.25	4.59	3.91	3.31
Coal Volume (sg 1.36)	(MBm^3)	0.11	0.75	1.19	1.56	1.92	2.35	2.70	3.13	3.38	2.88	2.43
COAL EXPOSED:												
Working Pit Inventory		0.79	0.79	0.79	0.74	1.48	1.48	1.48	1.48	1.48	1.48	1.48
Minimum Pit Inventory	(Mt)	0.10	0.20	0.25	0.25	0.28	0.28	0.28	0.28	0.28	0.28	0.28
Inventory Change	(Mt)	0.89	0.10	0.05	(0.05)	0.77	-	-	-	-	-	-
Coal Exposed	(Mt)	1.04	1.12	1.67	2.07	3.38	3.20	3.68	4.25	4.59	3.91	3.31
BLOCKS MINED:												
Block Numbers, tonneages		1,1.04	1,0.25	2,0.89	3,1.67	4,2.59	5,3.20	5,0.97	6,3.96	7,0.44	8,3.65	9,3.31
	(Loatta)		2,0.87	3,0.78	4,0.40	5,0.79		6,2.71	7,0.29	8,4.15	9,0.26	
WASTE:												
Ramps	(MBm^3)	0.10	-	-	-	-	-	-	-	-	-	-
Overburden in Advance	(MBm^3)	1.25	-	-	-	-	-	-	-	-	-	-
Waste from Coal Mining	(MBm^3)											
(excludes Basalt)		2.57	3.00	4.15	4.53	6.91	5.46	4.57	5.80	10.05	7.44	8.26
Basalt Volume	(MBm^3)	-	-	0.01	0.04	0.14	-	-	-	-	0.04	0.55
BUCKETWHEEL VOLUMES:												
Coal & Waste (Thoretical)	(MBm^3)	4.03	3.75	5.34	6.09	8.83	7.81	7.27	8.93	13.43	10.32	10.69
BWE Volumes Smoothed	(MBm^3)	4.00	5.20	5.20	7.20	9.20	10.40	10.40	10.40	10.40	13.00	15.60

NOTES:
1. Coal mined/sold = power station consumption + stockpile change.
2. Working pit inventory is coal exposed and available.
3. Minimum pit inventory is coal exposed but unavailable because of minimum bench width requirements.
4. Coal exposed = coal mined/sold + inventory change.

TABLE 6.1 - (Page 2)

11	12	13	14	15	16	17	18	19	20	Sub Total to 20	Yrs 21 to 30 (per yr.)	Total
4.06	4.06	4.44	3.95	3.65	3.95	3.95	3.95	3.95	3.95	69.97	2.77	97.67
0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	-	0.40	-
-	-	-	-	-	-	-	-	-	-	0.40	-	0.40
4.06	4.06	4.44	3.95	3.65	3.95	3.95	3.95	3.95	3.95	70.37	2.77	98.07
2.99	2.99	3.26	2.90	2.68	2.90	2.90	2.90	2.90	2.90	51.72	2.04	72.12
1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	-	1.48	-
0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	-	0.28	-
-	-	-	-	-	-	-	-	-	-	1.76	-	1.76
4.06	4.06	4.44	3.95	3.65	3.95	3.95	3.95	3.95	3.95	72.13	2.77	99.83
9,4.06	9,0.82 10,3.24	10,4.11 11,0.33	11,3.95	11,1.32 12,2.33	12,3.95 Pipers Lagoons:1,.0.34	12,3.61	1,3.29 2,0.66	2.3.17 3.0.78	3,1.20 4,2.48 5,0.27	100% of 5,6 20.3% of 7		8.16mt remains in Pipers Lagoon
-	-	-	-	-	-	0.10	-	-	-	0.20	-	0.20
-	-	-	-	-	-	2.00	1.00	-	-	4.25	-	4.25
10.13	10.86	11.82	7.68	11.13	14.52	14.72	17.00	19.12	21.09	200.81	9.66	297.41
0.67	0.68	0.96	3.31	1.55	0.76	0.70	-	-	-	9.41	-	9.41
13.12	13.85	15.08	10.58	13.81	17.42	19.72	20.90	22.02	23.99	256.98	11.70	373.98
15.60	15.60	15.60	15.60	15.60	15.60	15.60	15.60	15.60	15.60	257.00	13.0 to 10.40	374.00

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TABLE 6.2

Bucketwheel Schedule

(Volumes of Overburden plus Coal in MBm^3)

Year	Total BWE Volume Before Smoothing	BWE No. 1 Volume Allocated	BWE No. 1 Shifts	BWE No. 2 Volume Allocated	BWE No. 2 Shifts	Total BWE Output	Stripping In Advance Of Column 2
- 1	4.03	4.0	2 x 5	-	-	4.0	-
1	3.75	5.2	2 x 7	-	-	5.2	1.42
2	5.34	5.2	2 x 7	-	-	5.2	1.28
3	6.09	5.2	2 x 7	2.0	1 x 5	7.2	2.39
4	8.83	5.2	2 x 7	4.0	2 x 5	9.2	2.76
5	7.81	5.2	2 x 7	5.2	2 x 7	10.4	5.35
6	7.27	5.2	2 x 7	5.2	2 x 7	10.4	8.48
7	8.93	5.2	2 x 7	5.2	2 x 7	10.4	9.95
8	13.43	5.2	2 x 7	5.2	2 x 7	10.4	6.92
9	10.32	7.8	3 x 7	5.2	2 x 7	13.0	9.60
10	10.69	7.8	3 x 7	7.8	3 x 7	15.6	14.51
11	13.12	7.8	3 x 7	7.8	3 x 7	15.6	16.99
12	13.85	7.8	3 x 7	7.8	3 x 7	15.6	18.74
13	15.08	7.8	3 x 7	7.8	3 x 7	15.6	19.26
14	10.58	7.8	3 x 7	7.8	3 x 7	15.6	24.28
15	13.81	7.8	3 x 7	7.8	3 x 7	15.6	26.07
16	17.42	7.8	3 x 7	7.8	3 x 7	15.6	24.25
17	19.72	7.8	3 x 7	7.8	3 x 7	15.6	20.13
18	20.90	7.8	3 x 7	7.8	3 x 7	15.6	14.83
19	22.02	7.8	3 x 7	7.8	3 x 7	15.6	8.41
20	23.99	7.8	3 x 7	7.8	3 x 7	15.6	0.02
21	11.70	5.2	2 x 7	7.8	3 x 7	13.0	1.32
22	11.70	5.2	2 x 7	7.8	3 x 7	13.0	2.62
23	11.70	5.2	2 x 7	7.8	3 x 7	13.0	3.92
24	11.70	5.2	2 x 7	7.8	3 x 7	13.0	5.22
25	11.70	5.2	2 x 7	5.2	2 x 7	10.4	3.92
26	11.70	5.2	2 x 7	5.2	2 x 7	10.4	2.62
27	11.70	5.2	2 x 7	5.2	2 x 7	10.4	1.32
28	11.70	5.2	2 x 7	5.2	2 x 7	10.4	0.02
29	11.70	5.2	2 x 7	5.2	2 x 7	10.4	(1.28)
30	11.70	5.2	2 x 7	5.2	2 x 7	10.4	(2.58)

The total bucketwheel volumes of coal plus waste which result from meeting the coal exposed schedule are shown in the second last line in the schedule in Table 6.1. The schedule assumes that mining commences at the north end of Loatta deposit, proceeds in sequence through Loatta reserve blocks, then moves to the north end of Pipers Lagoons. This "theoretical" schedule gives peak annual quantities of up to 24.0 MBm^3 which is in excess of the capacity of two bucketwheels.

Table 6.2 shows a smoothed BWE schedule which allows the two BWEs to comfortably move all material required to meet the burning schedule, but it does result in up to 26.0 MBm^3 of material (coal plus waste) being removed in advance of when it is actually required to meet the burning schedule. The effect of this in practical terms has not been fully assessed. It is an expediency adopted for this preliminary study. In practice, a number of alternative mine schedules could be investigated, including commencing mining earlier in the Pipers Lagoons deposit.

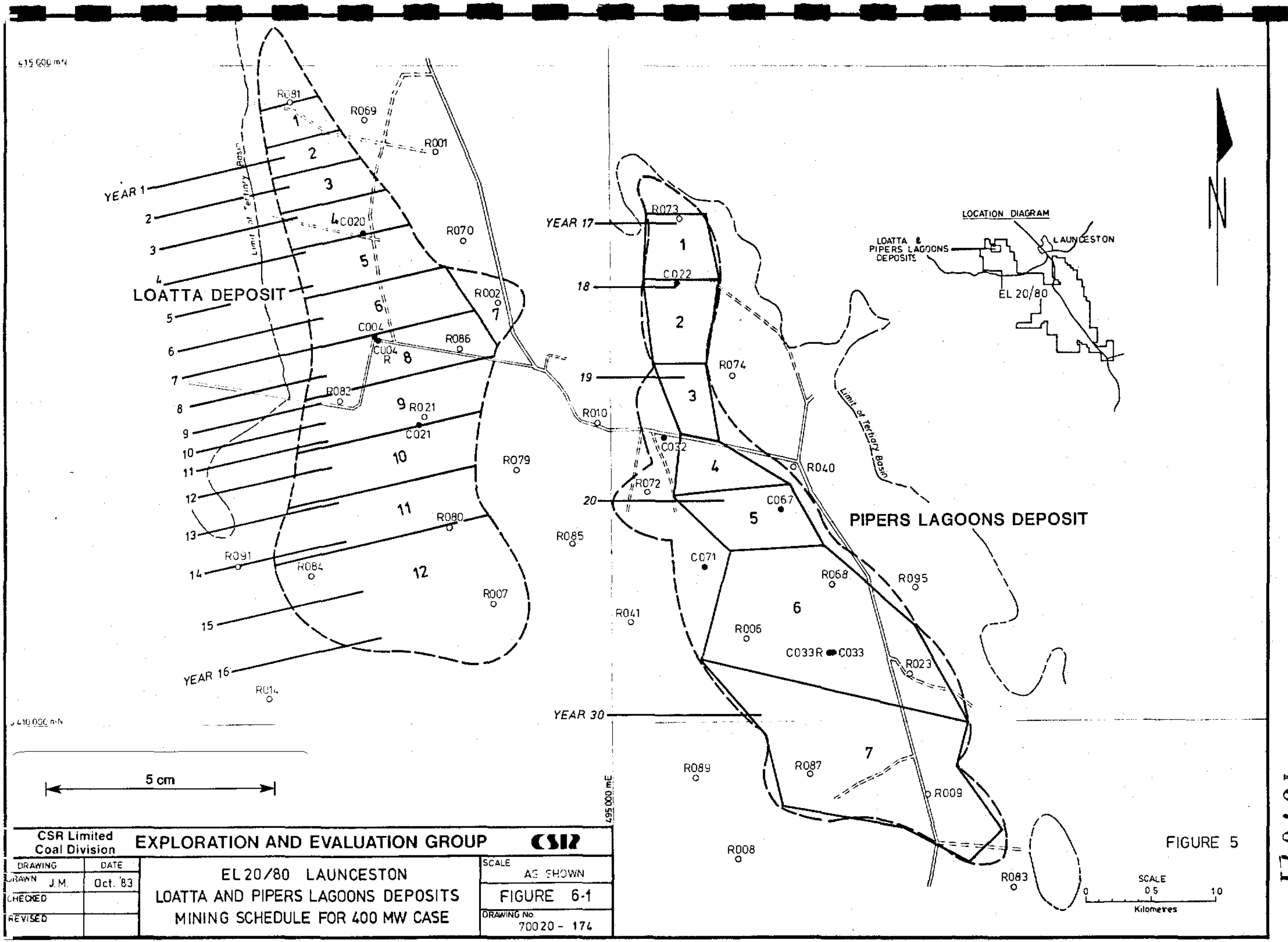
Figure 6.1 shows the 'theoretical' advance of mining through the deposits.

Table 6.1 also shows that small amounts of basalt have to be removed in the early years increasing to an average of 1.15 MBm^3 per year from years 10 to 18.

6.2 Variation in Coal Quantity

6.2.1 Introduction

The mine is being developed to supply the scheduled tonnages with the built in flexibility to meet significant variations about these tonnages.


415 000 mN
410 000 mN
495 000 mE
LOATTA DEPOSIT
PIPERS LAGOONS DEPOSIT
YEAR 1
YEAR 16
YEAR 17
18
19
20
YEAR 30
Limit of Tertiary Basin
LOCATION DIAGRAM
LOATTA & PIPERS LAGOONS DEPOSITS
LAUNCESTON
EL 20/80
5 cm
FIGURE 5
SCALE
0 0.5 1.0
Kilometres
CSR Limited
Coal Division
EXPLORATION AND EVALUATION GROUP
DRAWING
DATE
DRAWN J.M.
Oct. '83
CHECKED
REVISED
EL 20/80 LAUNCESTON
LOATTA AND PIPERS LAGOONS DEPOSITS
MINING SCHEDULE FOR 400 MW CASE
SCALE
AS SHOWN
FIGURE 6-1
DRAWING No.
70020 - 174

The capabilities are:

- base design capacity of 4.60 Mtpy
- the potential to increase production to 5.0 Mtpy (ie., equivalent to about 80% annual capacity factor of the power station)
- the ability to produce coal at the rate of 6.25 Mtpa for two separate 30 day periods each year. (ie, equivalent to the coal demand of the power station at full load)
- the ability to vary output on a seasonal basis about the base tonnage. This variation is:

summer	90% of base tonnage
autumn	130% " " "
winter	120% " " "
spring	50% " " "

- reduced or increased demand to meet HECT requirements.

A description of how this will be accomplished follows.

The impact of varying tonnages on price, contractual tonnage variations and notices will be reported in the document, "Indicative Pricing and Commercial Arrangements", due for presentation to HECT on 8th November, 1983.

6.2.2 Mine Flexibility

An open cut coal mine of this type has the ability to vary coal output depending on how the operation of the BWEs is scheduled. Each BWE (and the associated conveyors) will have considerable reserve capacity and will be capable of supplying power station requirements on its own. Each or both can be scheduled to dig coal, overburden or parting, depending upon requirements.

For example in periods of low coal demand, the BWEs will concentrate on overburden, stripping well ahead of coal. High coal demand periods would see both machines concentrating on coal.

Of particular importance in giving this flexibility is the mining machinery specification which is discussed in Section 9 of this volume.

The method of operation is described below:

- Concentrate on overburden stripping and major overhauls during the low coal demand periods of spring and summer.

  This may be achieved by concentrating on topside digging and leaving the coal untouched in the bottomside face. The face conveyor would be beltshifted after each topside pass.

  The annual two week overhaul on each BWE would be carried out during this period.

- Concentrate on coal mining during the autumn and winter periods.

  As the high coal demand period approaches, the face conveyor would be shifted back to the start of the coal face and the BWE would then operate bottomside, mostly digging coal.

This type of operation, with a large proportion of overburden being dug during the drier weather of summer and coal being dug during the wetter months is beneficial to the mining operation, as it is more difficult to handle overburden than coal during the wetter periods.

The security of coal supply is improved by this type of operation.

The mine equipment has the capacity to supply 5.0 Mtpy and this tonnage can be supplied in any year. This is subject to confirmation that the mine can be re scheduled to produce the required output later in the mine life.

6.2.3 Selection and Specification of Equipment

In Section 9, the productivity and specifications of the BWEs is described. Each BWE is capable of moving 7.8 MBm^3 of material per year, so each on its own is capable of supplying coal at a rate well in excess of the rates required. The duration of coal supply at peak rates depends on the amount of exposed coal available and the proportion of coal in the mining face.

The machine specification is based on the nature of the coal formation, the mining method and the production requirements.

The BWEs specified and costed are based on the following criteria:

- each machine to be able to supply coal at the peak daily demand rate over 2 x 30 day periods plus additional capacity to mine the partings and some interburden off the top of the coal. This capacity will assure security of coal supply to the power station with one BWE out of service

- the ability to mine thin seams (down to 0.5m thick) at the desired output rates (ie, required production rates are maintained with thin seams)

- the ability to minimise coal losses and dilution, even at peak production rates

- good mobility, enabling a change in coal mining location to be easily and quickly achieved.

The associated conveyors, bandwagons and tripper stackers have been designed to accommodate the maximum output of the BWEs.

These factors combine to ensure that a flexible reliable coal supply can be assured from the mining machinery.

6.2.4 Mine Plan

The operating levels in the mine have been designed to ensure that each BWE has coal available to excavate. The lower BWE is the major coal mining machine with the digging face containing predominantly coal, and located below the conveyor level. There is also coal accessible to the upper BWE working predominately on overburden. This will enable increases in coal outputs to be met quickly and easily by both machines with less than one month's notice. After a 30 day peak production period, a recovery period of 30 days will be required.

Conversely, if coal demands are down, the BWEs can concentrate on excavating overburden and interburden in preparation for the next period of high coal demand.

The coal supply reliability, and the flexibility of the operation make this mining method an attractive proposition for power station coal supply.

6.2.5 Stockpile

To date, a specific stockpile is not included in the coal supply system, it being assumed that coal stockpiling would be carried out by and adjacent to the power station. However, the mine schedule allows coal for:

- a security stockpile of 200,000t
- a variable "live" stockpile of 200,000t

- an in pit inventory of uncovered coal of 1.48 Mt which, combined with the above stockpiles, is equivalent to the HECT requirement of 500,000 tonnes of black coal.

It is believed that the inherent flexibility and security of this operation will reduce the need for such a large external stockpile. However, some stockpile may be required and, in recognition of this, CSR has appointed Rheinbraun Consulting Australia Pty Ltd., to undertake a feasibility study into stockpiling Rosevale coal.

6.3 Security of Coal Supply

In the early years when there is only one BWE on site, there is a small possibility that the BWE may have a major mechanical failure, necessitating an alternate source of supply. The options available are:

- Bring forward the purchase of the second BWE

- A larger surface stockpile of say 500,000 tonnes, which would supply 30 days at the peak output rate. In that time alternative arrangements could be made

- With an uncovered coal reserve of over 1 million tonnes it would be possible to:

  - excavate with the Cat. 225 backhoe and either load into trucks or directly onto the conveyors

- bulldoze the coal into heaps and load it into trucks or directly onto the conveyors with the Cat. 988 FEL, or larger hired loaders.

These measures would make it possible to supply approximately 4000t/day without additional plant.

Any major breakdown of the BWE would most likely be a gearbox or a slew gear failure, and would be repairable in a maximum time of 4 weeks. The probability of a major failure on a BWE is low, say between 2% and 5%.

If there was a 5% probability of a major failure on the BWE and on a seasonal basis there is a 25% probability it could occur during a period of maximum power station demand, then the overall probability is 1% that a 4 week outage could occur during a peak period. The probability of a major catastrophic failure is far less.

It is believed that the best option available would be to bring forward the purchase of the second BWE if a very high degree of security was required. This would necessitate a very small increase in the base price of coal.

7. DEWATERING REQUIREMENTS AND MINE WATER DISPOSAL

7.1 Groundwater Flow and Dewatering

The ground conditions indicate that artesian aquifers exist, and that saturated overburden and interburden conditions can be expected with artesian groundwater pressures associated with porous, sand-rich beds.

As discussed in Section 3.4, a perimeter dewatering system will be designed to dewater the sediments such that artesian pressure and water inflow are controlled to allow relatively dry and stable mining conditions.

The dewatering system has not been specifically designed, but allowance was made in the costs for the installation of 20 electric pumps in perimeter holes. Costs also allow for the system to be replaced every five years.

7.2 Mine Drainage

The area has an average rainfall of 750mm per annum. This rainfall combined with groundwater inflow and water recirculated for fire protection, make an in-pit water management and disposal system necessary.

Water will be drained into sumps in a worked out section of the pit and pumped out. Some may be used to supply the mine fire protection system, for road watering and, depending upon quality, for power station cooling.

7.3 Water Disposal

Water disposal will be by re-use in the mine or power station, or by controlled release to the local drainage system. The shallow groundwater table excludes re-injection, whilst a mean average evaporation rate of about 750mm per annum precludes the use of evaporation ponds.

Water quality data (Mathews, 1979) based on drillhole samples and over a 30 month period indicates:

Total Dissolved Salts	890 - 1570	mg/l
Na	175 - 330	mg/l
Ca,Mg,K	130 - 220	mg/l

Disposal by controlled discharge could be an acceptable option due to present discharge of groundwater to the ground surface (springs and soaks) hence to drainage courses. However this would need verification by an analysis of water quality versus aquifer depth.

7.4 Flood Protection

The Rosevale deposits are in the catchment area of the Meander River, and as the Meander is known to flood it may be necessary in the later years of the project (after year 15), to carry out flood protection works. More investigation is required in this area, but a nominal capital cost provision has been made for levees in Year 15.

8. MANNING REQUIREMENTS

The manning numbers required for mine operation are shown in Table 8.1.

The total manpower required to operate the mine in year 5 has been determined to be a total of 221 employees. Of the total, 69 are staff and 152 are wages employees. These numbers allow for absentees. Manpower requirements reach a maximum of 248 in Years 10 through to 19, then gradually decrease to 217 in the later years of the project.

The following approach was used to estimate mine manpower numbers:

- equipment operators were allocated to specific items of machinery
- the staff numbers in areas such as engineering and administration were estimated by referring to operations of a similar size
- service personnel such as storemen were estimated by referring to operations of a similar size
- the maintenance numbers were estimated by considering the number of people that should be required by referring to similar sized operations and comparing this with the maintenance cost generated from the equipment cost model.

TABLE No. 8.1

MANPOWER CHART (Year 5)

GENERAL MANAGER (1)

OPERATIONS MANAGER (1)

MANAGEMENT
- Mine Supt. (1)

TOPSOIL & REHABILITATION
- Overseer (1)
- Loader Ops (1)
- Truck Drivers (2)

OVERBURDEN & COAL
- Pit Foreman (3)
- BWE Operators (6)
- BWE Oilers (6)
- B'Waggon/Dozer (6)
- Hopper/Att. (6)
- C/Veyor/Patrol (6)
- Stacker Oprs. (12)
- Dzr Ops.(Stkrs)(6)

DEWATERING
- Pumpmen (4)

MINE SERVICES
- Mine Serv.Fmn (1)
- Grader/Water tank Drivers (2)
- Coal Drill Ops (2)
- Loader Oprs. (1)
- Truck Driver (1)
- Dozer Oprs. (2)
- Conveyor C'trol(3)
- Other Oprs. (2)
- Day Lab. Pool (6)
- Safety Officer (1)

RELIEF OPERATORS (15)

Total 97

- Sen. Mining Eng.(1)
- Mining Engineer (2)
- Data Processing (1)
- Surveyor (1)
- Survey Assist (1)
- Draftsmen (1)
- Geologist (1)
- Sampler/ Coal Quality (1)
- Environmental Officer (1)

Total 10

CHIEF ENGINEER (1)

- Mech. & Elect. Supt. (1)
- Mech Engineer (1)
- Elect. Engineer (1)
- Eng. Draftsman (1)
- Tech. Assist (1)
- Clerks Records (1)

FIELD MAINT.
- Shift Maint. F'men (3)
- Crane DriverT/A(3)
- Riggers (3)
- Fitters (6)
- T.A.s (3)

RELIEF TRADESMEN (7)

WORKSHOP
- Workshop F'men (1)
- Fitters (6)
- Machinists (1)
- Welders (4)
- Servicemen (2)
- Apprentices (6)
- T.A's (3)
- Mechanics (2)
- Auto Electrns (1)
- Bath Attend's (1)
- Labourers (1)

Total 60

- Elect. Foreman (4)
- Electrician (4)
- Elect. Linesmen (1)
- Apprentices (1)
- T.A's (1)

SHIFT CREW
- Electricians (4)
- T.A.s (3)

Total 18

FINANCIAL CONTROLLER (1)

- Manag/Acct. (1)
- Admin/Plan/MIS(1)
- Cost Clerk (2)
- Paymaster (1)
- Pay Clerk (1)
- Secretary (1)
- Reception (1)
- Typist (2)
- Telex/Mail (1)
- Tea/Printroom (1)
- Telex/Mail (1)

Total 13

Absentee & Relief Staff (3)

- Warehouse Spt. (1)
- Purchasing Off.(1)
- Expeditor (1)
- Senior Storeman(4)
- Storemen (4)
- Clerks (2)

Total 13

PERSONNEL MGR. (1)

- Assistant (1)
- First Aid (4)

Total 6

SUMMARY BY DEPARTMENT

DEPARTMENTS	SALARY	WAGES	TOTAL
General Manager	1	-	1
Mining Department	18	89	107
Mech/Elec. Department	15	63	78
Accounting/Purchasing	26	-	26
Industrial	6	-	6
Staff Absentee	3	-	3
Grand Total	69	152	221
Including relief & absentees allowances	3	22	25
Actual Manning	66	130	196

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- the allowance for relief personnel is sufficient to cover absenteeism due to annual leave, sick leave or compassionate leave.

The combined manning estimates for both the mine and the power station, including construction personnel are shown in Table 8.2.

Table 8.3 shows for the BWE operation the numbers of men on shift roster.

TABLE 8.2

ROSEVALE PROJECT

MANNING SCHEDULE

MINE AND 2x200MW POWER STATION

	Year Ending March (YEM)													
	88	89	90	91	92	93	94	95	96	97	98	99	2000	2001
	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9
POWER STATION														
Construction	120	254	443	625	610	479	261	268	426	314	114			
Operation					20	150	150	150	170	240	242	242	242	242
Total	120	254	443	625	630	629	411	418	596	554	356	242	242	242
MINE														
Construction			50	120	120	20	100	20						
Operation	–	–	–	8	102	157	173	199	210	221	221	221	228	237
Total	–	–	50	128	222	177	273	219	210	221	221	221	228	237
COMBINED														
Construction	120	254	493	745	730	499	361	288	426	314	114			
Operation				8	122	307	323	349	380	461	463	463	470	479
Total	120	254	493	753	852	806	684	637	806	775	577	463	470	479

TABLE 8.3

Shift Manning for BWE Systems on 3 x 7 Roster (Years 9 to 24)

	D/S	A/S	N/S	Rost. Off	Total
Foreman	1	1	1	1	4
BWE Operator	2	2	2	2	8
BWE Oiler	2	2	2	2	8
Bandwagon/Dozer Op.	2	2	2	2	8
Hopper Attendant	2	2	2	2	8
Conveyor Patrol	2	2	2	2	8
Stacker Operators	4	4	4	4	16
Dozer Operator (Stacker)	2	2	2	2	8
Control Centre Attendant	1	1	1	1	4
	18	18	18	18	72

Shift Maintenance

	D/S	A/S	N/S	Rost. Off	Total
Foreman	1	1	1	1	4
Fitters	2	2	2	2	8
Crane Driver/TA	1	1	1	1	4
Rigger	1	1	1	1	4
Electrician	1	1	1	1	4
T/A	1	1	1	1	4
	7	7	7	7	28

9. EQUIPMENT REQUIREMENTS

9.1 Equipment Selected

All major equipment items, such as BWEs, conveyors and the tripper stacker, are sized according to the duty required, the estimated time available for operation, and the estimated operational efficiency. Details are given later in this section. Auxiliary equipment has been assigned to the major activity centres based on experience in similar operations. A full list of all equipment required on site at full production is given in Table 9.1.

9.2 Productivity

Two different rosters will be worked at different points in time:

a 7 days x 2 shift roster and
a 7 days x 3 shift roster.

The derivation of effective production hours per year follows the sequence in Table 9.2 When the BWEs are scheduled to operate on a 7 x 3 roster, 335 days per year, net operating time is 5,095 hours per year and effective production hours are 4,586. There is an allowance for an annual two week overhaul on each BWE in these figures.

TABLE 9.1

Mine Equipment Items

		UNIT TYPE	NO.OF UNITS	UNIT COST ($x1000)	UNIT LIFE
A.	Bucketwheels,				
	Bandwagons & Stackers				
	Bucketwheels		2	9000	LOM
	Bandwagons		2	3300	LOM
	Stackers		2	5200	LOM
B.	Conveyors				
	Conveyor Control Centre		1	200	LOM
	Face Conveyors		2	2650	LOM
	Trunk Conveyor 1/1		1	3240	LOM
	Trunk Conveyor 1/2		1	3820	LOM
	Trunk Conveyor 1/3		1	2220	LOM
	Trunk Conveyor 2/1		1	3240	LOM
	Trunk Conveyor 2/2		1	3820	LOM
	Dump Conveyor 1		1	3340	LOM
	Dump Conveyor 2		1	2370	LOM
	Trunk Conveyor Extensions		14	993	LOM
	Lateral Conveyor Extensions		5	960	LOM
	Conveyor Head Transporter		1	900	LOM
C.	Heavy Mobile Equipment				
	Hydraulic Excavator	CAT 225	1	200	15,000 hrs
	Mayhew 1000 Mack PM		1	280	40,000 hrs
	Front End Loader	CAT 988	1	440	15,000 hrs
	Front End Loader	CAT 920	2	108	8 Years
	Dozer	CAT D9L	6	475	15,000 hrs
	Grader	CAT 14G	2	300	15,000 hrs
	Rear Dump 35T	CAT 769C	3	360	15,000 hrs
	Water Truck 10T		1	120	20,000 hrs
	Crane 20T		1	160	30,000 hrs
	Mobile Generator		1	200	16 Years

TABLE 9.1

Mine Equipment Items

	UNIT TYPE	NO.OF UNITS	UNIT COST ($x1000)	UNIT LIFE
D. Other Equipment				
Bobcat Loader		2	20	8 Years
Tractor Seeder		1	30	8 Years
Service/Lube Truck		1	80	11 Years
Fire Truck		1	80	11 Years
Ambulance		1	35	11 Years
Sedans		10	10	3 Years
4WD Sedan		3	15	3 Years
4WD Utility		2	12	3 Years
Utility	F100	10	15	3 Years
10T Truck & HIAB Crane		2	58	6 Years
Forklift Gen. Purpose	6T	2	60	7 Years
Portable Welder		2	6	6 Years
Lighting Plants		2	21	11 Years
Technical Equipment		1	80	6 Years
Workshop Tools & Equip.		1	250	35 Years
Warehouse Equipment		1	150	35 Years
Mine Office Equipment		1	80	6 Years
Mini Computer & Software		1	200	11 Years
Crib Hut		3	25	12 Years
12 Seater Bus		1	15	3 Years
Personnel Carrier		3	27	5 Years
Dewatering System		1	500	40,000 hrs
Pit Pumps & Pipes		4	50	6 Years
Stand Pipe & Pump		1	10	6 Years

TABLE 9.2

Production Hours

Days per week	7
Working days possible	365
less:	
Public holidays	2
Industrial delays	12
Weather and external delays	16
Scheduled Days	335
hours per shift	8.0 hours
shift change	0.2 hours
scheduled hours per shift	7.8 hours
shifts per day	3 shifts
maximum possible hours per year	7839 hours
scheduled maintenance *	5%
mechanical/electrical delays *	15%
available hours per year	6271 hours
operational delays *	15%
operating hours per year	5095 hours
operator efficiency	90%
production hours per year	4586 hours

* percentage of max. possible hours/year

Unscheduled delays include provision for 12 days of industrial disputes and 16 days bad weather. Operational delays include BWE travelling time, and delays on associated plant such as conveyors and the stackers. The figure of 4586 production hours per year is consistent with the Latrobe Valley overburden systems comprising BWEs, conveyors and stackers.

Operator efficiency of 90% allows for inefficient digging, trimming batters and other delays caused by not operating at optimum efficiency.

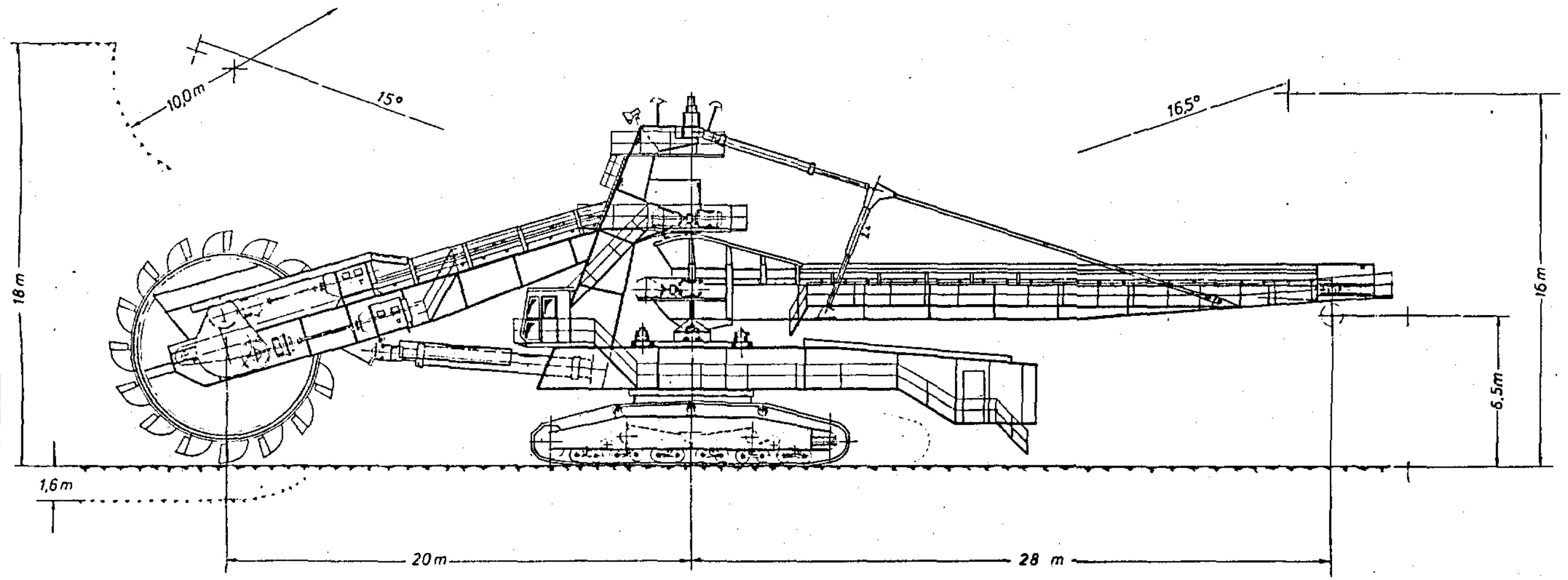
Production hours per year when multiplied by the effective production rate per hour, gives the annual production output for each item of equipment.

BWE Production Rates

The BWEs selected are compact 1200 litre machines similar to the O & K SH1000 which have a theoretical output of 5500 m^3/h (loose) and an effective output of 1400 to 2600 Bm^3/h, (depending on the type of material being dug). For this study an effective output of 1700Bm^3/h has been used. See Figure 9.1 for a typical BWE profile.

The swell of overburden and coal is taken as 40% for this application. A productivity factor of 0.43 takes into account production losses due to slew reversal, changing terraces etc. The productivity factor was developed by analysing a typical block dug by the BWE. The analysis was carried out by estimating the following factors for each terrace:

- pure digging time
- segment reversals



CSR Limited Coal Division	EXPLORATION AND EVALUATION GROUP	CSR
DRAWING: DRAWN J.M. DATE Oct.'83; CHECKED; REVISED	EL 20/80 LAUNCESTON LOATTA DEPOSIT TYPICAL BUCKETWHEEL EXCAVATOR	SCALE 1 : 250 FIGURE 9-1 DRAWING No 70020 -164

49709 1

- travel retreat
- lowering and positioning for each terrace.

The volume in each terrace was calculated and the total volume in the block was determined.

The total time to excavate the block was determined by adding the times to excavate each terrace and making an allowance for transportation delays in shuttling conveyors from coal transport to overburden transport.

A nominal output rate was then determined and expressed as a percentage of the theoretical output rate. This productivity factor was 0.53.

As the deposit is not yet fully delineated and there is the possibility of delays due to coal bunkers being full and time being lost travelling between levels to resume digging on overburden a factor of 0.8 was applied giving a productivity factor of 0.53 x 0.8 = 0.43.

The Table below summarises some machine parameters and production rates.

. Maximum face height	16.0m
. Length of bucket wheel boom	20.0m
. Length of discharge boom	30.0m
. Number of buckets	16
. Bucket plus half ring capacity	$1.2m^3$
. Discharges per minute	72
. Theoretical capacity	$5500m^3$/h(loose
. Swell (estimated)	40%
. Productivity Factor	0.43
. Effective Production per hour	1400-$2600m^3$/h(bank)
. Yearly production (approx)	7,800,000 (Bm^3)

Overburden Conveyors Size

The overburden conveyors have been sized at 1600mm wide with 45° troughing. They will run at 5.2m/s. With a 15° surcharge, the theoretical capacity is:

Theoretical capacity (m^3/h) = cross sectional area x belt speed x 3600
= 0.276 x 5.2 x 3600
= 5167m^3/h (loose)

The cross sectional area has been obtained from manufacturers' data. The theoretical output is such that the overburden conveyors can carry the maximum output from the BWE.

Overburden Tripper Stacker Size

The theoretical capacity of the overburden tripper stacker is 6600m^3/h (loose) which deliberately exceeds the capacity of the conveyors. The specification of the stacker is based closely on one of suitable size operating for the SECV.

10. SITE ESTABLISHMENT AND INDUSTRIAL AREA

10.1 General

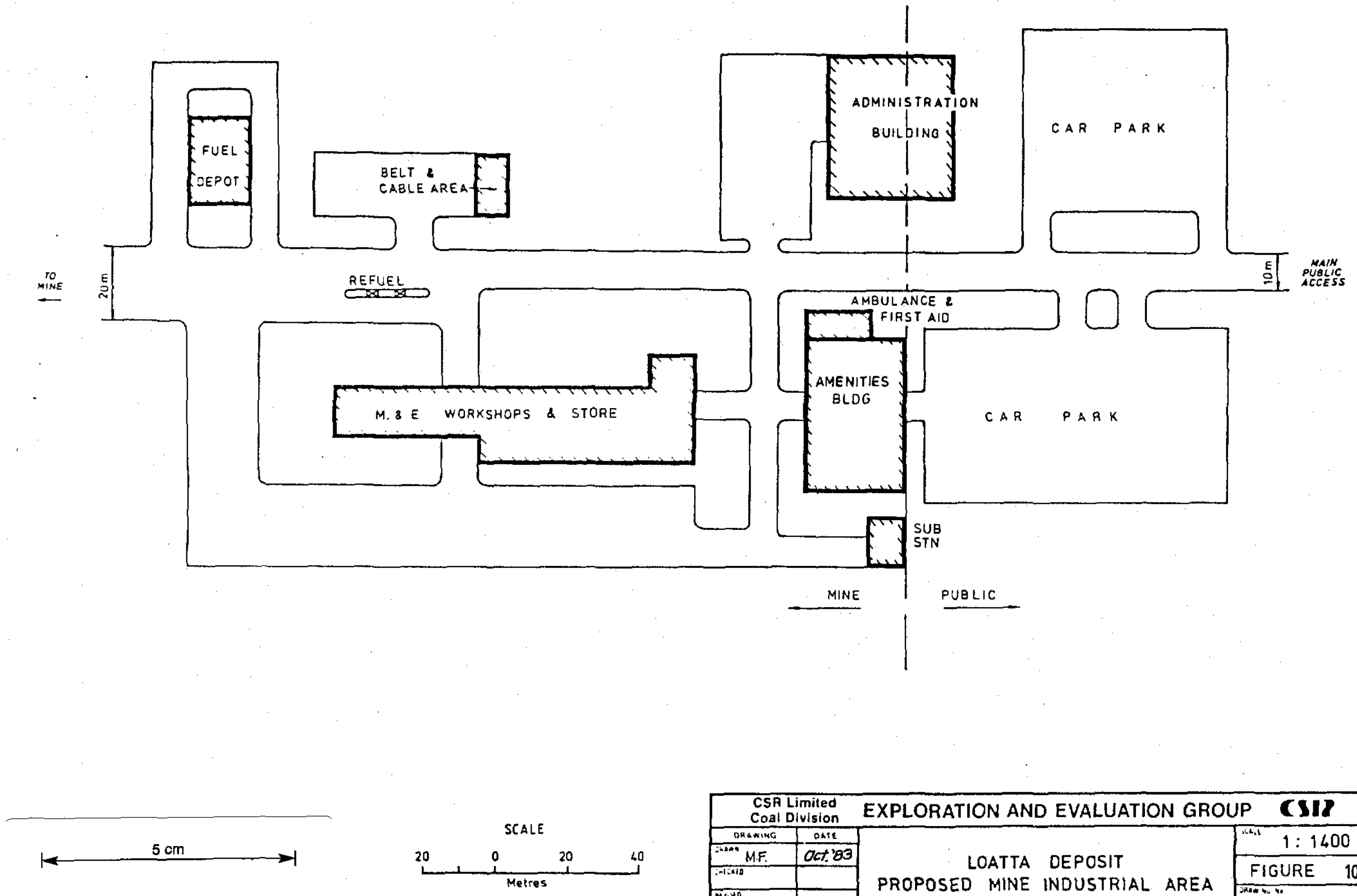
Surface facilities and service requirements for this 4.6 Mtpy mine at Rosevale have been based on information from other mining operations in Australia.

10.2 Mine Industrial Area

Three possible sites adjacent to the mine with ready access to roads have been chosen. The final location would be selected after more detailed study. All buildings shown are of typical standard for the purposes nominated and include appropriate equipment. The proposed layout of the area is shown on Figure 10.1.

The industrial area includes the following facilities:-

- mechanical and electrical workshop complex, which includes mobile plant shop, boilermakers shop, civil workshop, warehouse and stores stockyard
- fuel storage and fuelling point
- conveyor belt storage area
- amenities building including bathhouse, changing facilities and training room.
- administration building



CSR Limited
Coal Division

EXPLORATION AND EVALUATION GROUP

DRAWING	DATE
DRAWN M.F.	Oct.'83
CHECKED	
REVISED	

LOATTA DEPOSIT
PROPOSED MINE INDUSTRIAL AREA

SCALE 1 : 1400
FIGURE 10·1
DRAWING No. 70020-148 R

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- ambulance and first aid station
- electrical substation and area lighting
- carparks and paved road area including washdown pad
- fencing and carparks.

10.3 General Civil Works

Site Drainage

As described in Section 7.4, flood protection may be required. This would be in the form of levee banks, which would protect the mine from flooding from the Meander River.

In the earlier years, minor earthworks would be required to divert water from the catchment located to the north of the mine site.

Access Road to Industrial Area

The main access to the mine will be a nominal 7m wide sealed road of highway standard, connecting with the Bass Highway.

Interconnection Road with Power Station

A direct connection between the mine industrial area and the power station is included.

Service Roads

A heavy duty access and service road will run along the side of the mine trunk conveyors and into the Industrial Area. Crossings are planned at suitable points to give truck and crane clearance where necessary.

11. INFRASTRUCTURE

11.1 General

The infrastructure requirements have been described more fully in a separate Volume. They have been evaluated assuming a mine and a notional mine-site power station.

A conceptual layout of the project area showing the mine area, notional power station sites and the features of the area is shown in Figure 11.1.

11.2 Power Supply

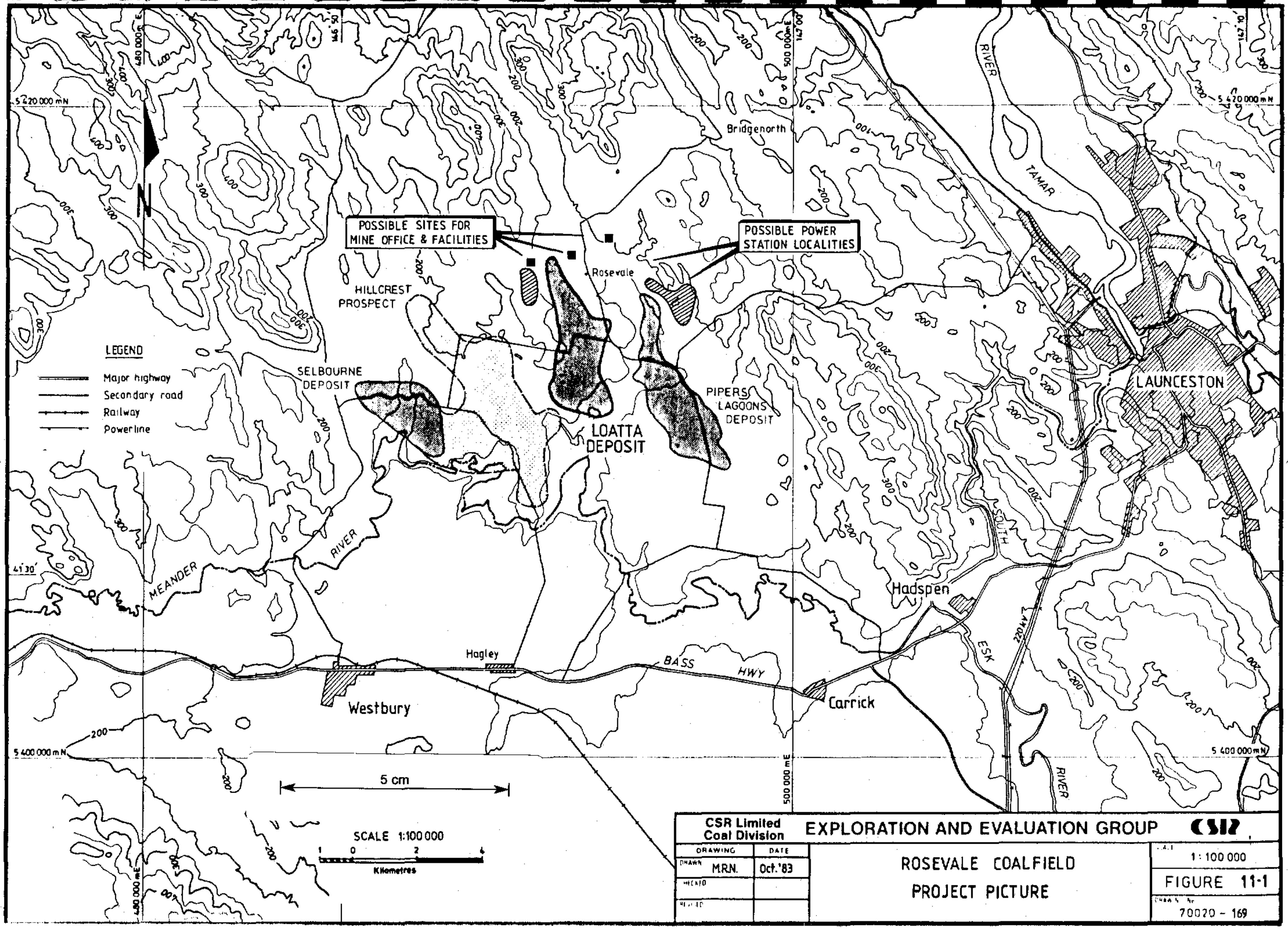
During construction, it is envisaged that a 6.6kV power supply will be required to serve both the mine and the power station. It is believed that the existing 22Kv reticulated supply is for domestic supply and that some upgrading will be required to supply the later construction phase of the project as power demand increases.

The operating mine will require a 66kV high voltage supply of about 25MW. It is proposed that this be supplied direct from the power station switchyard.

11.3 Access Roads

The area has good access both from the north and from the Bass Highway to the south.

Main access will be from the Bass Highway via an existing road which will require widening to about 7m and upgrading to allow it to cope with the increased traffic and the "heavy loads" of plant and equipment during construction.



POSSIBLE SITES FOR MINE OFFICE & FACILITIES
POSSIBLE POWER STATION LOCALITIES
Bridgenorth
Rosevale
HILLCREST PROSPECT
SELBOURNE DEPOSIT
LOATTA DEPOSIT
PIPERS LAGOONS DEPOSIT
LAUNCESTON
TAMAR RIVER
MEANDER RIVER
SOUTH ESK RIVER
Hadspen
Hagley
Westbury
Carrick
BASS HWY
220 kV
LEGEND
Major highway
Secondary road
Railway
Powerline
5 420 000 mN
5 400 000 mN
480 000 mE
500 000 mE
146°50'
147°00'
147°10'
41°30'
5 cm
SCALE 1:100 000
Kilometres
CSR Limited Coal Division
EXPLORATION AND EVALUATION GROUP
CSR
DRAWN M.R.N.
DATE Oct.'83
ROSEVALE COALFIELD
PROJECT PICTURE
1 : 100 000
FIGURE 11-1
70020 - 169

At the conclusion of construction, it is likely this road will become the major operational access.

Some upgrading and sealing of other roads in the general area of the mine and power station will also be required to give suitable access.

11.4 Water Supply

Mine water requirements of 250ML/a are small in comparison with the demands of the power station of about 5300ML/a. Therefore power station water strategies will determine mine supply sources.

Preliminary studies show that there is significant potential to supply part of this total project requirement of 5550ML/a by groundwater from mine dewatering in conjunction with a local water storage fed by run-off water. To provide the balance it is envisaged that a supply from outside the immediate area will be required. On the assumption that 2000ML/a can be supplied locally, an additional 3550ML/a will be required.

A number of potential sources have been identified, of which the most prospective is the South Esk River - at Hadspen or the Travellyn Dam. There is sufficient water available, up to about 5500ML/a, and subject to approval by HEC, who hold the water rights, this will be piped to the project area.

11.5 Waste Disposal

It is anticipated that the major mine wastes will include:

- groundwater produced in dewatering
- sewage and domestic wastes
- waste oil and industrial wastes from machine maintenance and general operations.

Ultimate waste management and disposal strategies will depend upon detailed feasibility and design studies, which will consider water quality standards, acceptable disposal methods and the opportunities for optimization by recycling and re-use. Based upon the information currently available it is believed that disposal can utilize proven, acceptable techniques.

Groundwater from mine dewatering is the major mine waste. Dependent upon quantities and qualities it is proposed to recycle this water for power station cooling.

Quantities used in the power station will depend on groundwater quality. Assuming a total dissolved solids content less than 650ppm from combined groundwater and run-off, up to 5000ML/a could be used in this way. Water not used will be disposed of according to its quality and the quality standards for receiving waters. The main alternatives for disposal are:

- draining into Meander River
- discharge to Tamar River via a pipeline.

If necessary, the water will be further treated to enable the discharge quality standards to be met.

Sewage, domestic liquid wastes and wash down water will be treated using conventional settlement and/or sewage treatment methods and the effluent disposed of according to water quality.

Oils and chemical wastes from maintenance operations would be collected then recycled, dumped or sold.

Solid wastes will be placed in an approved tip or dumping area.

Wastes generated by the power station could have a major impact, but given existing practices it is probable that this impact can be minimised by an integrated disposal approach. In addition to utilization of mine groundwater for condenser cooling, concepts for interchange and integration include dry ash disposal back to the mine pit and the common treatment of industrial wastes and sewage.

11.6 Manpower

Total manpower for the mine and a 400MW mine-power station will be 480 permanent operating personnel and a total workforce peaking at 852 during construction. The attached manning schedule Table 8.2 shows the buildup of this workforce.

11.7 Worker Accommodation

A preliminary investigation of the district's ability to absorb population growth indicates that the area has the capacity to support a significant number of additional people without incurring major expansions in existing infrastructure.

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 is expected that some will be accommodated in a construction camp and/or caravan park near the project area. Others will live in Launceston and in the more immediate area.

It is anticipated that some specialist and senior management personnel will be recruited from outside the area but that a major proportion of the operational workforce will be drawn from the region. It is envisaged that a limited amount of new housing will be required for newcomer mine and power station personnel.

12. ENVIRONMENTAL ASPECTS

12.1 General

The environmental impacts associated with both the mine and the power station have been discussed in detail in a separate accompanying Volume. They will need to be assessed in a cumulative manner and their significance in the Tasmanian context evaluated.

Given the very early stage of the project, only preliminary environmental work has been undertaken. The project is currently engaged in environmental investigations designed to give a preliminary overview of the environmental and infrastructural factors likely to be associated with the project. While this work is still proceeding, a number of preliminary comments on the project's environmental status can be made:

12.2 Land Use

- the coal deposits at Loatta and Pipers Lagoons occur under lands which are principally used for sheep and cattle grazing, with a limited amount of fodder and cash cropping

- most of the Loatta deposit has been cleared for grazing, with only remnant areas of vegetation. The majority of land over Pipers Lagoons is swampy, has been logged, and is covered by scrubby regrowth vegetation

- notional sites, considered appropriate for the proposed power station, will involve further clearing of partially timbered areas.

12.3 Land Tenure

The lands likely to be affected by mining are primarily held under freehold title.

12.4 Land Capability

Much of the land used for grazing purposes consists of reasonably productive improved pasture. The potential exists in some areas for productivity to be increased through the application of fertilizer and improvements in local drainage.

12.5 Vegetation

The vegetation in the area in question is typical of that found in north-eastern Tasmania in similar physical conditions.

12.6 Archaeology

A preliminary review of government records has shown that no known declared Aboriginal relics sites exist in the locality. It is believed that the probability of existence of significant sites is low. An initial reconnaissance of the deposits has, however, revealed evidence of past Aboriginal activity in proximity to Pipers Lagoon to the south of the proposed mining areas. Due to the highly disturbed nature of the Loatta deposit area it is considered unlikely that any relic sites exist over the deposit.

12.7 Noise and Air Pollution

- the proposed mining operation using a BWE/Conveyor system combination would keep noise and dust levels within acceptable limits, although any blasting of basalt cap rock will generate some additional noise and dust

- given the comparatively low sulphur content of the coal, sulphur emissions from a power station stack should be within currently acceptable limits.

The types of environmental impacts which can be associated with brown coal mining operations are now well understood in Australia and various control measures have been developed and successfully implemented in many instances. While each new mining project has its own specific, site-related, considerations, mining can be undertaken in an environmentally acceptable manner.

12.8 Rehabilitation

Unlike many other similar mining operations, the nature of the soil and overburden at the Rosevale coalfield is not thought to present any major concerns with respect to the rehabilitation of the area disturbed by mining. Further, the proposed method of mining will allow for the selective handling of topsoil and the placement of overburden, although this is not thought to be required. This will permit the progressive rehabilitation of disturbed areas and a return to productive use.

A preliminary mass balance evaluation has indicated that in view of the low overburden to coal ratio associated with the deposits, it is probable that the final rehabilitated land surface will be slightly less in elevation than the present land surface. This assumption is, however, very dependent upon swell factors which are yet to be definitely established.

13. COSTS

Operating and capital cost information has been provided in an accompanying volume "Indicative Costing and Commercial Aspects 400 MW case".

A brief description of the methods used to estimate the mining related costs follows:

- Manpower costs per man year are calculated from appropriate awards, taking into account overtime, shift loadings, allowances, leave loadings, bonus and overheads.
- The number of men required in each work area (or cost centre) is estimated for each year of the project life as described in Section 8.
- Equipment numbers and operating hours for each work area are calculated, for each year of the project life.
- Equipment unit capital costs, and operating costs per hour for power, fuel, greases, tyres, parts, maintenance labour, consumables are determined for each item of equipment in the mine, based on information from operating mines and manufacturers.
- All of the above information is used in a computer cost modelling system which calculates and schedules equipment replacements, generates annual costs, unit costs, manpower reports etc.

TABLE A1

Hole C004 Working Section Analysis

					DRY BASIS							DRY ASH FREE			IN SITU								
HOL	DEPTH	THICK	WS	C	S.EN.	ASH	V.M.	F.C.	SUL	SOD	CHLOR	S.EN.	V.M.	F.C.	T.M.	S.EN.	R.D.	ASH	V.M.	F.C.	SUL	SOD	CHLOR
4	12.01	1.63	0	-	0.39	85.1	13.7	1.3	0.05			2.59	91.4	8.6	29.5	0.27	1.759	60.0	9.6	0.9	0.04		
4	14.45	1.14	1	*	17.56	31.8	38.8	29.4	0.34			25.74	56.9	43.1	48.5	9.04	1.282	16.4	20.0	15.1	0.18		
4	14.75	0.30	1	*	18.44	29.1	40.6	30.4	0.45			26.00	57.2	42.8	54.3	8.43	1.230	13.3	18.5	13.9	0.21		
4	15.26	0.51	1	*	20.00	25.2	41.2	33.6	0.33			26.73	55.1	44.9	51.4	9.71	1.243	12.2	20.0	16.3	0.16		
4	15.83	0.57	1	*	14.42	42.7	34.3	23.1	0.30			25.16	59.8	40.2	47.4	7.59	1.325	22.5	18.0	12.1	0.16		
4	16.10	0.27	1	*	15.89	35.6	37.3	27.1	0.36			24.67	57.9	42.1	44.8	8.77	1.313	19.6	20.6	15.0	0.20		
4	16.32	0.22	1	*	14.42	42.7	34.3	23.1	0.30			25.16	59.8	40.2	47.4	7.59	1.325	22.5	18.0	12.1	0.16		
4	17.08	0.76	1	*	12.60	46.8	31.2	22.0	0.28			23.66	58.6	41.4	43.3	7.14	1.361	26.5	17.7	12.5	0.16		
4	17.77	0.69	2	-	5.52	69.6	22.6	7.8	0.18			18.19	74.3	25.7	36.3	3.52	1.543	44.4	14.4	5.0	0.12		
4	18.51	0.74	3	*	14.46	40.7	35.4	23.9	0.27			24.40	59.7	40.3	47.0	7.66	1.321	21.6	18.7	12.7	0.14		
4	18.83	0.32	3	*	16.66	32.2	38.5	29.3	0.33			24.59	56.8	43.2	51.2	8.13	1.266	15.7	18.8	14.3	0.16		
4	18.98	0.15	3	*	14.46	40.7	35.4	23.9	0.27			24.40	59.7	40.3	47.0	7.66	1.321	21.6	18.7	12.7	0.14		
4	19.49	0.51	3	*	12.22	49.1	31.4	19.5	0.23			24.01	61.8	38.2	45.5	6.66	1.357	26.8	17.1	10.6	0.13		
4	20.49	1.00	3	*	11.88	49.9	31.2	18.8	0.20			23.74	62.4	37.6	42.8	6.80	1.383	28.6	17.8	10.8	0.11		
4	21.30	0.81	3	*	17.41	31.8	39.2	29.1	0.32			25.52	57.4	42.6	48.5	8.97	1.281	16.4	20.2	15.0	0.16		
4	21.57	0.27	3	*	16.41	35.2	38.4	26.4	0.35			25.34	59.2	40.8	51.5	7.96	1.266	17.1	18.6	12.8	0.17		
4	21.75	0.18	3	*	17.41	31.8	39.2	29.1	0.32			25.52	57.4	42.6	48.5	8.97	1.281	16.4	20.2	15.0	0.16		
4	22.04	0.29	3	*	14.50	40.5	35.9	23.6	0.29			24.36	60.3	39.7	45.4	7.91	1.328	22.1	19.6	12.9	0.16		
4	22.27	0.23	3	*	10.37	52.2	32.0	15.7	0.28			21.71	67.1	32.9	44.1	5.80	1.373	29.2	17.9	8.8	0.15		
4	22.93	0.66	3	*	15.55	39.2	35.1	25.7	0.28			25.59	57.8	42.2	47.3	8.20	1.322	20.7	18.5	13.5	0.15		
4	23.25	0.32	4	*	2.38	78.9	17.1	4.1	0.10			11.25	80.7	19.3	32.3	1.61	1.668	53.4	11.6	2.8	0.07		
4	23.54	0.29	4	*	19.24	25.8	41.2	33.1	0.34			25.92	55.4	44.6	54.4	8.77	1.226	11.7	18.8	15.1	0.16		
4	24.24	0.70	4	-	2.38	78.9	17.1	4.1	0.10			11.25	80.7	19.3	32.3	1.61	1.668	53.4	11.6	2.8	0.07		
4	24.81	0.57	5	*	13.04	45.7	32.2	22.1	0.31			24.02	59.3	40.7	43.6	7.35	1.361	25.8	18.2	12.4	0.18		
4	26.20	1.39	5	*	10.70	52.7	30.2	17.1	0.27			22.60	63.9	36.1	42.6	6.14	1.403	30.2	17.3	9.8	0.15		
4	26.54	0.34	5	*	18.71	28.2	40.5	31.2	0.36			26.07	56.5	43.5	52.4	8.90	1.242	13.4	19.3	14.9	0.17		
4	27.56	1.02	5	*	17.41	34.4	38.4	27.2	0.26			26.55	58.6	41.4	49.0	8.88	1.277	17.6	19.6	13.9	0.13		
4	28.05	0.49	5	*	13.77	44.7	32.7	22.6	0.26			24.91	59.1	40.9	45.0	7.57	1.347	24.6	18.0	12.4	0.15		
4	28.37	0.32	5	*	17.75	30.9	38.2	30.9	0.35			25.69	55.3	44.7	52.4	8.45	1.248	14.7	18.2	14.7	0.17		
4	28.57	0.20	5	*	13.77	44.7	32.7	22.6	0.26			24.91	59.1	40.9	45.0	7.57	1.347	24.6	18.0	12.4	0.15		
4	28.78	0.21	5	*	13.82	43.6	33.7	22.7	0.32			24.50	59.8	40.2	47.4	7.27	1.323	22.9	17.7	11.9	0.17		
4	29.06	0.28	5	*	8.51	60.0	29.5	10.5	0.19			21.26	73.7	26.3	43.0	4.85	1.428	34.2	16.8	6.0	0.11		
4	29.66	0.60	5	*	13.82	43.6	33.7	22.7	0.32			24.50	59.8	40.2	39.0	8.43	1.394	26.6	20.6	13.8	0.20		
4	30.73	1.07	6	-	7.13	64.7	24.5	10.8	0.24			20.21	69.4	30.6	39.0	4.35	1.484	39.5	14.9	6.6	0.15		
4	31.93	1.20	6	-	7.01	64.4	24.4	11.2	0.24			19.67	68.6	31.4	38.8	4.29	1.499	39.4	15.0	6.9	0.15		
4	33.10	1.17	7	-	9.59	57.1	28.2	14.6	0.27			22.36	65.8	34.2	42.9	5.47	1.404	32.6	16.1	8.4	0.15		
4	33.74	0.64	7	-	16.41	35.7	38.0	26.3	0.37			25.50	59.1	40.9	48.2	8.49	1.283	18.5	19.7	13.6	0.19		
4	39.57	1.20	8	-	5.46	70.1	21.5	8.4	0.14			18.27	72.0	28.0	35.8	3.50	1.551	45.0	13.8	5.4	0.09		
4	39.96	0.39	8	-	9.92	56.2	27.1	16.6	0.25			22.67	62.0	38.0	39.9	5.96	1.438	33.8	16.3	10.0	0.15		
4	40.32	0.36	9	-	9.39	56.7	26.8	16.5	0.24			21.69	62.0	38.0	41.6	5.48	1.425	33.1	15.7	9.6	0.14		
4	40.57	0.25	9	-	11.45	48.6	29.6	21.8	0.27			22.28	57.6	42.4	47.4	6.02	1.347	25.6	15.6	11.5	0.14		
4	41.32	0.75	9	-	9.39	56.7	26.8	16.5	0.24			21.69	62.0	38.0	41.6	5.48	1.425	33.1	15.7	9.6	0.14		
4	43.14	1.82	10	-	2.28	81.4	16.5	2.1	0.13			12.25	88.8	11.2	30.0	1.60	1.758	57.0	11.6	1.5	0.09		
AVERAGE of HOLE No: 4																							
4	29.66	14.96	0	*	14.12	42.6	34.2	23.2	0.28			24.60	59.6	40.4	46.1	7.62	1.332	23.0	18.5	12.5	0.15		

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TABLE A2

Hole C020 Working Section Analysis

					DRY BASIS							DRY ASH FREE			IN SITU								
HOL	DEPTH	THICK	WS	C	S.EN.	ASH	V.M.	F.C.	SUL	SOD	CHLOR	S.EN.	V.M.	F.C.	T.M.	S.EN.	R.D.	ASH	V.M.	F.C.	SUL	SOD	CHLOR
20	8.33	0.69	0	*	14.28	42.3	39.2	18.5	0.24			24.75	68.0	32.0	45.1	7.84	1.329	23.2	21.5	10.1	0.13		
20	9.10	0.77	0	-	6.11	68.5	21.2	10.3	0.14			19.39	67.3	32.7	37.3	3.83	1.531	43.0	13.3	6.4	0.09		
20	10.48	1.38	0	*	16.70	34.9	36.9	28.2	0.26			25.65	56.7	43.3	45.4	9.12	1.305	19.0	20.2	15.4	0.14		
20	11.11	0.63	0	-	2.52	79.9	15.6	4.5	0.10			12.54	77.7	22.3	31.0	1.74	1.693	55.1	10.8	3.1	0.07		
20	12.16	1.05	0	*	9.66	57.8	26.7	15.4	0.19			22.89	63.4	36.6	40.5	5.75	1.443	34.4	15.9	9.2	0.11		
20	13.16	1.00	0	*	14.71	40.8	35.7	23.4	0.25			24.85	60.4	39.6	47.8	7.68	1.313	21.3	18.7	12.2	0.13		
20	13.31	0.15	0	-	6.92	65.1	26.2	8.8	0.13			19.82	74.9	25.1	37.4	4.33	1.515	40.7	16.4	5.5	0.08		
20	14.15	0.78	0	-	10.68	53.7	30.5	15.8	0.18			23.06	65.9	34.1	41.4	6.26	1.408	31.5	17.9	9.3	0.11		
20	15.48	1.33	0	*	16.72	34.8	38.0	27.2	0.26			25.65	58.3	41.7	49.2	8.50	1.280	17.7	19.3	13.8	0.13		
20	15.90	0.42	0	*	9.47	57.0	28.3	14.7	0.20			22.03	65.9	34.1	41.8	5.51	1.427	33.2	16.5	8.5	0.12		
20	16.69	0.79	0	*	16.55	35.3	37.1	27.5	0.25			25.58	57.4	42.6	50.4	8.21	1.276	17.5	18.4	13.7	0.12		
20	17.19	0.50	0	-	8.72	59.8	27.2	13.1	0.17			21.68	67.5	32.5	39.8	5.25	1.459	36.0	16.3	7.9	0.10		
20	18.40	1.21	0	*	16.96	33.7	38.1	28.2	0.27			25.59	57.5	42.5	51.9	8.16	1.261	16.2	18.3	13.5	0.13		
20	19.29	0.89	0	*	12.22	48.4	30.8	20.8	0.24			23.67	59.7	40.3	45.5	6.66	1.362	26.4	16.8	11.3	0.13		
20	19.75	0.46	0	*	13.36	44.8	32.7	22.4	0.23			24.23	59.3	40.7	46.0	7.22	1.340	24.2	17.7	12.1	0.12		
20	20.36	0.61	0	*	10.67	53.8	28.3	17.9	0.22			23.11	61.3	38.7	43.2	6.06	1.400	30.6	16.1	10.1	0.12		
20	21.43	1.07	0	-	4.19	75.3	18.6	6.1	0.13			16.97	75.3	24.7	34.5	2.75	1.615	49.3	12.2	4.0	0.09		
20	22.17	0.74	0	*	13.54	45.1	34.1	20.7	0.23			24.69	62.2	37.8	44.3	7.54	1.345	25.1	19.0	11.5	0.13		
20	23.54	1.37	0	*	16.45	35.9	37.8	26.2	0.25			25.68	59.0	41.0	49.3	8.34	1.276	18.2	19.2	13.3	0.13		
20	24.54	1.00	0	*	15.71	38.9	36.2	24.9	0.26			25.70	59.2	40.8	47.3	8.28	1.304	20.5	19.1	13.1	0.14		
20	25.18	0.64	0	*	19.23	29.2	41.8	29.0	0.28			27.15	59.0	41.0	50.0	9.62	1.247	14.6	20.9	14.5	0.14		
20	25.57	0.39	0	*	10.82	54.4	27.8	17.8	0.17			23.74	61.0	39.0	43.5	6.11	1.395	30.7	15.7	10.0	0.10		
20	30.07	1.17	0	*	13.19	47.0	33.5	19.5	0.22			24.91	63.3	36.9	42.2	7.62	1.370	27.2	19.4	11.3	0.13		
20	31.03	0.96	0	*	12.37	49.0	32.8	18.2	0.22			24.27	64.3	35.7	43.3	7.02	1.375	27.8	18.6	10.3	0.12		
20	32.45	1.42	0	*	14.85	40.8	35.1	24.0	0.25			25.10	59.4	40.6	49.3	7.53	1.301	20.7	17.8	12.2	0.13		
20	32.86	0.41	0	-	6.15	68.0	21.5	10.5	0.15			19.25	67.1	32.9	45.1	3.38	1.441	37.4	11.8	5.8	0.08		
AVERAGE of HOLE No: 20																							
20	32.45	17.52	0	*	14.29	42.7	34.5	22.8	0.24			24.95	60.3	39.7	46.4	7.66	1.326	22.9	18.5	12.2	0.13		

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TABLE A3

Hole C021 Working Sections Analysis

					DRY BASIS							DRY ASH FREE			IN SITU								
HOL	DEPTH	THICK	WS	C	S.EN.	ASH	V.M.	F.C.	SUL	SOD	CHLOR	S.EN.	V.M.	F.C.	T.M.	S.EN.	R.D.	ASH	V.M.	F.C.	SUL	SOD	CHLOR
21	9.76	1.15	0	-	6.98	61.9	26.1	12.0	0.16			18.33	68.5	31.5	40.1	4.18	1.474	37.1	15.6	7.2	0.10		
21	9.61	1.69	0	-	0.68	84.9	14.5	0.6	0.09			4.49	96.2	3.8	29.7	0.48	1.731	59.7	10.2	0.4	0.06		
21	10.16	0.55	1	*	14.05	42.1	34.8	23.1	0.27			24.24	60.1	39.9	47.2	7.42	1.323	22.2	18.4	12.2	0.14		
21	10.44	0.28	1	*	15.10	40.0	36.7	23.3	0.28			25.18	61.2	38.8	48.7	7.75	1.299	20.5	18.8	11.9	0.14		
21	10.97	0.51	1	*	14.05	42.1	34.8	23.1	0.27			24.24	60.1	39.9	47.2	7.42	1.323	22.2	18.4	12.2	0.14		
21	11.73	0.76	2	-	4.44	75.1	17.9	7.0	0.16			17.85	72.0	28.0	38.0	2.75	1.552	46.5	11.1	4.3	0.10		
21	13.20	1.47	3	*	18.87	26.9	42.6	30.6	0.34			25.80	58.2	41.8	50.5	9.33	1.254	13.3	21.1	15.1	0.17		
21	13.50	0.30	3	*	11.23	46.5	33.1	20.4	0.24			20.99	61.9	38.1	46.2	6.04	1.357	25.0	17.8	11.0	0.13		
21	13.58	0.08	3	*	18.87	26.9	42.6	30.6	0.34			25.80	58.2	41.8	50.5	9.33	1.254	13.3	21.1	15.1	0.17		
21	14.40	0.82	4	-	5.10	69.6	22.6	7.8	0.21			16.80	74.4	25.6	40.2	3.05	1.512	41.6	13.5	4.6	0.12		
21	15.18	0.78	5	*	13.26	45.9	33.9	20.2	0.27			24.50	62.7	37.3	44.5	7.37	1.353	25.5	18.8	11.2	0.15		
21	15.50	0.32	5	*	13.23	45.1	33.3	21.5	0.22			24.13	60.8	39.2	45.2	7.25	1.343	24.7	18.3	11.8	0.12		
21	15.82	0.32	5	*	14.80	41.0	34.6	24.4	0.24			25.08	58.6	41.4	51.1	7.24	1.290	20.1	16.9	11.9	0.12		
21	16.45	0.63	5	*	13.23	45.1	33.3	21.5	0.22			24.13	60.8	39.2	45.2	7.25	1.343	24.7	18.3	11.8	0.12		
21	16.96	0.45	5	*	11.72	49.3	31.9	18.8	0.20			23.13	63.0	37.0	43.2	6.67	1.380	28.0	18.2	10.7	0.11		
21	18.30	1.34	5	*	23.08	20.5	44.6	34.9	0.26			29.02	56.1	43.9	52.7	10.92	1.221	9.7	21.1	16.5	0.12		
21	18.62	0.32	5	*	16.36	35.9	36.7	27.4	0.21			25.52	57.2	42.8	51.6	7.92	1.279	17.4	17.7	13.3	0.10		
21	19.11	0.49	6	-	8.65	62.2	25.9	11.9	0.14			22.88	68.6	31.4	42.3	4.99	1.439	35.9	15.0	6.8	0.08		
21	20.34	0.84	6	-	7.33	63.2	24.1	12.7	0.15			19.93	65.6	34.4	41.6	4.28	1.462	36.9	14.1	7.4	0.09		
21	20.42	0.08	7	*	14.47	41.5	33.8	24.7	0.28			24.73	57.7	42.3	45.7	7.85	1.335	22.5	18.3	13.4	0.15		
21	20.79	0.37	7	*	16.51	34.9	37.6	27.5	0.24			25.35	57.7	42.3	52.5	7.84	1.264	16.6	17.9	13.1	0.12		
21	21.37	0.58	7	*	14.47	41.5	33.8	24.7	0.28			24.73	57.7	42.3	45.7	7.85	1.335	22.5	18.3	13.4	0.15		
21	22.06	0.45	8	-	7.09	65.8	23.4	10.8	0.19			20.73	68.5	31.5	41.1	4.17	1.470	38.7	13.8	6.3	0.11		
21	23.80	1.74	8	-	0.54	85.3	14.3	0.3	0.08			3.68	97.6	2.4	29.5	0.38	1.776	60.2	10.1	0.2	0.06		
21	24.75	0.95	8	-	4.73	70.2	24.3	5.5	0.22			15.86	81.5	18.5	39.0	2.88	1.553	42.8	14.8	3.4	0.14		
21	44.98	0.71	9	*	18.34	32.7	37.7	29.6	0.25			27.26	56.1	43.9	48.5	9.45	1.284	16.9	19.4	15.2	0.13		
21	45.32	0.34	9	*	14.13	42.7	33.6	23.7	0.24			24.68	58.7	41.3	48.1	7.34	1.309	22.2	17.4	12.3	0.13		
21	46.07	0.75	9	*	18.34	32.7	37.7	29.6	0.25			27.26	56.1	43.9	48.5	9.45	1.284	16.9	19.4	15.2	0.13		
21	46.87	0.80	10	-	4.25	74.4	19.2	6.4	0.10			16.62	74.9	25.1	37.8	2.64	1.551	46.3	11.9	4.0	0.07		
21	47.64	0.54	10	-	11.34	54.1	28.7	17.2	0.21			24.70	62.5	37.5	41.4	6.65	1.423	31.7	16.8	10.1	0.12		
21	48.17	0.53	11	-	9.52	59.6	25.8	14.6	0.20			23.54	63.9	36.1	43.1	5.42	1.421	33.9	14.7	8.3	0.11		
21	48.53	0.36	11	*	14.54	43.2	33.9	22.9	0.31			25.59	59.7	40.3	51.4	7.07	1.283	21.0	16.5	11.1	0.15		
21	49.39	0.86	11	*	14.98	42.1	35.1	22.8	0.36			25.87	60.7	39.3	46.7	7.98	1.322	22.4	18.7	12.1	0.19		
21	49.78	0.39	11	*	6.92	65.9	24.5	9.7	0.23			20.28	71.7	28.3	38.4	4.27	1.496	40.6	15.1	6.0	0.14		
21	50.29	0.51	11	*	18.29	31.5	41.0	27.6	0.43			26.69	59.8	40.2	50.5	9.05	1.263	15.6	20.3	13.6	0.21		
21	50.57	0.28	11	*	16.33	36.7	37.1	26.2	0.37			25.80	58.6	41.4	50.6	8.07	1.273	18.1	18.3	12.9	0.18		
21	51.58	1.01	11	-	10.26	51.0	30.8	18.2	0.27			20.93	62.8	37.2	45.6	5.58	1.349	27.8	16.7	9.9	0.15		
21	51.81	0.23	11	-	11.51	52.3	30.0	17.8	0.25			24.11	62.8	37.2	44.2	6.42	1.384	29.1	16.7	9.9	0.14		
21	52.21	0.40	11	-	17.38	32.6	37.5	29.9	0.34			25.78	55.7	44.3	53.2	8.13	1.250	15.3	17.6	14.0	0.16		
21	52.88	0.67	11	-	11.51	52.3	30.0	17.8	0.25			24.11	62.8	37.2	44.2	6.42	1.384	29.1	16.7	9.9	0.14		
21	53.69	0.81	11	-	10.96	54.4	30.1	15.5	0.23			24.03	65.9	34.1	43.3	6.22	1.397	30.9	17.1	8.8	0.13		
21	53.97	0.28	11	-	14.15	44.5	33.2	22.3	0.26			25.52	59.8	40.2	47.6	7.42	1.315	23.3	17.4	11.7	0.13		
21	54.55	0.58	12	-	11.92	50.7	31.3	18.0	0.23			24.20	63.4	36.6	41.9	6.93	1.379	29.5	18.2	10.5	0.14		
21	56.24	1.69	0	-	7.73	62.3	25.1	12.7	0.21			20.48	66.4	33.6	41.1	4.55	1.451	36.7	14.8	7.5	0.12		
21	58.06	1.39	0	-	10.69	53.4	28.9	17.6	0.23			22.95	62.1	37.9	43.6	6.03	1.400	30.2	16.3	10.0	0.13		
21	59.57	1.51	0	-	5.55	69.1	22.5	8.4	0.18			17.95	72.8	27.2	37.8	3.45	1.523	43.0	14.0	5.2	0.11		
AVERAGE of HOLE No: 21																							
21	50.57	12.58	0	*	15.78	38.4	36.5	25.2	0.28			25.60	59.2	40.8	48.1	8.19	1.302	19.9	18.9	13.1	0.14		

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TABLE A4 HOLE CO22 WORKING SECTION ANALYSIS

DEPTH	THICKNESS	WORKING SECTION	COAL OR DILUTION	AIR DRIED RD	ASH	S.E.	IM	TM
9.19	0.20		Dil.	1.90	56.0	6.84	9.6	
16.77	7.58	PB2&3	Coal.	1.59		11.90	18.6	47.0
16.97	0.20		Dil.	1.79	51.7	6.56	15.8	39.5
21.85	0.20		Dil.	1.94	59.7	5.32	13.0	
24.47	2.62	PB4	Coal	1.51		11.98	22.6	48.0
24.67	0.20		Dil.	1.60	43.20	7.56	25.0	
36.20	0.20		Dil.	No Data				
38.10	1.90	PC1	Coal	No Data				N.A.
38.30	0.20		Dil.	No Data				
48.67	0.20		Dil.	1.99	65.80	2.30	15.7	
53.63	4.96	PC4	Coal	1.60		10.19	21.1	47.4
53.83	0.20		Dil.	1.85	52.3	8.28	8.7	38.6
								39.9
	17.06	Coal Only		1.58		11.35	20.1	47.6
	1.60	Dilution		1.85		6.06	14.4	39.3
	18.66	Coal & Diln.		1.60		10.83	19.5	46.8

Tonnes increase by 10.76%

Heat increases by 5.69%

TABLE A5 HOLE C067 WORKING SECTION ANALYSIS

DEPTH	THICKNESS	WORKING SECTION	COAL OR DILUTION	AIR DRIED				TM
				RD	ASH	S.E.	IM	
6.62	0.20		Dil.	2.27	74.3	2.86	5.2	
8.35	1.73	PAO	Coal	1.76	44.6	11.06	9.3	48.2
8.55	0.20		Dil.	2.22	70.2	4.32	4.4	
23.94	0.20		Dil.	2.35	76.8	2.60	3.4	
29.45	5.51	PB3&4	Coal	1.66	35.2	14.10	10.8	45.4
29.65	0.20		Dil.	1.87	54.2	8.92	8.6	
38.05	0.20		Dil.	2.15	67.8	5.52	4.7	
40.10	2.05	PC2	Coal	1.74	41.4	12.20	9.2	46.3
40.30	0.20		Dil.	1.88	50.8	10.32	5.9	
44.33	0.20		Dil.	2.00	58.7	7.84	4.6	
48.60	4.27	PC3	Coal	1.73	38.6	13.49	9.0	43.8
48.80	0.20		Dil.	2.12	63.8	5.92	4.5	
	13.56	Coal Only		1.71		13.21	9.8	45.4
	1.6	Dilution		2.10		5.83	5.1	39.3 (est)
	15.16	Coal & Diln.		1.75		12.27	9.2	43.2

Tonnes increase by 14.41%

Heat increases by 6.27%

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TABLE A6 HOLE CO33(and 33R) WORKING SECTION ANALYSIS

DEPTH	THICKNESS	WORKING SECTION	COAL OR DILUTION	AIR DRIED RD	AIR DRIED ASH	AIR DRIED S.E.	AIR DRIED IM	TM	
8.13	0.20		Dil.	N.A.					
10.32	2.19	PB3	Coal	1.44	25.9	15.16	22.2	47.0	
10.52	0.20		Dil.	1.71	46.8	7.34	21.00		
11.44	0.20		Dil.	1.71	46.8	7.34	21.0		
13.66	2.22	PB4	Coal	1.54		13.18	20.00	49.7	
13.86	0.20		Dil.	2.08	63.3	6.02	7.4		
27.57	0.20		Dil.	2.25	73.2	3.18	7.5		
33.57	6.00	PC2	Coal	1.72		12.25	9.6	49.5	(Depth 31.5 in CO33R. 4.92m
33.77	0.20		Dil.	2.07	63.6	5.22	9.0		analysed in CO33R, 2.59m
35.84	0.20		Dil.	2.12	66.7	est5.00	N.A	39.2	analysed in CO33)
37.63	1.79	PC3	Coal	1.59		14.07	15.7	50.6	
37.83	0.20		Dil.	1.99	56.9	7.38	8.5		
	12.20	Coal Only		1.62		13.14	14.3	49.3	
	1.60	Dilution		1.99		5.81	11.8	39.3(est)	
	13.80	Coal & Diln.		1.66		12.12	14.0	47.9	

Tonnes Increase by 15.91%

Heat Increases by 6.91%

TABLE A7 (page 1)

Loatta & Pipers Lagoons - Incremental & Cumulative Strip Ratios in each Hole

HOLE	SEAM	DEPTH	THICK	INC RATIO	CUM RATIO	CUM O/B	CUM SEAM
C019	SA1	7.74	3.59	0.87	0.87	4.15	3.59
C019	SB4	22.58	1.88	5.18	2.35	17.11	5.47
C019	SC1	30.46	4.01	0.73	1.66	20.98	9.48
C064	SA1	13.48	2.71	2.99	2.99	10.77	2.71
C064	SA2	17.56	2.50	0.48	1.78	12.35	5.21
C075	SA1	6.81	2.34	1.44	1.44	4.47	2.34
C075	SA2	10.30	1.89	0.64	1.08	6.07	4.23
C075	SB3	18.80	2.07	2.34	1.49	12.50	6.30
R078	SA1	72.80	2.10	25.31	25.31	70.70	2.10
R006	PB3	25.20	2.70	6.27	6.27	22.50	2.70
R006	PB4	29.40	2.40	0.56	3.58	24.30	5.10
R006	PC3	56.00	3.60	4.80	4.09	47.30	8.70
R009	PB1	20.20	1.95	7.04	7.04	18.25	1.95
R009	PB3	26.25	2.45	1.10	3.73	21.85	4.40
C022	PB2&PB3	16.77	7.58	0.91	0.91	9.19	7.58
C022	PB4	24.47	2.62	1.46	1.05	14.27	10.20
C022	PC1	38.10	1.90	4.64	1.62	26.00	12.10
C022	PC4	53.63	4.94	1.61	1.61	36.59	17.04
R023	PB3	20.20	2.50	5.32	5.32	17.70	2.50
R023	PB4	23.17	1.87	0.44	3.23	18.80	4.37
R023	PC1	34.00	1.60	4.34	3.53	28.03	5.97
R023	PC2	42.40	5.90	0.32	1.93	30.53	11.87
R023	PC3	47.00	3.50	0.24	1.55	31.63	15.37
C032	PC2	43.87	4.11	7.27	7.27	39.76	4.11
C033	PB3	10.32	2.19	2.79	2.79	8.13	2.19
C033	PB4	13.66	2.22	0.38	1.58	9.25	4.41
C033	PC2	33.57	4.71	2.43	2.02	24.45	9.12
C033	PC3	37.63	1.79	0.95	1.84	26.72	10.91
C067	PA0	8.35	1.73	2.88	2.88	6.62	1.73
C067	PB3&4	29.45	5.51	2.13	2.31	22.21	7.24
C067	PC2	40.10	2.05	3.15	2.49	30.81	9.29
C067	PC3	48.60	4.27	0.74	1.94	35.04	13.56
R068	PB3	17.80	2.90	3.86	3.86	14.90	2.90
R068	PC2	38.10	3.90	3.16	3.46	31.30	6.80
C071	PB4	24.03	2.47	6.56	6.56	21.56	2.47
R072	PA0	16.70	2.00	5.53	5.53	14.70	2.00
R072	PC2	51.50	1.50	16.69	10.31	48.00	3.50
R072	PC3	56.30	2.30	0.82	6.55	50.50	5.80
R072	PC4	58.40	2.10	0.00	4.81	50.50	7.90
R073	PB3	18.60	8.50	0.89	0.89	10.10	8.50

TABLE A7 (page 2)

Loatta & Pipers Lagoons - Incremental & Cumulative Strip Ratios in each Hole

HOLE	SEAM	DEPTH	THICK	INC RATIO	CUM RATIO	CUM O/B	CUM SEAM
R073	PB4	25.20	3.70	0.59	0.80	13.00	12.20
R073	PC4	54.00	2.00	10.08	2.11	39.80	14.20
R087	PA0	10.40	2.70	2.14	2.14	7.70	2.70
R002	LB1	33.00	3.70	5.95	5.95	29.30	3.70
R007	LA1	9.90	1.75	3.50	3.50	8.15	1.75
R007	LA3	17.50	2.70	1.36	2.20	13.05	4.45
R007	LB2	49.90	2.30	9.84	4.81	43.15	6.75
R007	LB3	52.55	1.95	0.27	3.79	43.85	8.70
R021	LA1	10.30	2.45	2.41	2.41	7.85	2.45
R021	LA2	15.10	2.40	0.75	1.59	10.25	4.85
R021	LB1	39.90	3.75	4.22	2.74	31.30	8.60
R080	LA1	21.60	1.60	9.40	9.40	20.00	1.60
R080	LA3	27.80	3.00	0.80	3.79	23.20	4.60
R080	LB1	39.20	2.00	3.53	3.71	32.60	6.60
R080	LB2	52.00	2.80	2.69	3.41	42.60	9.40
R080	LB3	56.00	2.00	0.75	2.94	44.60	11.40
R081	LB2	9.60	4.00	1.05	1.05	5.60	4.00
R081	LB3	15.20	3.80	0.36	0.71	7.40	7.80
R081	LC1	35.70	2.30	5.95	1.91	25.60	10.10
R081	LC2	42.00	1.50	2.41	1.97	30.40	11.60
R081	LC3	44.50	1.90	0.24	1.73	31.00	13.50
R082	LA2	33.90	2.90	8.04	8.04	31.00	2.90
R082	LA3	37.40	2.20	0.44	4.76	32.30	5.10
R082	LB3	65.10	2.60	7.26	5.60	57.40	7.70
R082	LC1	69.80	1.60	1.46	4.89	60.50	9.30
R082	LC2	72.40	1.60	0.47	4.24	61.50	10.90
R082	LC3	74.70	1.85	0.18	3.65	61.95	12.75
R082	LC4	76.80	1.55	0.27	3.29	62.50	14.30
R084	LA2	24.50	1.60	10.76	10.76	22.90	1.60
R084	LA3	27.10	1.70	0.40	5.42	23.80	3.30
R084	LB3	59.90	2.60	8.73	6.88	54.00	5.90
R084	LC1	79.50	1.50	9.07	7.33	72.10	7.40
C004	LB1	17.08	3.77	2.65	2.65	13.31	3.77
C004	LB2	22.93	5.16	0.10	1.18	14.00	8.93
C004	LB3	29.66	3.46	0.71	1.05	17.27	12.39
C020	LB1	10.39	2.84	2.00	2.00	7.55	2.84
C020	LB2	20.33	9.31	0.05	0.51	8.18	12.15
C020	LB3	25.15	3.75	0.21	0.44	9.25	15.90
C020	LC1	32.42	3.55	0.79	0.50	12.97	19.45
C021	LA2	13.58	1.85	4.77	4.77	11.73	1.85
C021	LA3	18.62	4.16	0.16	1.58	12.61	6.01
C021	LB1	46.07	1.80	10.71	3.68	38.26	7.81
C021	LB2	50.57	2.40	0.66	2.97	40.36	10.21
R086	LA1	9.40	1.80	3.17	3.17	7.60	1.80
R086	LB1	32.90	3.15	4.86	4.25	27.95	4.95
R086	LB2	39.10	5.55	0.09	2.05	28.60	10.50

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