WOODBURY COAL PROJECT

Power Station Enquiry

October 1984

Costain Australia Limited
Victor Petroleum and Resources Limited
North West Bay Co. Pty Ltd

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Costain Australia Limited
Managers for the Joint Venture with
Victor Petroleum and Resources Limited
North West Bay Co. Pty Ltd

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EXECUTIVE SUMMARY

The Woodbury Joint Venture comprises

Costain Australia Limited
Victor Petroleum & Resources Limited
North West Bay Company Pty. Limited

Costain Australia Limited is acting as Joint Venture Manager

It is the intention of the Joint Venture to complete an exploration and feasibility progamme with the view to supply of coal to the Thermal Power Station proposed by the Hydro-Electric Commission, Tasmania.

The 1984 exploration programme at Woodbury has included 28 open holes, 11 partly and fully cored HQ diamond drill holes and 3 100mm cored seam intersections. All holes have been geophysically logged. Cored coal intersections have been subjected to full float and sink testing. Thermal coal quality parameters have been determined on composite samples.

The geological structure proposed for the coal measures in the Woodbury area consists of an east-west trending anticline plunging gently to the west. The lateral distribution of the principal economic seams, C and D, is largely governed by the present topography, the level of seam oxidation and two major faults.

Total in situ reserves for C and D Seams in the Main Reserve Block amount to 12.3 million tonnes at an average overburden

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ratio of 10.3 cubic metres per tonne in situ. Additional reserves are inferred in other areas: B Seam of the Main Block, the Sugarloaf, Northern and Western Reserve Blocks. Total in situ reserves may be as high as 23 million tonnes. For the purpose of this study only the Main Reserves Block has been included in the Mine Plan.

Results of testing to date confirm the following "as received" quality for a combined C and D Seam washed product:

Moisture	12%
Ash	24%
Volatile Matter	18%
Specific Energy	21.5 MJ/kg
Sulphur	<0.5%

The Volatile Matter Content averages 27.7% on a dry ash free basis.

The mining plan envisages a dragline strip mine producing 7.5 million tonnes over a 25 year period for C and D Seams at a rate of 300,000 tonnes per year. Similar ancilliary equipment is proposed to that currently employed at the Ravensworth and Warkworth mines in the Hunter Valley region of N.S.W.

It will be necessary to beneficiate the ROM coal. A washing plant is proposed using heavy medium cyclones for coarse coal and spirals for the fines circuit. Coal washing yields have been estimated at 75% and 65% for the C and D Seams respectively.

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Manning levels for the project are;

- up to 130 persons on site during the construction and development stage.

- a total of 117 persons once the mine is in operation.

As at October, a base price of [redacted]/tonne at supply rate of 300,000 tonnes/year is proposed.

Some works are still in hand in relation to the current programme and results will be available to the consultant group when these are complete.

The need is recognised for the following activities to be completed in the future:

- Additional Infill Drilling and Coal Analysis
- Environmental Monitoring Programme
- Groundwater Monitoring Programme
- Geotechnical Evaluation Programme

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1. BACKGROUND INFORMATION

1.1 JOINT VENTURE STRUCTURE:

The Joint Venture Participants in the Woodbury Coal Project are:-

Costain Australia Limited	50%
Victor Petroleum & Resources Limited	40%
North West Bay Company Pty. Limited	10%

Costain Australia Limited is acting as Joint Venture Manager.

1.2 MINING TITLE:

Currently, the following Exploration Licences and Mining Lease Applications are in the process of transfer to the Joint Venture Parties:

Exploration License: 31/80
Exploration License: 16/81
Mining Lease Applications: 1070 to 1078 inclusive.

The part of Exploration Licence 31/80 surrounding the Woodbury area covers an area of 766 square kilometres, as shown on Figure A. Mining Lease Applications, covering 16 square kilometres, are shown in Figure B.

LOCATION MAP OF WOODBURY COAL PROJECT

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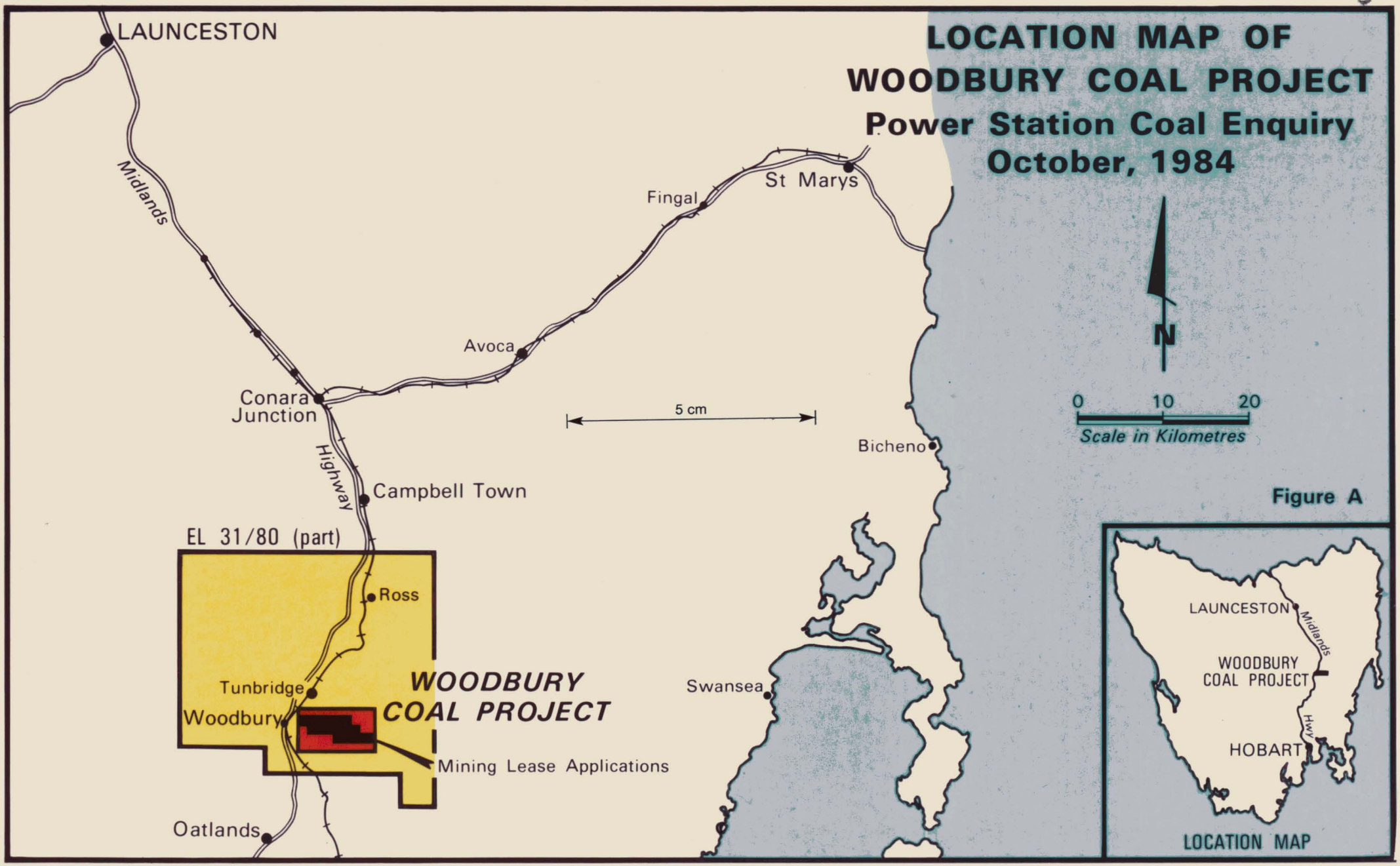
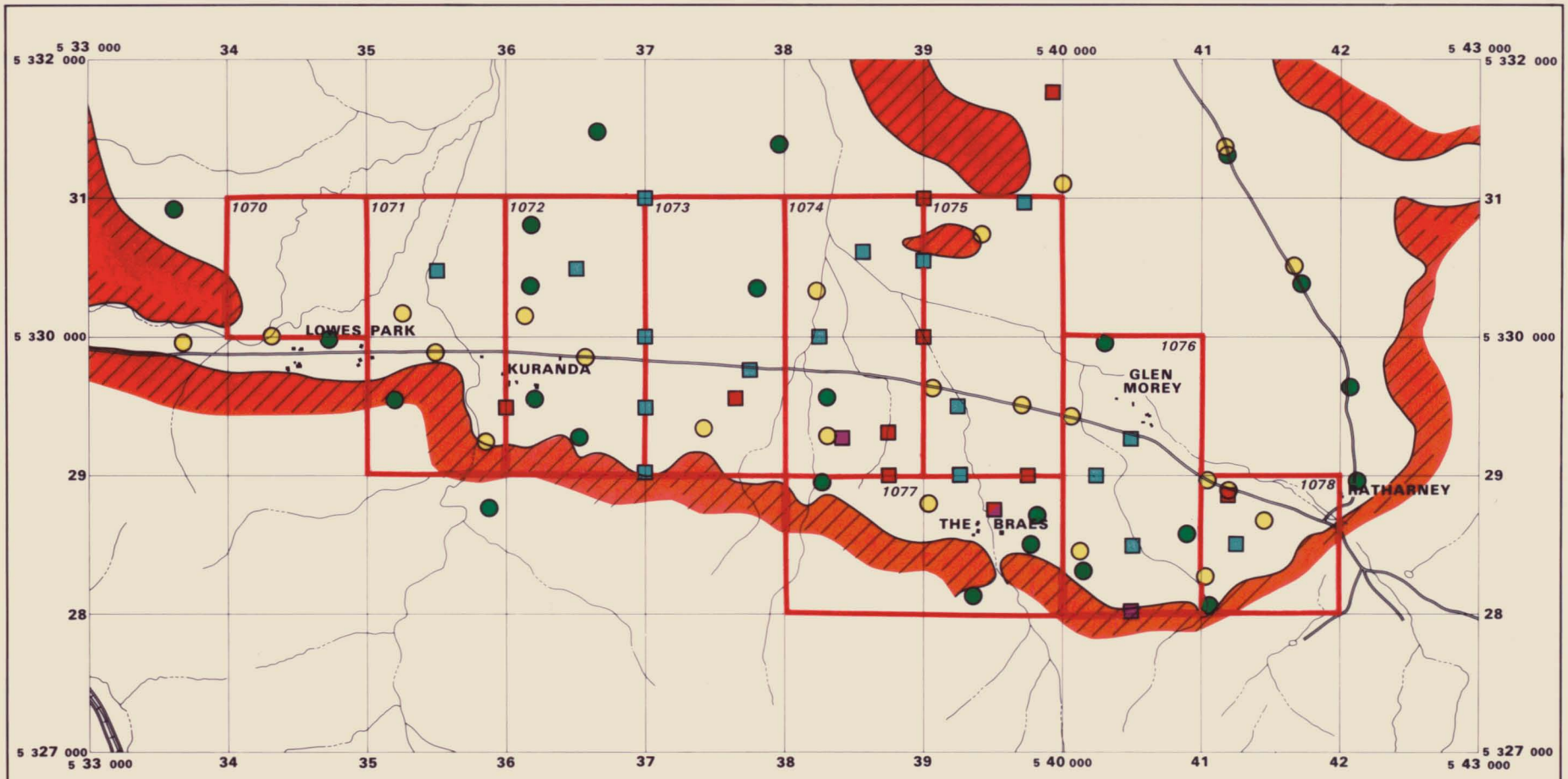


Figure A



LEGEND

- Drilling programme completed 1981
  - Open holes
  - H Q cored holes
- Current drilling programme
  - Open holes
  - H Q cored holes
  - Large diameter (100mm) cored holes
- Dolerite boundary
- Boundaries of Mining Lease Applications (1074)

5 cm

N

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MINING LEASE APPLICATIONS DRILL HOLE LOCATIONS

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0 500 1000 metres

Figure B

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Since early 1984, an ongoing liaison has been maintained with the local landholders in the Woodbury area as well as with the Council Officers from the Shire Councils of Oatlands, Ross and Campbell Town.

It is envisaged that, once the Woodbury Project is recognised as a likely source of coal to the proposed Thermal Power Station, the negotiations would commence with the landowners to identify the means by which Costain, as Mine Operator could gain access to the surface for the purpose of open cut mining.

1.3 LOCATION:

The Woodbury Coal Deposit is located in the Central Midlands of Tasmania, approximately 15 kilometres east of the Midland Highway, and the main railway line connecting Hobart 80 kilometres to the south and Launceston 85 kilometres to the north.

The closest settlement is at Tunbridge, some 10 kilometres to the north, with the main population centres of Ross, 20 kilometres, and Campbell Town, 30 kilometres to the north, and Oatlands 15 kilometres to the south.

The Woodbury area consists of undulating pastoral lands which are principally used for grazing of sheep. The area is within a rainshadow with the average annual rainfall of 300 millimetres.

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2. GEOLOGY AND EXPLORATION

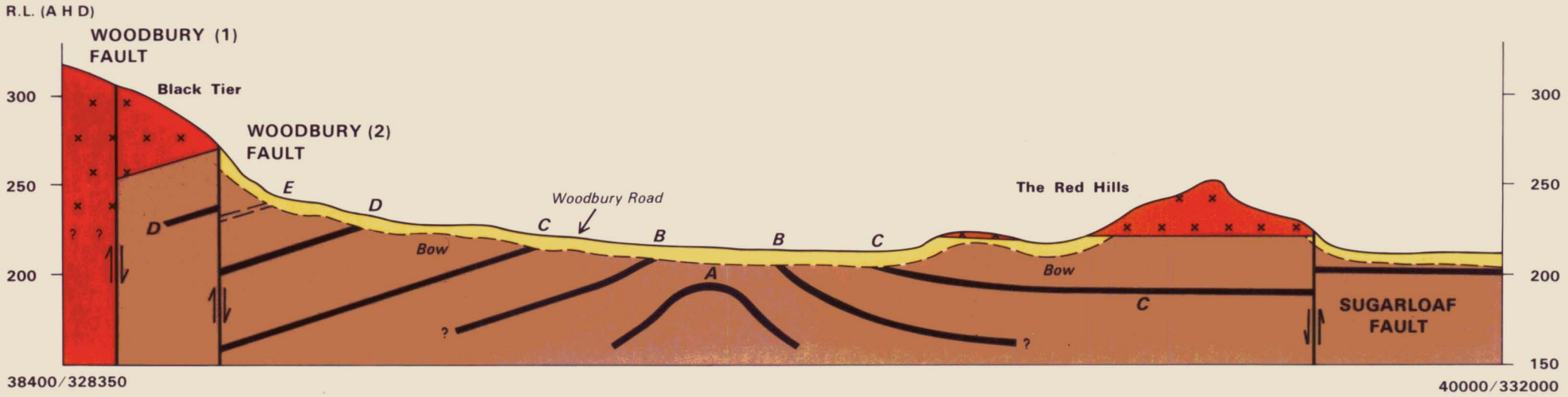
2.1 GEOLOGY

The middle to late Triassic stratigraphy of the Woodbury area consists of coal measures overlying a siltstone - mudstone sequence. The coal measures unit consists of a number of coal members, up to 2.5 metres in thickness, interbedded with lithic sandstone and minor siltstones and mudstones.

Five coal seams of potential economic importance have been identified and named Seams A, B, C, D and E in ascending stratigraphic order. Owing to uncertainties in correlation, seams in the western area have been identified as L, M, N, O and P.

Following an open hole and coring programme during 1984 coal seam correlations have been verified and a revised structural interpretation has been established for the Woodbury coal deposit.

The structure now proposed consists of an east-west trending anticline plunging gently to the west (Figures D and E). To the south of the Woodbury Road, in the central Woodbury area, the seams dip at approximately 3^{o} to the south. To the north, the seams dip at less than 1^{o}. The lateral distribution of the principal economic



LEGEND

Jurassic dolerite

Triassic coal seams

Vertical Exaggeration 5:1

Horizontal Scale

0 0.5 1.0

kilometres

5 cm

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SCHEMATIC CROSS SECTION

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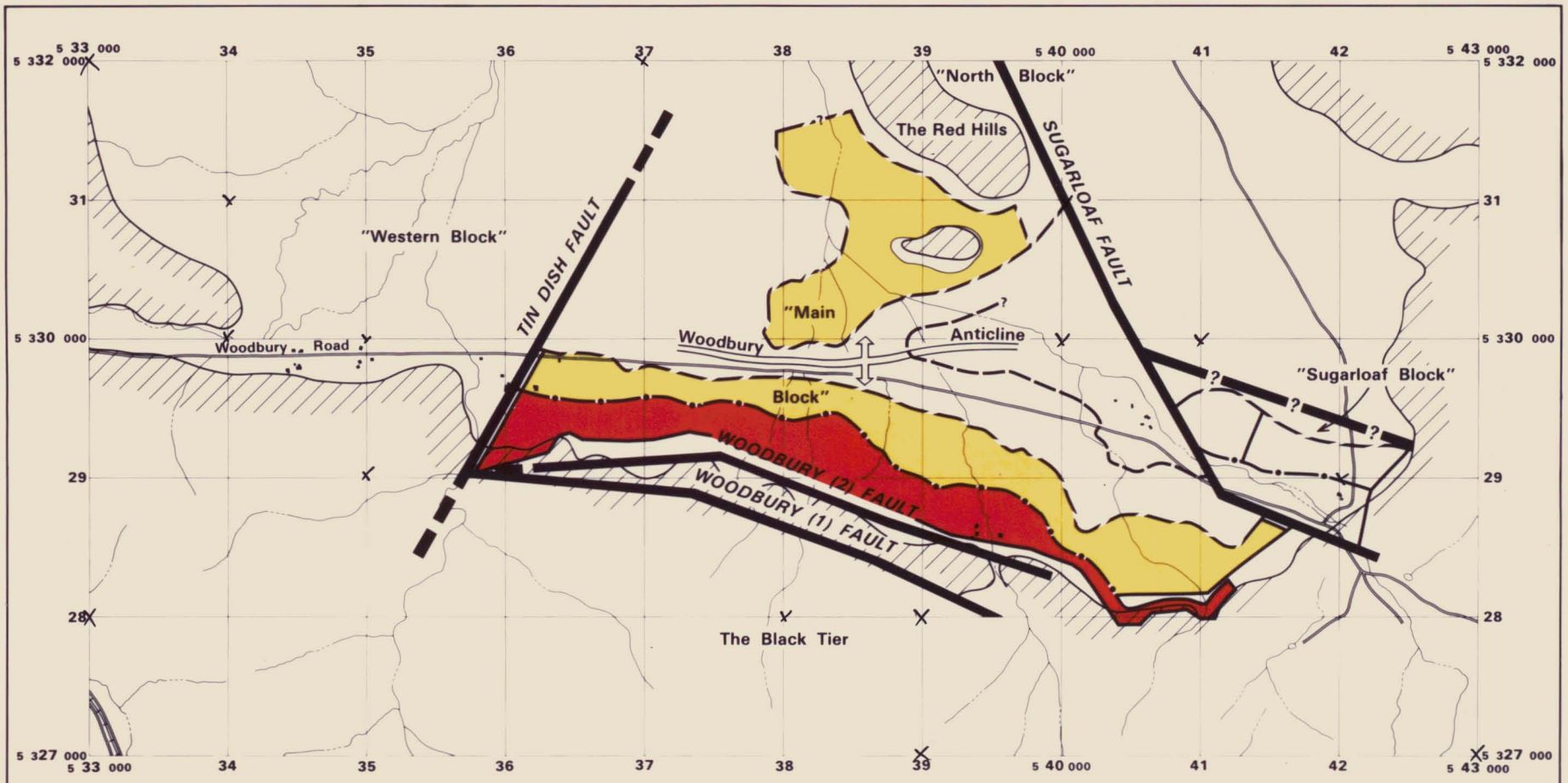
Figure D



LEGEND

- Dolerite boundary
- C Seam Reserve
- D Seam Reserve
- B Seam Loxline
- C Seam Loxline
- D Seam Loxline
- 50m cover on D Seam

N

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POTENTIAL OPEN CUT RESERVES

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0 500 1000 metres

5 cm

Figure E

seams, B, C and D are largely governed by the present topography and the level of seam oxidation, which averages approximately 10 metres in depth.

The Western Block seams are separated by a major north-easterly trending fault, the Tin Dish Fault. As drilling is at present incomplete in the western Woodbury area a more comprehensive interpretation of seam structures in this area has not been attempted.

As shown in Figure E the eastern area has been dissected by a major north westerly trending fault system (the Sugarloaf Fault). The coal measures sequence within this fault block have been down-thrown, juxtaposing B and D seams in the eastern area. Seams in this block dip at approximately 6^{o} to the south. Throws on the Sugarloaf Fault have been estimated at 60 metres at its south eastern extent. To the north of the Red Hills C seam is down-thrown by 5 to 10 metres.

To the south and east the coal measures are faulted against horsts of Jurassic dolerite (The Black Tier). To the south two parallel faults have been identified, the Woodbury (1) and (2) Faults (Figure E) between which the coal measures have been up-faulted in relation to those of the main Woodbury area. Dolerite outliers forming the Red Hills are inferred to be thin intrusive sheets overlying the C seam. Preliminary drilling indicates that seams of economic potential exist in the area to the north of the Red Hills.

The northern extent of Triassic coal measures in the Woodbury area is defined by a major fault to the north of which the Ross Sandstone of lower Triassic is encountered.

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2.2 THE 1984 EXPLORATION PROGRAMME

An infill drilling programme has been carried out during September-October, 1984 in order to further delineate the geological structure and nature of the Woodbury coal seams. This programme has been designed to supplement the 74 cored and open holes drilled in the Woodbury - Bells Lagoon area by Victor Petroleum and Resources Limited in 1981.

As shown in Figure B the recently completed programme has concentrated on the Main Reserve Block, with a number of additional open holes aimed at delineating further coal resources in the Woodbury area.

The 1984 exploration programme has included 28 open holes (rotary air), 11 partly and fully cored HQ diamond drill holes and 3 100mm cored seam intersections. All holes have been geophysically logged using long and short spaced gamma, caliper, neutron and s.p./resistance sondes.

Slim core coal samples have been subjected to float and sink testing of likely working sections followed by a full thermal coal testing and analysis programme on Fl.80 density composites which contain approximately 25% ash.

Large diameter (100mm) core samples have been obtained for better definition of the quality of the coal and its preparation. Samples have been subjected to conventional wet tumble pretreatment. Float and sink testing has been carried out at 8 densities on 4 size fractions.

A ground magnetometer survey has been conducted over much of the Woodbury area in order to elucidate structural features of the coal measures sequence.

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3. COAL RESERVES

3.1 STATEMENT OF RESERVES

Reserves for the Woodbury Coal Deposit have been delineated using results from the 1984 exploration programme together with those reported by Victor Petroleum and Resources Limited in 1981. Total reserve estimates of the Main Block, on which the present mining feasibility study has been based, are shown in Table 1A and Figure E. Total in situ reserves for C and D Seams amount to 12.3 million tonnes at an average overburden ratio of 10.3 cubic metres per tonne in situ. Additional reserves are inferred in other areas: B Seam of the Main Block, the Sugarloaf, Northern and Western Reserve Blocks (Figure E and Table 1B). Total in situ reserves may be as high as 23 million tonnes.

Reserves have not been classified into measured and indicated categories. It is recognised that additional cored seam intersections are required to evalutate reserve estimates to a measured status in several areas of the Woodbury Coal Deposit.

As a result of the recent drilling programme seam correlations have been verified and the structural geology of the coal measures sequence significantly simplified. Additional confidence must therefore be placed on the present statement of reserves.

Table 1. Coal Reserves, Woodbury Coal Deposit

A. Main Block Reserves, C and D Seams

SEAM	LOCATION	COAL							OVERBURDEN		
		In Situ				ROM	Washery Yield	Saleable		Ratios	
		Area	Av. Thickness	R.D.						In Situ	Saleable
		km^2	m		MT	MT	%	MT	Mm^3	m^3/tonne	
D	Main Block - South	1.53	2.4	1.65	6.06	5.15	65	3.35	49.9	8.3	14.9
C	Main Block - South	1.80	1.3	1.55	3.56	3.03	75	2.27	51.1	14.4	22.5
C	Main Block - North	1.42	1.2	1.55	2.67	2.27	75	1.70	25.6	9.6	15.1
	TOTAL, Main Block	4.75			12.29	10.45		7.32	126.6	10.3	17.3

B. Additional Reserve Potential

B	Main Block	0.81	1.5	1.65	2.0
D	Sugarloaf Block	0.39	3.0	1.65	1.9
C	Sugarloaf Block	0.31	1.3	1.55	0.6
C	Northern Block	0.80	1.3	1.55	1.6
LMN OP	Western Block				4.0
	TOTAL Other Reserves	2.31			10.1

TOTAL RESERVES 22.39MT

3.2 METHOD OF RESERVE CALCULATION

In situ reserves have been calculated using the conventional "area of influence" polygon technique. Aggregate seam thicknesses have been measured from cored seam intersections, excluding coal members less than 0.2 metres in thickness. In areas of widely spaced cored intersections, seam thicknesses have been determined from open holes using the bed resolution density geophysical log, the results of which compare accurately with values obtained from cored intersections.

Saleable reserves for C and D seams have been estimated on the basis of:

- 85% mining yield
- 75% and 65% washery yield respectively to produce a 25% ash product. (See Section 4.3)

3.3 RESERVE BLOCKS OF THE WOODBURY COAL DEPOSIT

Four reserve blocks have been recognized within the Woodbury Coal Deposit. Their boundaries are largely based on two major fault systems, the Tin Dish and Sugarloaf Faults (Figure E).

3.3.1 The Main Reserve Block

The Main Reserve Block, in the central Woodbury area, has been divided into northern and southern areas. To the south the C and D Seams dip in a southerly direction. Reserve limits are based on the level of seam oxidation (averaging 10 metres in depth), and on a 50 metre stand-off to the Tin Dish and Sugarloaf Faults. The D Seam limit of oxidation has been chosen as the southerly extent of extractable C Seam reserves; D Seam is limited by the 50 metre overburden isopach.

To the north the C Seam dips gently towards the Red Hills. The apparently irregular seam subcrop has been attributed to low amplitude warps in the seam's structure together with an erratic depth of weathering.

Reserves of B Seam have been reduced compared to previous estimates owing to the revised structural interpretation. Coal from B Seam has not been included in the current feasibility study as a result of its low Volatile Matter Content. This seam lies below the D and C Seams and is apparently heat affected by igneous activity at depth. Further exploration may show higher levels of Volatile Matter Content within B Seam and allow its exploitation.

The uppermost coal member, E Seam, has not been considered owing to its restricted occurrence within the Main Reserve Block.

3.3.2 The Sugarloaf Block

Limited drill hole information indicates a resource amounting to approximately 2.5 million tonnes in situ of C and D Seams within this block in the eastern Woodbury area.

3.3.3 The Western Block

Exploration in the area to the west of the proposed Tin Dish Fault by Victor Petroleum and Resources Limited led to the delineation of some 4.6 million tonnes within 5 seams dipping gently to the west. Further exploration has not been undertaken during the recent programme. These reserves have not been included in the present mine plan owing to low apparent Volatile Matter Content.

An in situ reserve/resource of approximately 4 million tonnes has been estimated for the Western Block.

3.3.4 The Northern Block

Recent open hole and limited cored drilling has delineated a resource of C seam to the north of the Red Hills. Reserves have been conservatively estimated at 1.6 million tonnes. Encouraging results have been obtained from the last drill hole of the recently completed programme in which an unweathered seam section, of approximately 1.2 metres aggregate thickness, was encountered at a depth of 6.5 metes (WDC141, 39950/331700).

3.4 COMPARISON WITH PREVIOUS RESERVE ESTIMATES FOR THE WOODBURY COAL DEPOSIT

The revised structural interpretation of the Triassic coal measures in the Woodbury area, together with restrictions imposed by the Volatile Matter Content of the product coal has resulted in a reduced estimate of coal reserves on which the current mine plan is based.

Estimates for the total coal reserve/resource in the Woodbury area are comparable to those presented by Victor Petroleum and Resources Limited and used in the previous submission. The recent drilling programme has delineated further reserves of C and D seam in the Sugarloaf Block. A significant reserve of C Seam may exist in the area to the north of the Red Hills, the Northern Reserve Block.

Details of adjustments to reserves, on a seam-by-seam basis are as follows:

3.4.1 D Seam

The overall in situ reserves of D Seam in the Main Block have not changed significantly following the recent recalculation of reserves. Additional reserves have been delineated within the western area of the Main Block. However, this additional tonneage has been reduced by the selective removal of non-coal partings within the D Seam.

In situ reserves of 6.1 million tonnes calculated in the present evaluation compares to 5.9 million tonnes previously calculated by Victor Petroleum and Resources Limited.

3.4.2 C Seam

A marked decrease has been observed in reserves of the C Seam within the Main Reserve Block. This adjustment is attributed to the revised structural interpretation which has imposed a greater southerly dip of the C Seam on the southern limits of the Woodbury Anticline than was proposed in earlier evaluation. The effect has been to constrain the northern extent of the C Seam by a revised limit of oxidation.

Total in situ reserves for the C Seam in the Main Block have been calculated at 6.2 million tonnes compared to 9.1 million tonnes previously reported.

3.4.3 B Seam

As a result of revised seam correlations the reserves of B Seam have been reduced : 2.0 million tonnes compared to 5.1 million tonnes previously reported. As discussed in Section 3.3, B Seam has not been included in the current mining plan owing to possible low levels of Volatile Matter Content.

3.4.4 Seams of the Western Reserve Block

Reserves of seams of the Western Block as calculated by Victor Petroleum and Resources Limited have been reduced by 0.6 million tonnes owing to an overlap with the Main Reserve Block. This has resulted from the positioning of the Tin Dish Fault at a different orientation to the formerly proposed Kuranda Graben.

4. COAL QUALITY

4.1 COAL TESTING

To date coal testing and analysis has been carried out on the following seam intersections, either on raw coal samples on Fl.80 density composites:

Seam D	6	intersections
Seam C	10	intersections
Seam B	5	intersections
Seam A	4	intersections
Seams L, N, N, O, P	10	intersections
TOTAL	35	intersections

Results from a further 5 seam intersections remain outstanding at this time.

The coal testing programme for the recent phase of exploration has been designed to maximize information on coal quality and has been aimed at providing sufficient information to derive an average coal quality specification as required in the preliminary tender document.

4.2 THE NATURE OF WOODBURY COAL

The Triassic coals in the Woodbury area are of moderate rank (medium to low volatile bituminous) and consist predominantly of durainous lithotypes. The elevated coal rank and high content of inertinite macerals (the latter being a property typical of Tasmanian coals) contributes to a higher specific energy (33 - 34 MJ/kg d.a.f.) and slightly lower Volatile Matter Content (up to 31% d.a.f.) when compared to the stratigraphically equivalent coal measures of the Fingal Valley.

According to the Seyler's classification the upper Woodbury seams are subhydrous ortho- to para-bituminous coals.

Owing to coal rank increase with depth presumably due to the effects of deeper igneous activity in the Woodbury area and a corresponding decrease in Volatile Matter Content the lowest seams, including those from the Western Reserve Block have been discounted from the total reserves at Woodbury. Insufficient information is available to accurately assess an average Volatile Matter Content for B seam.

4.3 COAL WASHABILITY

Float and sink testing carried out on samples obtained during the 1984 exploration programme has shown that beneficiation of the run of mine coal will be necessary. Preliminary results from the testing of slim and large

diameter (100mm) core samples, excluding thicker non-coal partings which may be selectively removed during mining, indicate that less than 25% ash content specification may be obtained at the following plant yields:

D Seam : 65% yield
C Seam : 75% yield

All information on which these estimates have been made will be available to the Commission and their consultants when the programme of testing is complete.

Plans for beneficiation of the coal have been addressed in Section 5.2.

4.4 COAL QUALITY SPECIFICATION

4.4.1 Product Coal Specification

Table 2 summarises an indicative average coal quality specification derived from the C and D seams. Coal quality parameters have been averaged in proportion to the saleable reserves of C and D seams (1.03:1).

Of major concern to the Power Station Coal Enquiry has been the Volatile Matter Content of Woodbury coal.

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Table 2. SCHEDULE A - COAL QUALITY SPECIFICATION

Weighted average of C and D Seams

A1. Coal Properties	Units	Basic Quality (as received basis)
Screen Size	mm	NA
Proportion passing 3mm screen	%	NA
Total moisture (at point of purchase)	%	12 *
Inherent moisture (air dried basis)	%	4.2
Ash at point of purchase	%	24.0 **
Volatile Matter at point of purchase	%	17.8 **
Fixed Carbon at point of purchase	%	46.2
Sulphur - total at point of purchase	%	0.43
Sulphur - pyritic at point of purchase	%	NA
Hardgrove Grindability Index		75
YGP Abrasion Index		NA
Quartz content of Mineral matter	%	NA
Gross Specific Energy at point of purchase	MJ/kg	21.5
Ash Fusion Characteristics - at reducing atmosphere conditions		
Initial Deformation	^{o}C	1260
Softening	^{o}C	>1340 ***
Hemisphere	^{o}C	>1360 ***
Flow	^{o}C	>1390 ***
Fly Ash resistivity	ohm-cm	NA

NOTES:

NA Value not available

* Total moisture estimated at 12%

** Values at 4.2% inherent moisture specified

Ash	26.1%
Volatile Matter	19.4%
Volatile Matter, dry ash free	27.7%

*** Average includes values greater than 1500^{o}C

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Table 2 : continued

Coal Properties	Units	Average
Ultimate analysis (dry ash free basis)****		
Carbon	%	85.35
Hydrogen	%	4.62
Oxygen	%	NA
Nitrogen	%	1.58
Sulphur	%	0.80
Phosphorus	%	0.09
Chlorine	%	<0.05
Analysis of Ash Constitutents		
SiO_2	%	53.9
Al_2O_3	%	25.5
Fe_2O_3	%	3.49
TiO_2	%	1.09
CaO	%	9.48
MgO	%	2.82
Na_2O	%	0.26
K_2O	%	1.13
P_2O_5	%	0.06
Mn_3O_4	%	0.44

NOTES:

**** Determined on C Seam only (average of 2 samples)

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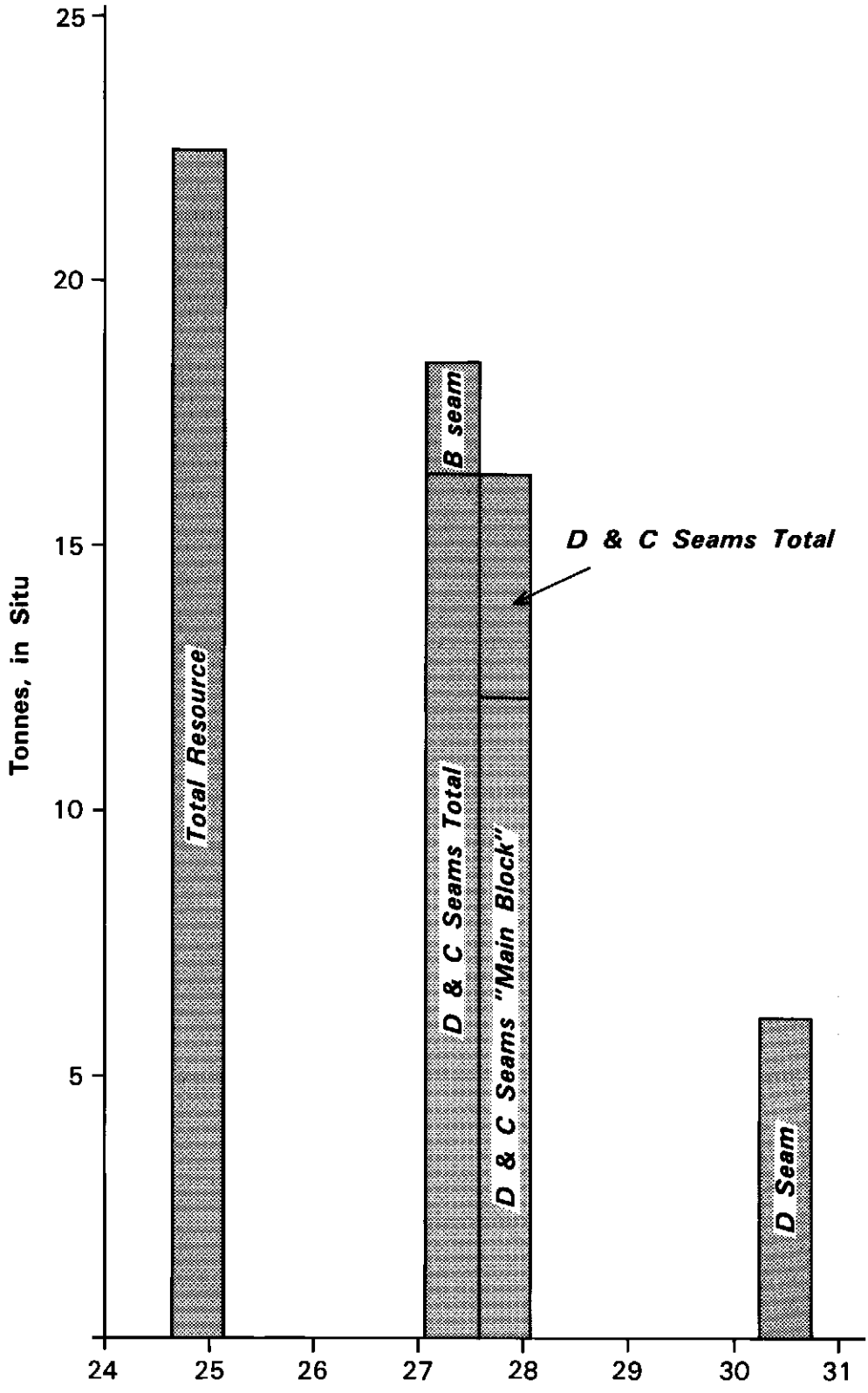
Results from the latest coal testing programme, together with analysis carried out on low ash (less than 40%) raw coal samples during the 1981 programme, show that Volatile Matter Contents of both C and D seams lie well above the minimum specification of 25% (dry, ash free basis).

These results, presented graphically in Figure C1, show that the combination of C and D seams at average Volatile Matter Content (d.a.f.) of 25% and 30.5% respectively results in an average value of 27.7% for the Main Block Reserves.

The average Volatile Matter Content for the Woodbury coal resource, including seams which have been eliminated on the basis of a 25% volatile matter (d.a.f.) cut off, has been estimated at 24.8% (d.a.f.). Sulphur levels of Woodbury coals are low. The average from 23 low ash (<40%) samples from all seams is 0.45%, ranging from 0.22 to 0.66%.

A number of tests and analysis have not been carried out at this stage of the exploration programme. These include:

- projected run-of-mine coal sizing;
- forms of sulphur;
- YGP abrasion index;
- quartz content of mineral matter;
- fly ash resistivity.



Cumulative Volatile Matter Content%
(dry, ash free basis)

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Figure C1

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4.4.2 Thermal Coal Quality Frequency Distribution

Table 3 shows the number of samples on which averages for the principal fuel coal quality parameters have been based. Ash content of a beneficiated coal has been set at 24 per cent on an as received (12% total moisture) basis. Frequency distributions for gross specific energy (d.a.f.) and fixed carbon to volatile ratio for C and D Seams are shown in histogram form in Figure C2. Note that these histograms represent all data from C and D Seams, the number of which are not in proportion to saleable reserves.

Table 3. Principal Coal Combustion Paramaters, C and D Seams

A2

Coal Properties	Average	Number of Samples	Range
Gross specific energy, MJ/kg (dry, ash free basis)	33.72	15	33.18 - 34.28
Total moisture %	12	estimated	
Ash % (as received basis)	24		
Volatile Matter % (dry, ash free basis)	27.7	15	22.4 - 33.1
Fixed carbon to volatile ratio (as received basis)	2.60	15	2.02 - 3.38

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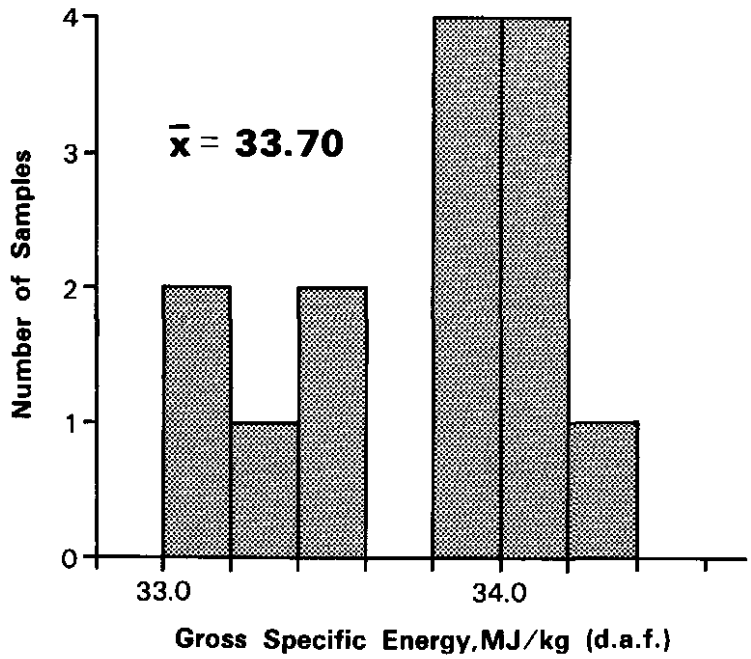

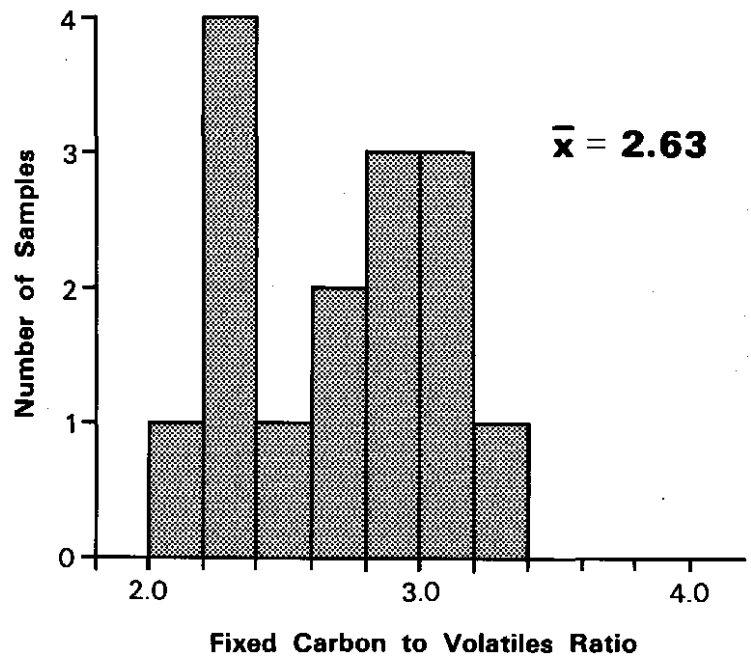

FREQUENCY DISTRIBUTION OF COAL COMBUSTION PARAMETERS

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Figure C2

5. DEVELOPMENT PLAN

5.1 MINING

Detail in the Commission's "Specification for Coal Supply" confirms the expected economic life of the Power Station will be 25 to 30 years. This proposal provides for the supply of some 7.5 million tonnes over a 25 year period relying only on those reserves confirmed in Figure E.

It is envisaged that ultimately it will be possible to provide additional coal from further reserves contained within the Lease. For the purpose of this exercise, only the Main Block Reserves have been included in the Mine Plan.

Further, it is appropriate to confirm that, apart from this proposal, none of the Woodbury Coal Reserves have been committed elsewhere.

5.1.1 Optimum Rate of Production

Inherent in the Mining Plan, utilising a stripping dragline as the major item of equipment, is the characteristic that the cheapest option to the Power Station will occur when coal deliveries are at an even annual rate over the contract period.

This is clearly in contrast to the requirement of the Power Station for long-term variations in coal supply. Accordingly, it is proposed to offer a base tonneage with no selling price variation for the ± 10% range and subsequent selling price adjustment for the (-10% to -25%) option.

Short-term annual tonneage increases above the + 10% option have not been provided in this proposal. However, it is envisaged that such increases would probably be catered for by the scheduling of the dragline to areas of lower stripping ratio in order to achieve an increase in level of sales.

It is confirmed, at this stage, the "rectangular" contract is preferred and variations of ± 10% on an annual basis can be handled.

5.1.2 Mining Proposal

The proposed development involves the establishment of an open cut strip mining operation along with the development of supporting surface facilities to accommodate equipment maintenance as well as coal washing and handling.

The first step in the mining process will involve the stripping of topsoil to be stockpiled for future rehabilitation work.

WOODBURY COAL PROJECT

Power Station Coal Enquiry - October 1984

Next, the overburden material will be drilled using a rotary blast hole drill, loaded with bulk explosive or blasting agent, and fired to provide optimum fragmentation for the dragline.

The dragline geometry envisages up to 50m digging depth and a 28 cu.m. bucket. This machine will remove overburden to expose the coal seam, casting the overburden material into the void of the previous strip from which the coal has been extracted.

After the coal seams has been bared by the dragline, the top will be cleaned by rubber-tyred dozer.

It is planned to mine coal from seams as thin as 20cm with stone bands of a similar thickness extracted at the coal face.

Both coal and parting bands would be mined using front-end loaders tipping into rear dump trucks which would haul the coal to the coal preparation plant for processing and parting material for disposal either within the cut or within the dragline spoil piles.
Whilst the efficient mining of thin seams can be difficult to achieve, experience from the Costain operations in New South Wales, as well as overseas, along with the recognition of the level of pit supervision required, will result in minimal coal losses and seam dilution.

After mining has progressed for several strips, the spoil rehabilitation will commence and continue concurrently with the dragline operation, keeping the spoil reshaping to within about 100m of the current dragline strip.

5.1.3 Major Mining Plant List

Based primarily on Costain's experience with mining equipment performance and productivities at the Ravensworth and Warkworth Mines, the following major plant lists have been assembled for the proposed Woodbury Coal Project:-

Table 4. Major Mining Plant

TASK	PLANT DESCRIPTION	NUMBER OF UNITS
Overburden Drilling	Electric Blast Hole Drill 270mm diameter holes	1
Overburden Excavation	Electric Dragline, 28 cubic metre bucket	1
Coal and Partings Excavation	5.5 cubic metre Front-End Loader	4
Coal and Partings Haulage	50t Rear Dump Trucks, approx. 450 kW.	7
General Site Services	Tracked Dozer, approx. 225 kW.	1
Rehabilitation	Tracked Dozer, approx. 300 kW.	1
Coal and Parting Ripping	Tracked Dozer, approx. 300 kW.	1
Coal Clean-Up	Wheel Dozer, approx. 225 kW.	1
Road Maintenance	Grader, approx. 130 kW.	1
Dust Control	Water Truck, 20,000 litre	1

5.1.4 Mining Manning Levels

The anticipated employment in the overburden stripping and coal mining operations is:

Table 5. Mining Manning Levels

ACTIVITY	LABOUR
Drill and blast	9
Dragline	11
Mobile Equipment	29
Maintenance	29
TOTAL	78

5.2 COAL PREPARATION

Bulk Materials (Coal Handling) [BMCH] have been retained to advise on the coal preparation facilities required. Although information available is limited, BMCH have prepared washability curves from the analysis available from three cores: D Seam from W39 and C Seam from WDC106 and WDC120 (Figure F1). These show a range of washing characteristics likely to be encountered at Woodbury and design is based on this information as well as practical operating experience.

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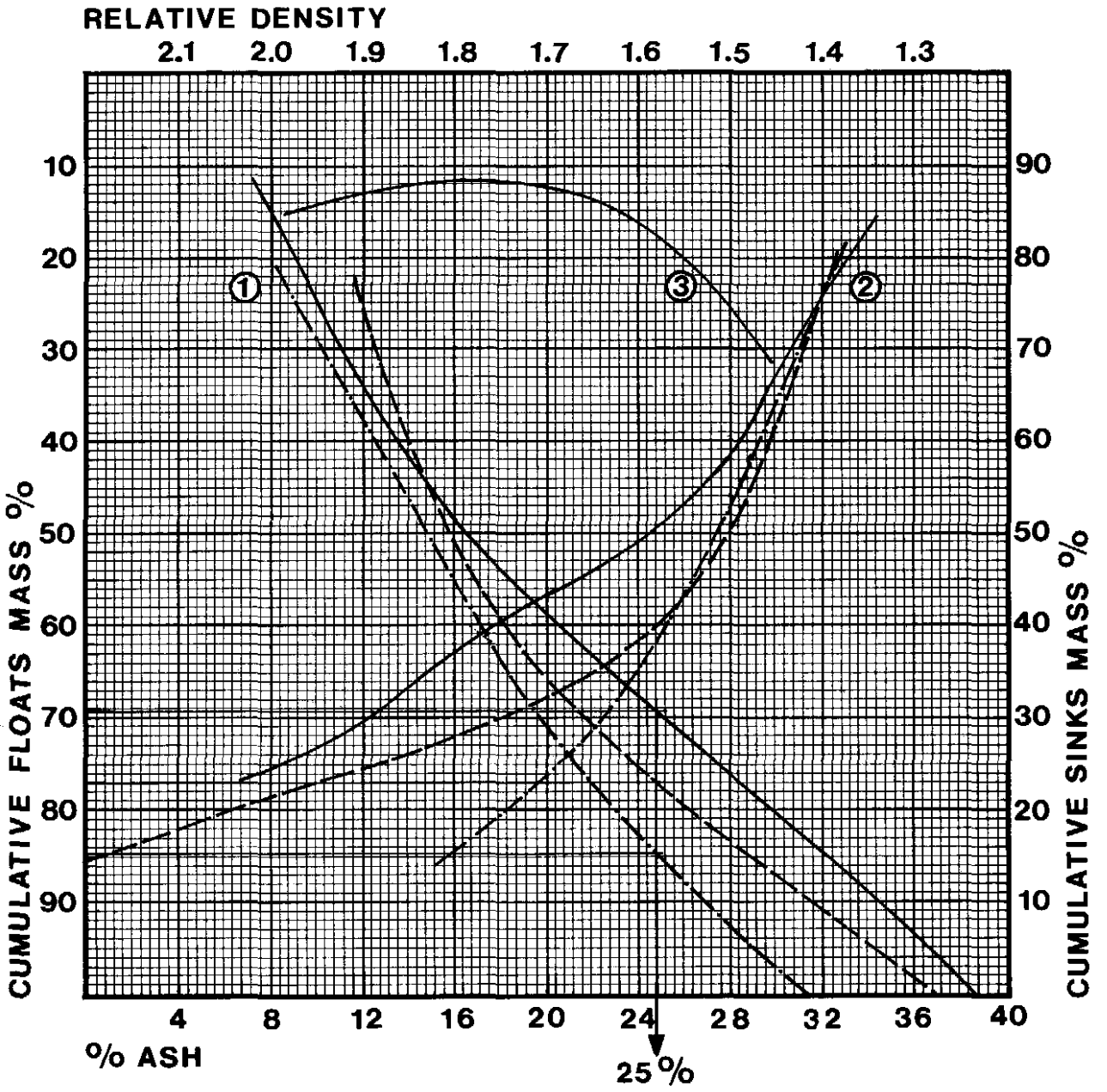


LEGEND		BORE CORE
CURVE 1	FLOATS / ASH	——— DDH W39
CURVE 2	FLOATS / R.D	– – – WDC 106
CURVE 3	NEAR GRAVITY MATERIAL	–·–·– WDC 120

WASHABILITY CURVES

WOODBURY COAL PROJECT
POWER STATION COAL ENQUIRY

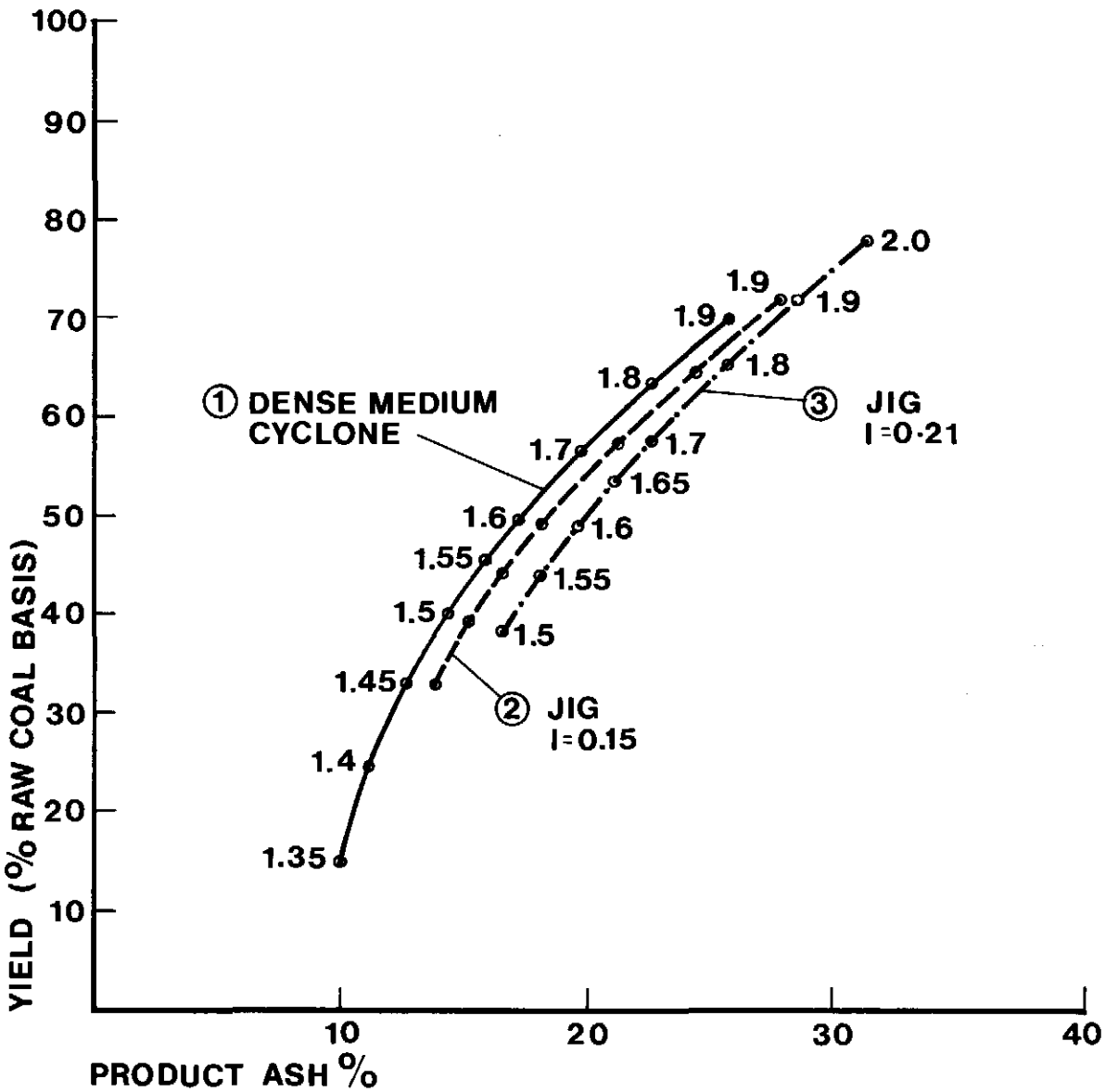
OCTOBER 1984.

Figure F1

The composite in situ ash content of the plies of coal seams is usually greater than 30% and this will be increased by at least 5% of mining dilution. The curves show that a product of not more than 25% ash content as desired by the Commission can be recovered at a Cut Point above 1.80 specific gravity with reasonable yield. Further improvement of the coal quality will diminish the recovery of the energy content of the resource and reduce the washery yield resulting in a price increase directly in proportion to this change. For these reasons coal product with higher ash content is worthy of consideration.

5.2.1 Process Design

BMCH have considered and compared two levels of jig washing of a deslimed coal feed and a combination of heavy medium cyclones and spirals for the fine coal (Figure F2). They have experience of jig washing Tasmanian coal and recommended (Figure G) the use of the H.M. cyclones for higher coal recovery and better control of quality. Spirals are favoured for the washing of deslimed fine coal.



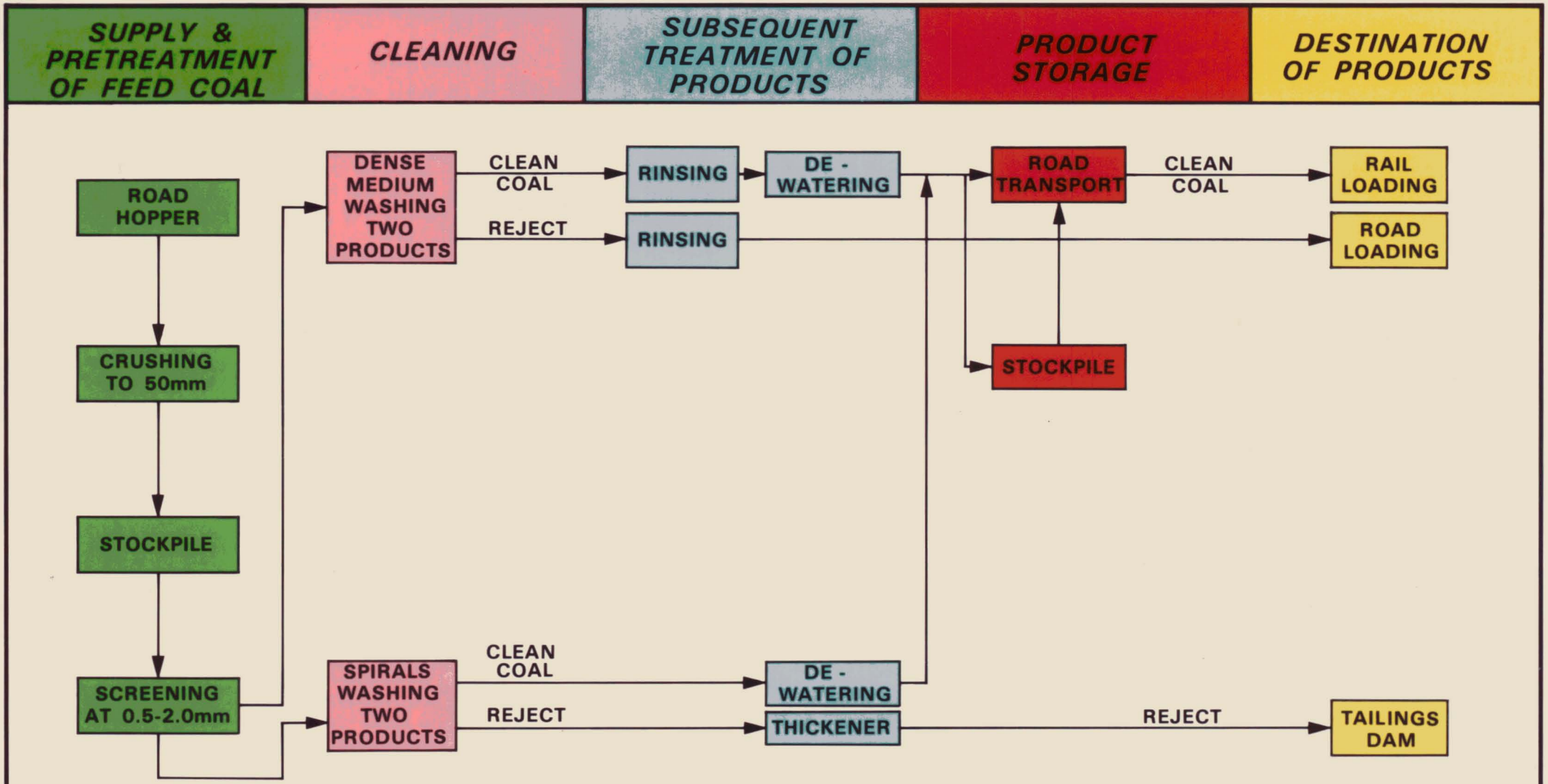
ASH %	YIELD		
CURVE	①	②	③
20.0	57	54	50
22.5	63	60.5	57.5
25.0	67.5	66.3	63.5

YIELD / ASH COMPARISON DDH W39

WOODBURY COAL PROJECT
POWER STATION COAL ENQUIRY

OCTOBER 1984.

Figure F2



PROCESS FLOWSHEET FOR WOODBURY COAL PROJECT

Power Station Coal Enquiry - October, 1984

Figure G

5.2.2 Coal Preparation Plant

The coal handling facilities, preparation plant, workshop and offices are proposed to be located as shown in Figure H away from workable coal north of the local road to Woodbury and on the western side of the mining areas in the logical movement of the coal westwards to the railway line for transport to the proposed power station.

The preparation plant has been designed to meet the following criteria:

Coarse Coal	50 x 1mm
Fine Coal	1mm x 75microns
Coal Feed rate	428,000 R.O.M. tonnes per year
Washery Yield	70%
Coal Product	300,000 tonnes per year
Operating Time	5 days/week 2 shifts/day
Operating Capacity	160 T.P.H.

This is to be achieved with a single 700mm diameter H.M. cyclone and spirals.

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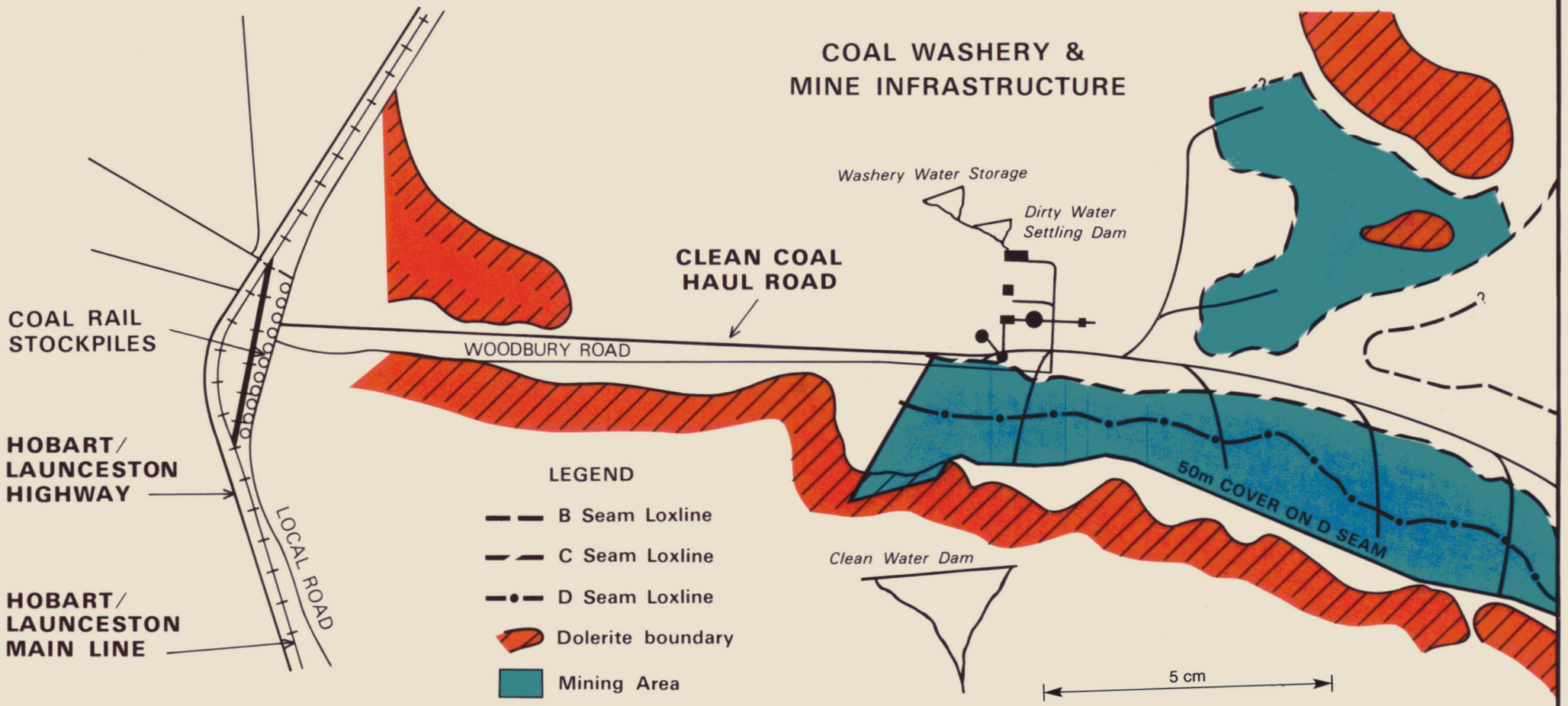

WOODBURY COAL PROJECT

SCHEMATIC COAL PREPARATION & HANDLING FACILITY

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Figure H

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WOODBURY COAL PROJECT

Power Station Coal Enquiry - October 1984

The raw coal from the pit will be dumped into a hopper and fed to two stages of crushing to -50mm. The crushed raw coal stockpile will meet differences in rates of mining and washing coal and ensure continuous operation of the washery. A front-end loader will feed raw coal to the washery hopper.

The coarse coal product will be rinsed and dewatered in a centrifuge prior to discharge to the product coal conveyor. The fine coal will be dewatered and deslimed in a classifying cyclone prior to passing over a dewatering screen and uniting with the coarse coal product on the conveyor to the product coal bin.

This bin will be about 300 tonne capacity to meet differences in the rates of coal production and truck haulage to the stockpiles adjacent to the railway siding.

Similarly, the coarse reject will be stored in a 100 tonne hopper from which it will be regularly drawn as required by trucks from the coal fleet for disposal in the dragline spoil.

The fines reject will pass to the tailings thickener and mixed with flocculant to accelerate settling prior to pumping to tailings dams. Investigations will be made into the potential of other methods of

dewatering tailings which might permit their discharge direct to the reject conveyor and simultaneous disposal.

Water in the washery will be kept in closed circuit with settling ponds and make-up from the mine water supply.

5.2.3 Coal Preparation Manning Levels

The following employment is expected in the coal preparation and handling area:

Table 6. Coal Preparation Manning Levels

ACTIVITY	LABOUR
Operators	5
Samplers/Labourers	4
Mobile Plant	3
Maintenance	7
TOTAL	19

5.3 TRANSPORT

The Commission have nominated purchase FOR which assumes delivery of coal to the railway line at Woodbury. This is about 5km from the planned location of the washery and it is proposed to

regularly haul coal from the washery to the stockpile to be established adjacent to the railway line.

The clean coal will be stored at the washery in a 300 tonne bin which will provide for unforeseen delays in the road haulage of coal to the railway. Should the capacity be insufficient the front-end loader at the washery could be used to move coal from the bin to an emergency stockpile nearby and reload it into trucks subsequently.

It is planned to build a new road to the railway line and use contractors to haul in tipping trucks about 17-20 tonnes capacity.

A new siding will be constructed to accommodate the necessary rail movements and a front-end loader of about 5 cubic metres capacity will be located at the siding to side load the coal into wagons.

5.3.1. Stockpiling and Loading

It is not anticipated that problems will be encountered with Woodbury coal during storage in stockpiles. The coal, being of medium to low volatile bituminous rank and of low sulphur content is unlikely to be susceptible to spontaneous combustion.

Minor variations in the quality of coal will be reduced by planned dumping procedures which will be further enhanced by the manner in which the front - end loader is operated to load the rail wagons.

5.3.2 Transport Manning Levels

The trucking operation is planned on a contract basis and should employ 6 people. The operator for the front-end loader is included in the washery establishment.

5.4 MANNING FOR THE WOODBURY OPERATION

It has been Costain's policy, both in Australia and abroad, to recruit the workforce for a new mining venture from the surrounding communities. This policy would continue in the advent of the establishment of an open cut mine at the Woodbury Site. The exploration, development and operation of this mine offers significant employment potential for the district residents and particularly those in the nearby population centres of Campbell Town, Ross and Oatlands.

The skills required for open cut mining are similar to those found in the earthmoving and construction industries, namely plant operators, tradesmen,

clerical and administrative skills. On-the-job training programmes would be sufficient to increase the workforce skills to the desired level.

The anticipated employment is:-

Table 7. Woodbury Project Manning Levels

ACTIVITY	LABOUR	
	Employed	Contract
Mining	78	-
Coal Preparation	19	-
Transport	-	6
Administration and Management	20	-
TOTALS :	117	6

5.5 CONSTRUCTION ACTIVITIES

To establish the mining operation at Woodbury requires construction work in the following main areas:

- Dragline erection
- Washery construction
- Surface buildings and services

Based on Australian experience, it is estimated that the

dragline erection will require 16 months and the services of up to 40 persons principally tradesmen, at any one time.

It is estimated that the washery will take 9 months to construct and commission. The labour force required will rise from an initial four men to a team of 44 for ten weeks and then fall back to 12 at the final commssioning stage.

There is a range of activities including provision of a water supply, connection to electricity service and communications, preparation and drainage of the area for the erection of buildings including the workshop/store, bath house, office and truck fueling and servicing facilities. These are estimated to require a period of 12 months and a labour force peaking at 45 men.

Overall construction is expected to take 20 months with a peak site labour force of some 130 persons.

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6. PRICING

The estimated base prices and variations are set out as requested by the Commission in Schedules B and C:

SCHEDULE B - PRICES AND TONNEAGE

B1 Base Tonneage	
Base tonneage (kt/yr)	[redacted]
Base Price FOR ($/t)	[redacted]
B2 Annual Variations	
Price for Annual Production 25% above Base ($/t)	*
Price for Annual Production 25% below Base ($/t)	[redacted]
Maximum variation in annual production rate above base (percent)	[redacted]
Maximum variation in annual production rate below Base (percent)	[redacted]
Price for maximum annual production rate for this Base rate ($/t)	[redacted]
Price for minimum annual production rate for this Base rate ($/t)	[redacted]

* refer Section 5.1.1 Optimum Rate of Production

WOODBURY COAL PROJECT
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SCHEDULE 'C' - RISE AND FALL PROVISIONS

C1 Price FOR Component	Percent of FOR Price	Indices
Labour	40	1.
Materials	22	2.
Energy	7	3.
Explosives	12	4.
Capital - infrastructure	5	5.
- mining plant	14	6.
	100	

1. Labour cost model devised to reflect working conditions and award rates applicable to a Tasmanian coal mining operation.
2. Australian Bureau of Statistics Catalogue No. 6412.0
   Price Index of Materials Produced by Manufacturing Industry
   Sub Index: Fabricated Metal Products.
3. Quoted wholesale price (Hobart) for distillate from a nominated supplier.
4. Quoted landed price (Hobart) for bulk explosives from a nominated supplier.
5. Australian Bureau of Statistics Catalogue No. 6407.0
   Price Index of Materials used in Building other than House Building
   Sub Index: all groups
6. Australian Bureau of Statistics Catalogue No. 6412.0
   Price Index of Materials produced by Manufacturing Industry
   Sub Index: Industrial Machinery and Equipment.

C2 Statutory Charges

Description of Charge	Rate
Excise	$0.25 per tonne of sales
Lease Rental	$2.50 per ha_2 per year
Exploration Licence	$2.50 per km^2 per year

None of the above Statutory Charges have been included in Schedule B

WOODBURY COAL PROJECT

Power Station Coal Enquiry - October 1984

APPENDIX 1.

STATUS OF CURRENT EXPLORATION PROGRAMME,
WOODBURY COAL DEPOSIT.

WOODBURY COAL PROJECT

Power Station Coal Enquiry - October 1984

A1. STATUS OF THE CURRENT EXPLORATION PROGRAMME

As a result of the time schedule for the preparation of this document, a detailed summary of the results of the current exploration programme is not available.

Commencement of the recent exploration programme was delayed until early October, 1984, as a result of heavy and prolonged rainfall.

As discussed in Section 2.1, 42 open and cored holes have been drilled in the Woodbury area since this time. All open holes and cored intersections have been logged on site. This information is currently being compiled for inclusion in the Woodbury exploration computer database. Cored seam intersections have been submitted to two coal laboratories, SGS Australia Limited (Sydney) and Carbon Consulting International Pty. Limited (Newcastle) in order to expedite testing and analysis.

Results currently outstanding at the time of preparation of this document include:

- Down-hole geophysical logs from the last stages of drilling, which was concentrated in the Northern Reserve Block.

- Float and sink test results from one of three large diameter cored intersections of D Seam.

- Testing and analytical results from several coal density composites.

WOODBURY COAL PROJECT

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- Compilation of the results from the ground magnetometer survey. Preliminary inspection of these data suggests that it will be invaluable in delineating structural features in the Woodbury area.

Sufficient information has been available for the calculation of coal reserves and overburden quantities. Following compilation of the exploration database more precise estimates of coal and burden quantities will be available, using the geological computer modelling package of K.R. Johnson and Associates. Depending on time constraints, all or some of the following plans will be available as soon as possible.

- details of seam intersections presented on a borehole-by-borehole basis.
- borehole cross sections.
- structure contour plans for all seams.
- overburden isopach plans for all seams.

Results from the coal testing progamme are currently being compiled and will also be made available as soon as possible.

WOODBURY COAL PROJECT

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APPENDIX 2

PROPOSED ON-GOING EXPLORATION AND EVALUATION PROGRAMME WOODBURY COAL DEPOSIT

WOODBURY COAL PROJECT

Power Station Coal Enquiry - October 1984

A2. PROPOSED ON-GOING EXPLORATION AND EVALUATION PROGRAMME

A2.1 PROPOSED EXPLORATION PROGRAMME

The aims of the 1984 drilling programme have been twofold:

- firstly, to refine the structural interpretation and coal seam correlation within the deposit;

- second, to obtain sufficient samples of potential economic seams to ensure that coal quality suitable for a power station feedstock can be obtained.

Costain consider that the results of this phase of exploration are sufficiently encouraging to maintain an ongoing commitment to exploration.

A third phase is likely to include the following aspects:

- Within the Main Reserve Block an infill HQ coring programme aimed at providing cored intersections of C and D Seams at a 250 metre spacing and coring of B Seam to improve definition of its structure and quality.

- Within the Western Reserve Block an initial open hole programme followed by several cored intersections of the L, M, N, O and P Seams.

WOODBURY COAL PROJECT

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- To the north of the Woodbury Road further open and cored (HQ) drilling to define further reserves of C Seam.

- A large diameter coring programme (possibly 200mm diameter core samples) aimed at obtaining further samples of the potentially economic seams.

- A scout open hole and coring programme within other prospective areas of the Woodbury coal deposit.

WOODBURY COAL PROJECT

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A2.2 ENVIRONMENTAL MONITORING PROGRAMME

Based upon the experience of Costain Australia Ltd not only in N.S.W. but elsewhere within the world it is recognised that studies to identify background meteorological, groundwater and other conditions be undertaken as early as possible.

Accordingly Mr J. Stephens of Environmental and Technical Services Pty. Ltd. has been retained to advise on environmental issues which may influence open cut mine development in the Woodbury area. Mr. Stephens has had wide experience in the preparation of environmental documents for the Tasmanian mining industry.

Aspects to be addressed include:

- Sociological factors
- Dust emissions
- Surface and groundwater
- Solid wastes and rehabilitation
- Visibility
- Noise

Mr Stephens has made a visit to the Woodbury area and reported as follows:

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ENVIRONMENTAL AND TECHNICAL SERVICES PTY. LTD.

29 October, 1984.

ENVIRONMENTAL CONSIDERATIONS

WOODBURY PROJECT

Inspection of the area under consideration was carried out by our Mr. J.R. Stephens on 26 October 1984. The open cut coal mining proposal was explained in general terms by Mr. C. Baker of Costain Australia Ltd.

Exploration drilling was then taking place, and it was apparent that no firm detail of the mining plan could be developed for some considerable time. Environmental safeguards are to be built into the proposed mining techniques during the detailed planning phase.

Principal areas of environmental concern that will be canvassed in some detail as planning proceeds have been identified, and are discussed briefly below, in approximate order of perceived importance.

1. Sociological Factors

It is apparent that five substantial grazing/farming properties will be affected, three to a considerable extent, for some period during the life of the mine. Against this disadvantage, the economic and employment benefits to the Oatlands/Tunbridge district will have some balancing effect.

2. Dust Emissions

The emission of some dust from a large open cut mine is inevitable. The direction and extent of the drift of a dust plume, and dust fallout patterns are seen as crucial environmental issues. To enable predictive modelling to be carried out, it has been recommended that a meteorological station be set up in the vicinity, for the collection of basic met. data over (preferably) several years. Dust suppression measures will be built into the operation plan to establish practical limits on such emissions. Dust emissions may have significant implications with respect to the nearby farming properties.

3. Water

Rainfall in this district is relatively low. There are several facets of water control that will require careful evaluation, including the source of washery water, treatment and recycling of washery water, the quality and effects of surface water emissions into the environment, and the potential effect of the project on groundwater availability and quality.

The quality of surface water emissions is controlled by the Environment Protection (Water Pollution) Regulations 1974, which include such maximum permissable limits as :-

non-filtrable residue (i.e. suspended solids)	30 mg/L
grease and oil in stable dispersion	10 mg/L
boron	1.0 mg/L
chlorides	250 mg/L
iron plus manganese (filtrable)	1.0 mg/L

Additionally, goals are currently being drafted by a statutory committee to specify the quality of receiving waters matched against their end-use.

Groundwater characteristics are to be ascertained during future investigations by consultants to Costain.

4. Solids Wastes and Rehabilitation

The stockpiling of topsoils (apparently about 1-2 metres depth throughout the valley) will be a necessary part of the mining plan to enable progressive reconditioning of worked-out areas. Temporary overburden stockpiles will be necessary, to provide material for the progressive back-filling of the pit. All such stockpiles will require stabilization to minimise dust emission by windage. Those slopes of stockpiles with visibility implications will require grassing, even if only on a temporary basis. Disturbed land should be restored, wherever practicable, on a progressive basis to its former usage - that is, as grazing land. The development of water storage ponds, as part of this plan, would be beneficial to the district.

5. Visibility

The visibility of operations, plant and equipment, and stockpiles will be assessed from such vantage points as Tunbridge and along the Midlands Highway. The development plan should aim to minimise the visibility of operations and equipment from permanent residences and frequently-trafficked roads. The visibility of stockpiles should be minimised by grassing relevant faces. The intensity and extent of a visible dust plume should be minimised by on-site controls.

6. Noise

As the district is essentially rural, the normal background noise level is very low, with the most significant current noise source being the Midlands Highway. Operations noise will be audible for some considerable distance; the extent of audibility will be investigated, but will depend on methods of operation, topographical and artificial barriers and the like. Any blasting noise will be heard, or sensed, over a wide area, mainly as the result of low-frequency air blast; such vibrations can, however, be minimised by modern blasting practices. The potential effects of ground vibration on nearby structures will be evaluated in conjunction with the Department of Mines.

Once some firm ideas have been gained in terms of the area involved in the mining operation, and possible mining plans, the details of the environment protection measures to be incorporated into the proposal will be developed. During this stage, there will be regular consultation with the Department of Mines, and also particularly with the Department of the Environment.

Towards the end of this planning stage, potential environmental impacts will be assessed, and detailed in an Environmental Impact Statement. This Statement will be submitted to the Department of the Environment as an adjunct to an application for a "Licence to Operate Scheduled Premises" (being premises described in the Schedule of the Environment Protection Act 1973).

Public advertisement of the Company's intention to apply for such a licence is made. Any objections to the issuing of a licence are received by the Director of Environmental Control, who takes these matters into account together with the various assessments of the Impact Statement, when making his "determination" of the application. There is no machinery for public intervention, except by appeal against the Director's issuing of a licence, or against the conditions attached to such licence.

WOODBURY COAL PROJECT

Power Station Coal Enquiry - October 1984

A2.3 GROUNDWATER MONITORING PROGRAMME

A preliminary programme of groundwater level monitoring has commenced in the Main Reserve Block of the Woodbury Coal Deposit.

As exploration proceeds at Woodbury an ongoing groundwater evaluation programme will be maintained. For this reason Australian Groundwater Consultants Pty. Limited have been retained by Costain Australia Limited.

It is anticipated that pumping tests will be carried out during the latter part of 1984. Further monitoring of groundwater levels and flows will be continued during the third phase of drilling, early in 1985.

Included with this report are documents relevant to the proposed groundwater testing programme.

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AUSTRALIAN GROUNDWATER CONSULTANTS PTY LIMITED

GEOHYDROLOGISTS & ENGINEERS

J. S. HANCOCK, B.Sc., M.I.W.E.S., M.Aus.I.M.M.
W. H. MORTON, Ph.D., M.Aus.I.M.M., M.I.E.
P. J. DUNDON, M.Sc., M.Aus.I.M.M.
C. H. KIDD, M.Eng.Sc.
I. S. ROWAN, B.Sc., A.M.Aus.I.M.M., A.S.E.G.

Consultant: C. F. FORBES, B.E., M.Aus.I.M.M., M.I.E.

26 WELLINGTON STREET, ST. KILDA, VICTORIA 3182

ALSO AT SYDNEY, PERTH, BRISBANE, AND ADELAIDE

TELEPHONE (03) 529 3211

CABLES: "SUBAQUA"

TELEX: AA39156

ARB:DK:PO

20th September 1984

Mr. C. Ba ker,
Project Geologist,
Woodbury Project Office,
PO Box 58
OATLANDS TAS 7120

Dear Mr. Ba ker,

This letter follows your letter (Sept, 1984) and our telephone conversation of 19/9/84 and formalizes our cost estimate for groundwater advice during the forthcoming drilling programme at Woodbury.

Please note that our Sydney office has transferred this project to our Melbourne office (unless your have any objections) because of its closer location to Tasmania and because Dr. Bowden has detailed knowledge and experience of Tasmanian hydrogeology.

As indicated in our conversation, it is possible at this stage to obtain extremely valuable groundwater knowledge during the planned drilling programme, which would require minor modification to the programme and a relatively small outlay. If you were to follow our proposal, we consider that you would be able to ascertain at a general level, the groundwater conditions in terms of aquifer type and dynamics, the potential dewatering problems during mining, potential mine water quality, the various dewatering systems which could be applied and approximate dewatering operation costs within an order of magnitude.

We suggest that Dr. Bowden visit the Woodbury site after you have gained some groundwater experience from the early drilling results. During the visit he would advise on (and where necessary, demonstrate) the best data to collect during the remainder of the programme, the best methods of collection (given the available equipment) and indicate more clearly the applications of the data.

We also propose that the site visit would be followed by a brief office evaluation of available data and information (including any Mines Department reports) and a letter report would be provided.

We also feel that the best use could be made of the data if Australian Groundwater Consultants Pty Ltd evaluated the data collected by you, either after selected stages of collection, or at the end of the drilling programme.

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The results obtained from the proposed evaluation could then be used to closely cost and formulate a more exhaustive groundwater study if required.

The estimated cost of the proposed site visit and data evaluation is presented below.

Professional Fees		
Site Visit		
Dr. A. Bowden	2.5days @ $376/day	940
Data Analysis and Reporting		
Dr. A. Bowden	16hrs @ $47/hr	752
Drafting	8hrs @ $21/hr	168
Expenses		
Motor Vehicle	2.5days @ $65/day	163
Acommodation and Meals	2.5days @ $50/day	125
Airfare	(Mel/Hob/Mel)	234
Plan Printing		50
		$2,432

We feel that the proposed programme will provide a benefit far in excess of its costs and we look forward to providing a service to you. Please contact us if you have have questions.

Yours faithfully,
AUSTRALIAN GROUNDWATER CONSULTANTS PTY LTD

Adrian Bowden

Signed by Dr. A. Bowden for
STEPHEN HANCOCK
PRINCIPAL CONSULTANT

c.c. Mr. J.S. Braddock - Costain , NSW

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AUSTRALIAN GROUNDWATER CONSULTANTS PTY LIMITED

GEOHYDROLOGISTS

J. S. HANCOCK, B.Sc., M.I.W.E.S., M.Aus.I.M.M.
W. H. MORTON, Ph.D., M.Aus.I.M.M., M.I.E.
P. J. DUNDON, M.Sc., M.Aus.I.M.M.
C. H. KIDD, M.Eng.Sc.
I. S. ROWAN, B.Sc., A.M.Aus.I.M.M., A.S.E.G.

Consultant: C. F. FORBES, B.E., M.Aus.I.M.M., M.I.E.

273 ALFRED STREET NORTH, NORTH SYDNEY, N.S.W. 2060

ALSO AT MELBOURNE, PERTH, BRISBANE AND ADELAIDE

TELEPHONE: (02) 929 4611

CABLES: "SUBAQUA"

GG:MB:P01530

10th October, 1984

Mr. C.K. Baker,
Costain Australia Limited,
Project Geologist,
Woodbury Coal Deposit,
P.O. Box 294,
MUSWELLBROOK N.S.W. 2333.

Dear Mr. Baker,

RE: WOODBURY COAL DEPOSIT

Following our meeting on the 6th September 1984 and your subsequent letter we have set out below a schedule of investigations necessary to determine the groundwater occurrence, distribution, mine inflow rates and water quality at the Woodbury coal deposit.

The investigation into groundwater will rely heavily on information which can be obtained during the proposed drilling program and also on existing borehole information.

1. GROUNDWATER OCCURRENCE AND DISTRIBUTION

The first step in the investigation will be to define the extent, distribution and water bearing properties of the underlying coal seam strata.

To achieve this it will be necessary to carry out an airphoto study, review existing geological cross sections of the area and inspect geological and geophysical logs across the deposit. A hydrogeological inspection will be required to do this and to view the terrain, inspect the rocks for recharge potential, vertical leakage, etc.

By recording the depths of water intersections in the proposed drilling program, measuring the airlift water flows and combining this with water levels a conceptual model of the groundwater flow can be obtained. It is important that the water data collected is representative of the whole area and not just one part of the deposit. It may be necessary therefore to clean out some of the old investigation holes to obtain additional information where required.

2. PERMEABILITY TESTING

The next step in our investigation would be to determine the hydraulic properties of the coal bearing strata. This is required to calculate mine inflows and long term safe pumping rates for water supply bores. Groundwater flow is directly proportional to the permeability of the strata, and therefore accurate determination of this parameter will be necessary.

In addition, because of the nature of the underlying strata, the permeability will vary from site to site and may decrease in a down dip direction. Thus a reasonable distribution of points at which this parameter is measured is desirable.

It is recommended that at least 3 holes be tested by pumping for 24 hours followed by 12 hours of recovery measurements to enable a regional value of permeability to be determined. In addition subject to a detailed review of the geology and site inspection it may also be necessary to obtain additional permeability data from short term testing with say the drill rig air compressor.

During pumping tests the water level should be measured in both the pumping bore and in open holes (piezometers) nearby. The sites for the pumping bore should be selected in the more permeable zones within the deposit and this would be determined after a hydrological inspection and review of all hydrology data has been carried out.

Water samples would be collected during the pumping program for complete chemical analysis. This is required to determine the suitability of the water for drinking, hosing down plant, coal washing, etc.

3. WATER SUPPLY AND MINE INFLOWS

From the data collected the long term groundwater yield of the strata will be determined together with the progressive mine inflows as the mine grows.

The prediction of inflows will involve setting up a computer model which simulates the mining process and calculates the average inflows in a series of time steps as mining progresses.

The model uses a finite difference solution technique and has been developed to incorporate dipping layers, and variations of permeability in a down dip direction. It was developed by AGC for the N.S.W. Coal Association to aid in mine planning and development.

The model requires data to be entered on the extent, distribution, geometry of the coal seam strata, elevation, water table configuration prior to mining and aquifer hydraulic data on the proposed mining plan.

Then, in a series of time steps, the model simulates open cut or underground mining and computes the average inflow rates and the decline in the water table surrounding the mine.

Thus it will be possible to assess the regional effects of mining on the groundwater system including those areas outside of the lease boundaries.

It should be pointed out that A.G.C. have found that traditional methods of analysis using "rule of thumb" or analytical equations to determine these inflow rates have proved to be highly inaccurate. In addition, these methods cannot determine the decline of the surrounding water table due to mining. Our experience with our modelling technique shows it is vastly superior to any other method currently available.

It should be noted however, that the model accuracy is dependent on the basic data included in it. The more permeabilty data collected in the area, the more reliable the inflow estimates.

4. REPORTING

A detailed report would be prepared after completion of the field work which would incorporate all hydrogeological data and the results of groundwater model simulations. The report would be a comprehensive treatment of groundwater flow, water quality, water supply and water inflow problems. It would be suitable for inclusion in an Environmental Impact Statement.

We would be pleased to provide you with a cost estimate for a groundwater survey as outlined above. Before we do this however it may be beneficial if we speak with you again to determine how much input AGC staff should have in the data collection stage of the work. Obviously Costain staff can collect some data and pass it on to us directly for interpretation. For your information however a similar program of work was recently completed in the Lower Hunter Valley at a cost of about $23,000 plus drilling costs.

We trust that this information is helpful to you and we would be pleased to answer any questions that you may have. Our senior consultant Adrian Bowden from our Melbourne Office is often in Tasmania on business and he will arrange a visit to site next time he is in the area.

Yours faithfully,
AUSTRALIAN GROUNDWATER CONSULTANTS PTY. LTD.,

F.R. KALF
PRINCIPAL

A2.4 GEOTECHNICAL EVALUATION PROGRAMME

While it is recognised that the roof material of both C and D Seams comprises competent sandstone, the floor material comprises mudstone which may result in difficult operating conditions in the pit. Accordingly Coffey & Partners of Sydney will be retained to review this matter, as well, will review the high wall stability and angle of repose for the loose wall material.

Exploration drilling in progress at Woodbury.