COAL WORKERS' PNEUMOCONIOSIS SELECT COMMITTEE

QUESTION TAKEN ON NOTICE No.1

Retention and disposal of health scheme records under the *Public Records Act 2002*

asked on 14 October 2016

QUESTION: Who gave the approval for the retention or destruction of documents in accordance with the Archives Act?[1]

ANSWER:

Coal Workers' Health Scheme Records

After further investigation, the Department of Natural Resources and Mines can find no evidence that it has destroyed or disposed of any Coal Workers' Health Scheme records.

Since 2000, disposal of health scheme records is subject to a disposal authority issued by the State Archivist (Attachment A: Disposal Authority QDAN519 Department of Mines and Energy – Coal Industry Employment Health Assessments 2000).

No instances of disposal under this disposal authority have been recorded.

Other departmental documents

From 1 July 2002, the *Public Records Act 2002* (PRA) has applied to the disposal of public records. Prior to the PRA, the *Libraries and Archives Act 1988* was the applicable legislation. Prior to that Act there was no formal framework applying to the disposal or destruction of public records.

It is the department's view that the chief executive of the department at the given time is accountable for retention and destruction of records.

The Director-General has not authorised the destruction or disposal of any records since his appointment.

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[1] Public briefing transcript, Brisbane, 14 October 2016, pp 2

Queensland Government
Queensland State Archives

Disposal Authority

Responsible Agency : DEPARTMENT OF MINES AND ENERGY

Queensland Disposal Authority Number (QDAN)	**: 519**	**Version: 1**
Date of approval	**: 27/10/2000**	
Approved by State Archivist	**:**	(Signature)
QSA File Reference	**: F78/175**	

Scope of disposal authority: Paper and electronic records relating to the Coal Industry Employees' Health Scheme.

NB Should the Pre-Employment Health Assessment Form As and Period Health Assessment Form Bs be made available in electronic format, thereby allowing the inclusion of *all* medical information in the Health Scheme Database, this disposal authority should be submitted for review.

Revocation of previously issued disposal authorities:

Any disposal authority issued previously, which applied to disposal classes described in this authority, is revoked. The agency responsible should take measures to withdraw revoked disposal authorities from circulation.

Disposal actions:

Records of permanent status are not to be transferred automatically to Queensland State Archives. Agencies are required to submit a transfer proposal containing details of the records under consideration for transfer and a comprehensive list. The transfer proposal will be assessed by Queensland State Archives before formal approval to transfer is issued. The State Archivist reserves the right to revise any previous decisions made with regard to the appraisal and transfer of records. Contact the Transfers Officer at Queensland State Archives on 07 3875 8755 for further details.

Conditions:

Authorisation for the disposal of public records is given under and subject to the provisions of Section 61 of the *Libraries and Archives Act 1988*, (Reprint No. 2, 27 January 1998), ("Section 61"). Public records must not be disposed of if disposal would amount to a contravention of Section 61. Particular care should be taken before disposing of public records of a Court or a Commission within the meaning of the *Commissions of Inquiry Act 1950*.

Public records must not be disposed of if they are required:

(i) for any civil or criminal court action which involves or may involve the State of Queensland or an agency of the State; or

(ii) because the public records may be obtained by a party to litigation under the relevant Rules of Court, whether or not the State is a party to that litigation; or

(iii) pursuant to the Evidence Act 1977; or

(iv) for any other purpose required by law.

This list is not exhaustive.

Documents which deal with the financial, legal or proprietorial rights of the State of Queensland or a State related Body or Agency viz-a-viz another legal entity and any document which relates to the financial, legal or proprietorial rights of a party other than the State are potentially within the category of public records to which particular care should be given prior to disposal. Internal documents which strictly relate to uncontentious matters and do not involve areas of controversy (staff employment, discipline issues etc.) are unlikely to be required.

If in doubt about the legality or probity of the disposal of any document which may fall within these categories you should obtain legal advice.

Reference	Series Description	Status	Disposal Action
1	*Coal Industry Control Act 1948* Pre-Employment Medical Examination Forms & relevant x-rays	Permanent	Retain permanently
2	*Coal Industry Employees' Health Scheme Regulation 1998* Pre-Employment Health Assessment Forms & relevant x-rays	Permanent	Retain permanently
3	*Coal Industry Employees' Health Scheme Regulation 1998* Periodic Health Assessment Forms & relevant x-rays	Permanent	Retain permanently
4	Health Scheme Database	Permanent	Retain permanently in an accessible, unalterable and readable form

COAL WORKERS' PNEUOMCONIOSIS SELECT COMMITTEE

QUESTION TAKEN ON NOTICE No.2

on 14 October 2016

In relation to your comments about changes in management, Mr Purtill, I have here the Report on the Queensland Coal Board Coal Miners' Health Scheme, commonly known as Rathus report, which was produced back in May 1984 when there were 75 coalminers diagnosed with pneumoconiosis.

QUESTION: Can you tell us what happened in that case—what happened with the coalminers and whether they were advised that they had pneumoconiosis and what the department did after that, considering that you are saying that pneumoconiosis has just re-emerged?[1]

ANSWER:

The department has located documents which confirm that all workers were contacted about their individual x-ray results.

The Rathus and Abrahams report (Attachment A: Rathus report) included a program to survey coal workers by chest x-ray and lung function. The program was established and administered by the former Queensland Coal Board (QCB) under an order (Attachment B: Orders).

The program was conducted by medical consultants engaged by the QCB.

Under the order, employees were to be contacted by the Department of Health if any follow up examination or further medical examination was necessary.

The Rathus and Abrahams report itself confirms that the medical consultants *"identified 499 cases of abnormality and appropriate action was taken in each of these cases. Of these, 102 received a more complete follow up. Pneumoconiosis and suspect pneumoconiosis case totalled 75"* (p. 2 of attachment A).

This is confirmed in the Queensland Coal Board Annual Report for the year ended 30 June 1984 (Attachment C: Queensland Coal Board Annual report 1984) at page 42:

"The Medical Consultants identified 499 cases of abnormality and appropriate action was taken in each instance. A complete follow-up involved 75 cases of pneumoconiosis and suspect pneumoconiosis and 47 emphysema diagnoses. All other personnel were advised that their x-ray was considered to be quite satisfactory".

The Queensland Coal Board 34th Annual Report, for the year ended 30 June 1985 (Attachment D: Queensland Coal Board Annual report 1985) confirms that further contact was made the following year (p. 33):

"Employees who had been advised of an abnormality as a result of the X-ray programme, which was completed last year, have been contacted again."

[1] Public briefing transcript, Brisbane, 14 October 2016, pp 3

REPORT

ON

THE QUEENSLAND COAL BOARD COAL MINERS' HEALTH SCHEME

* * *

Chest X-Ray and Emphysema Check Survey of Colliery Employees in Queensland

by

Dr. E.M. RATHUS,
M.B., Ch.B,
(U.C.T.) F.A.C.O.M.

Dr. E.W. ABRAHAMS,
M.B., B.S. (Melb),
M.D. (Melb), M.R.C.P. (Lond),
F.R.A.C.P., F.R.C.P. (Lond).

Medical Consultants to The Queensland Coal Board

MAY, 1984

THE QUEENSLAND COAL BOARD
G.P.O. BOX 384
BRISBANE. 4001. Q.

FOREWORD

The Queensland Coal Board decided to take responsibility for development of a Coal Miners' Health Scheme and two Orders made by the Board on 8th December, 1982, and subsequently published in the Queensland Government Gazette formally established that Scheme.

One of these Orders set up a programme to Survey by Chest X-ray and lung function test all colliery employees in the State, and the second Order required new entrants to meet a pre-entry medical standard.

It is the first of these Orders with which this Report is concerned and a copy of that Order and its rescission are included.

The objectives of the Survey were primarily to identify the incidence and severity of lung disorders which may be related to coal mining and to seek recommendations for future direction.

In setting up the Survey the views and co-operation of the Queensland Coal Association, the Combined Mining Unions, and individual colliery managements were sought and it is pleasing to record that the degree of co-operation was outstanding.

Some 7 784 employees together with 123 retired employees were examined. The bulk of these were looked after by a mobile clinic, supplied and manned by the Queensland Department of Health, which visited 33 mine sites and 6 towns. The Medical Consultants to the Board identified 499 cases of abnormality and appropriate action was taken in each of these cases. Of these, 102 received a more complete follow-up. Pneumoconiosis and suspect pneumoconiosis cases totalled 75.

The setting up of the clinic at each site, together with the rostering and processing of employees, required a high order of organisation. This was made possible through the co-operation afforded by mine management and employees with the Board's officers and the staff of the mobile clinic.

The Queensland Coal Board is most grateful to the Department of Health for its logistic support and the Workers' Compensation Board of Queensland for its financial contribution towards the cost of the Survey.

The advice and efforts of its Medical Consultants, Dr. E.M. Rathus and Dr. E.W. Abrahams, have contributed significantly to its success.

In due course the Board will seek comment on this Report and its recommendations.

THE QUEENSLAND COAL BOARD

The Chairman,
The Queensland Coal Board,
G.P.O. Box 384,
BRISBANE. Q. 4001.

Dear Sir,

We have the honour to present to you our report on the findings of the Chest X-ray Survey of coal miners carried out under the Coal Miners' Health Scheme, published in the Queensland Government Gazette dated December 11, 1982, Vol. CCLXXI, No. 81, pages 1676-1677, under the authority of the Order vested in The Queensland Coal Board under the Coal Industry (Control) Act 1948-1978.

The Orders make provisions "for the compulsory medical examination of new entrants to the Coal Mining Industry and for the medical examination of employees of the Coal Industry under certain circumstances" and came into force from the first day of January, 1983.

This made it possible to Order a Chest X-ray Survey of miners and others presently employed in the Coal Industry.

In conjunction with the X-ray examination a check for Emphysema was carried out and a medical questionnaire was completed to provide basic data for supportive analysis and comment.

The Order relating to the X-ray Survey was rescinded by The Queensland Coal Board by notice in the Government Gazette dated April 21, 1984.

The Survey formally commenced on March 1, 1983 on the Ipswich coal fields where the first X-rays were taken, and continued until April, 1984, when all mines had participated as required.

The Survey was carried out by employees of the Department of Health under the auspices of the Director of Tuberculosis. We owe our thanks to this officer and the Chief Radiographer and the staff of the X-ray mobile unit for the continued excellence of the organisation of the Survey over this protracted period, and for co-ordination of visits amongst the scattered smaller mines.

We wish to record our appreciation of the technical advice and assistance given at all times by the Division of Health and Medical Physics.

We are also grateful to the staff of The Queensland Coal Board at all levels for their courteous and friendly help at all times in a programme which required constant adherence to detail and exact presentation of information.

ORGANISATION

The programme was organised by preliminary discussions between your Board, the Director of Tuberculosis, the Chief Radiographer and ourselves. Our intention was to notify every miner or other employee with an individual report on the X-ray, either normal or abnormal, and advised action as a consequence. Forms were designed for ease of recording and to facilitate communication of results to all concerned.

A facsimile of each of these forms is below.

1. Satisfactory Report (No significant abnormality noted)

   "Dear Sir,
   Your recent Chest X-ray is considered to be quite satisfactory. Your co-operation in this Survey of the health of Queensland coal miners is very much appreciated.
   Yours faithfully,

   <u>MEDICAL ADVISER</u> "

2. Abnormality Noted.

   "Dear Sir,
   An abnormality has been noted in your recent Chest X-ray and an interview will be arranged for you with the doctor whom you nominate, or whom you have already indicated on the questionnaire form.

   You should not be concerned about this information as I will see that a full report is sent by the Department of Health to your doctor so that he can discuss the matter in detail with you.

2. Abnormality Noted (Contd)

Should you wish to be seen at the local hospital, the Medical Superintendent will receive a similar full report, and a suitable consultation will be arranged for you.

Your co-operation in this Survey of the health of Queensland coal miners is very much appreciated.

Please Note:- All future advice or action in this matter will be handled by:-

The Assistant Director (Chest Diseases),
Division of Environmental and Occupational Health,
Department of Health,
63-79 George Street,
BRISBANE. Q. 4000.

Yours faithfully,

MEDICAL ADVISER "

Form 2 above was circulated to the person concerned and the Director of Tuberculosis and a copy retained for the file. All abnormal X-ray films were sent to the Director of Tuberculosis for retention and usual action in the constant programme in this regard within the community, together with our comments on the accompanying copy of the questionnaire. This ensured efficient follow-up of important or suspect pathology.

A separate letter was sent to the person's nominated Doctor and this is reproduced below.

"Dear Doctor,

RE: COMPULSORY CHEST X-RAY - COAL MINERS' HEALTH SCHEME

Your patient has asked for any comments on his X-ray to be notified to you.

Enclosed please find copy of the questionnaire form and X-ray report.

A copy of this report and the Chest X-ray have been sent to:-

The Assistant Director (Chest Diseases),
Division of Environmental and Occupational Health,
Department of Health,
63-79 George Street,
BRISBANE. Q. 4000.

All further correspondence on this matter should be referred to the Assistant Director (Chest Diseases), who will be communicating with your patient in any event on this basis of the report received.

Yours faithfully,

MEDICAL ADVISER "

Our report on the X-ray was included in the questionnaire form together with any clinical or advisory statements we cared to make, so that the Doctor received the totality of information available at the time.

The Questionnaire form consisted of a single folded sheet, and pages 1, 2, 3 and 4 are reproduced below to provide necessary information.

PAGE I

THE QUEENSLAND COAL BOARD

G.P.O. Box 384,
BRISBANE. Q. 4001.

X-RAY SURVEY QUESTIONNAIRE

Date..................

1. SURNAME................................. Number......................
(Block Letters) (Office use only)

GIVEN NAMES..

2. ADDRESS...

3. AGE...................................... DATE OF BIRTH ..../..../19.

4. AGE AT ENTRY INTO COAL INDUSTRY...

5. PRESENT CLASSIFICATION AND DURATION...

....

QUESTIONNAIRE FORM - PAGE I (Contd)

6. PAST CLASSIFICATION(S) AND DURATION..

....

7. OTHER DUSTY OCCUPATIONS - Mining ....
- Quarrying ....
- Foundryman...
- Other ....

8. HAVE YOU BEEN A MINER IN THE UNITED KINGDOM? YES/NO

9. IF YES, HOW LONG? ....

10. HAVE YOU BEEN A MINER IN OTHER OVERSEAS COUNTRIES? YES/NO

11. IF YES, HOW LONG?..

12. DO YOU FEEL GENERALLY FIT? ....

13. DO YOU SMOKE? YES/NO

PAGE 2

14. IF YES, HOW MUCH? (a) YEARS ....

(b) How many cigarettes ....

pipes ....

cigars ....

15. IF RETIRED, WHEN DID YOU RETIRE? ....19..
(To be answered only by those receiving compensation for "dust disease".)

16. WHEN WAS YOUR COMPENSATION GRANTED? ....19..

17. WHAT IS YOUR PRESENT STATE OF HEALTH?

GOOD...............

FAIR..............

POOR...............

N.B. (a) You will be advised of the result of your X-ray in due course.

(b) The answers to these questions are confidential

(c) Please enter the name and address of your own Doctor.

Doctor's Name: ....

Address: ....

....

QUESTIONNAIRE FORM - PAGE 3

SPIROMETRY:

Age.............M/F HT ....cms (........feet ......ins)

WT .... kg (.......stone ......lbs)

	Predicted (L)	Observed (L)
Forced Exp. Vol. 1 sec FEV_1(L)		
Forced Vital Capacity FVC (L)		
Vital Capacity VC (L)		
FEV_1/VC %		

RESULT OF CHEST X-RAY

Normal .... ☐

Further Action .... ☐

....

....

PAGE 4

FACTS ABOUT THIS X-RAY SURVEY

The Queensland Coal Board is undertaking an industry Survey of both coal miners who are at present employed in and about coal mines in Queensland and those who have recently retired.

This Survey will essentially consist of a Chest X-ray and a test of lung function. The latter test is a simple "blowing" test and will be undertaken at the same time as the Chest X-ray. The intention is to obtain information on the present and past exposure of miners and associated workers to coal dust in the course of their work. The data will be used in future planning for health and safety in coal miners in Queensland.

In addition there will be an opportunity for retired miners to take advantage of the Survey and it is hoped that as many as possible will volunteer as this will give much valuable and necessary background information. All those

QUESTIONNAIRE FORM - PAGE 4 (Contd)

persons taking part in this Survey are asked to complete the questionnaire which will be handed to them prior to the X-ray. The questions asked are brief and direct, and require very little time and effort. Your co-operation in obtaining this data will be greatly appreciated.

As you will note on this questionnaire, all participants will be individually notified of their results, and a report sent to the Doctor of their choice where this is indicated.

The Survey is being carried out by the Department of Health under the auspices of the Director of Environmental and Occupational Health.

- - - - - - - - - - - - - - - -

Germane to this segment is the fact that we became aware of several short comings in the presentation of the questionnaire, and these are now discussed so that these omissions may be corrected in the event of such an exercise being undertaken in the future.

Title Page - Question 6

This should be more clearly expressed. Miners especially did not realise that it was necessary to clearly indicate all classifications and their duration, even when interrupted for periods of years.

For instance, a man may state he had entered the coal industry (Question 4) age 36, whereas in fact, he may have entered at age 15 to 26, and had another occupation intervening.

Title Page - Question 7

Few men indicated complete detail, and particularly so in relation to time spent. The intention may have been implied but it must be spelt out.

Title Page - Question 13

Those who had given up smoking, often did not indicate their previous habit, which may have been significant.

Second Page - Question 17

Again, it may have been expected that miners and others would record significant illnesses, operations etc. but the omission remains.

SUGGESTIONS FOR FUTURE QUESTIONNAIRES

Question 4 to read:-

4. Age at first entry into coal industry.

Question 6 to read:-

6. Past employment in coal mines and duration, whether continuous or interrupted (years).

Question 7 to read:-

7.

	Type	Duration Years
Other Dusty Occupations	- Metalliferous Mining	
	- Quarrying, Brickworks	
	- Foundryman	
	- Other Employment (e.g. chemical industry stonemason, etc.)	

Question 13 to read:-

13. Do you smoke? Yes/No
    If you have given up the habit, indicate your pattern in 14 below.

Question 18 - to be inserted

18. Record any serious illnesses, accidents or operations.

DISCUSSION

A total of 7 907 X-rays were viewed. Of these we reported 7 408 as normal or satisfactory, and 499 as abnormal or requiring action or comment.

TABLE I

Total	Normal	Abnormal (action)	Other Pathology Abnormal (comment only)
7 907	7 408	465	34

The thirty-four cases reported as "Other Pathology - Abnormal (comment only)" refer to X-rays where there was evident known pathology, of which the individual would be aware. These were mainly persons who had normal lung fields but presented wire suture shadows indicating coronary by-pass operations

TABLE I (Contd)

on the heart, or other cardiac operations, and other persons with normal lung fields but who had skeletal or other anomalies of which they would be aware. Individual letters of explanation were sent to such persons.

TABLE II

SUMMARY: NORMAL LUNG FIELDS

OTHER PATHOLOGY

	NO.	REMARKS
Heart Operation	24	2 cases probably congenital lesions
Other Pathology - Skeletal and other deformities	10	e.g. Multiple rib fractures, severe scoliosis, shoulder girdle injury
Total	34	

TABLE III

PATHOLOGY	NO.	REMARKS
Pneumoconiosis	75	Siderosis (1)
Tuberculosis	2	1 Proven - 1 Suspect
Emphysema	47	
Asbestos-related	4	Diaphragmatic calcification etc. No asbestosis found
Bullae	10	
Cyst	1	
Sarcoid	3	
Coin lesion	18	
Heart outline	76	Enlargement and/or aortic changes
Aorta	96	Kinking, dilatation, etc.
Foreign body	6	Metallic of significant size
Linear atelectasis and linear opacities	15	
Intercurrent infection	9	
Pleural thickening/changes	20	
Calcified pleural plaque	1	
Mucoid impaction	1	

TABLE III (Contd)

PATHOLOGY	NO.	REMARKS
Calcified primary complex	7	Calcified tuberculosis primary complex
Diaphragmatic hernia	1	
Post-operative changes	7	Rib resection etc.
Congenital anomaly	4	
Vascular ring	1	
Nipple shadow	1	
Bone island	2	
Mediastinum enlarged	8	
Technical faults	15	
Pericardial calcification	1	
Bronchiectasis	2	
Hilar prominence	2	
Hilar calcification	1	
Unidentified (minor) or for investigation	14	
Pulmonary infarct	1	Changes suggest antecedent history
Obesity	2	
Post-infection changes	7	Evidence of healing, past infection
Chicken pox/histoplamosis	1	Requires history to classify
Under medical care (old T.B. therapy)	1	Thoracoplasty/calcified pleura
Carcinoma	2	Suspect lesions
Carcinoma	2	Known carcinoma of the lung under present active care and treatment
Inactive - tuberculosis	1	Apical scarring
Silico - tuberculosis	1	Inactive - under surveillance
Mass in lung or mediastinum	5	
Rib anomaly	3	
Skeletal anomaly	2	
Old injury (fractures etc)	8	
	486	

Several of the X-ray appearances appear under two (2) headings, so that there is a small discrepancy in the total abnormal X-rays reported and those listed in Table III. For example, cases of emphysema with significant associated bullous changes would appear under both headings, as would cases of emphysema with the additional presence of aortic dilatation, where a note would have been made against each presentation.

Old injuries with pleural thickening or other associated pathology would also have some influence on cross reference. This recording was held to an absolute minimum and only used where each condition was an apparent positive entity, so that the final analysis is not affected to any significant degree.

It will be appreciated that all diagnoses reflect only those reported during the Survey, so that exact pathology can only be reported where adequate follow-up has ensued.

To this end all Doctors, Hospital Superintendents and the Chest Clinic were circularised at the conclusion of the Survey and correlation of our reading of the X-ray and final diagnosis and disposal of the individual concerned will be discussed within the body of the report where appropriate information has been obtained.

APPRAISAL OF CONDITIONS OTHER THAN PNEUMOCONIOSIS:

Emphysema

Forty-seven (47) cases of emphysema were diagnosed on the X-ray appearances. The ages ranged from 25 years to 79 years.

TABLE IV - EMPHYSEMA

Age	No.	Smokers		Severe	Bulla
		Yes	No		
25 - 39	7	6	1	-	4
40 - 49	16	16	-	2	4
50 - 59	19	13	6	-	1
60 - 79	5	3	2	1	1
TOTAL	47	38	9	3	10

It will be noted that virtually all case)f emphysema are smokers. Of the 25 - 39 year age group, two cases presen l with giant bullae, possibly congenital. In the 50 - 59 year age gro , one case of unilateral bullous change was noted.

Tuberculosis:

One (1) case was clearly active, and was immediately contacted, diagnosis confirmed, and admitted to hospital for treatment. The only other case presenting X-ray appearances suggesting possible tuberculosis infection occurred in a young man. This case turned out in fact to be a right upper lobe pneumonia which resolved completely.

Mucoid Impaction:

This case turned out to be an asthmatic who had a bronchoscopy following our report.

The Unidentified Group:

This group comprised X-ray appearances of apparent minor significance, but which in the nature of things should be reported and followed in the customary manner.

Chicken Pox:

One (1) case had the typical appearance of post-chicken-pox calcification and a history would help in classifying this case. The alternative diagnoses are less likely, but pneumoconiosis cannot be excluded.

Intercurrent Infection:

Intercurrent infections were routinely reported, and the occasional case notified immediately to the Doctor named by the patient where relatively urgent therapy appeared indicated.

Sarcoid:

Three (3) cases had changes suggesting previous sarcoid. These were referred for history, follow-up, and comparison with previous films if available.

Coin Lesions:

A total of eighteen (18) coin lesions were reported, and adequate follow-up is expected.

Heart and Aorta:

Enlarged hearts and dilated and uncoiled aortic shadows were reported to the Doctors named as a general service in the event of useful therapy being suggested. Several cases indeed suggested early heart failure, but of course clinical assessment was mandatory.

Suspect Lesions: (Malignancy)

Lung masses, hilar enlargement and lesions suggesting possible malignant change were reported immediately for diagnostic purposes. Two (2) cases of carcinoma of the lung had already been diagnosed and were under treatment, and two (2) suspect lesions were reported for follow-up.

Silicosis:

Two (2) cases of silicosis were reported, one of which had been complicated by tuberculosis. This patient had been successfully treated but remains with significant scarring and opacities in both lungs.

It is interesting to note that both of these men had spent many years on tunnelling operations on the Snowy Mountains Scheme.

Miscellaneous:

One case presented with nodules which were unlike those seen in classical pneumoconiosis as they were isolated and scattered sparsely and irregularly. Inactivated parasites or other cause is postulated, and routine supervision and a detailed history as follow-up, as dust exposure was quite negligible. A similar case of unilateral nodules was notified for observation.

A young man of 20 years was noted to have an abnormality, suggesting a possible aneurysm of the aorta. As a direct result of the Survey he was investigated and a post-traumatic (motor-bike accident) aneurysm of the thoracic aorta was repaired.

Other conditions listed are mainly routine findings of no urgency, but requiring clinical assessment.

Some thirty-five (35) replies were received on case referrals, several of which provided information mentioned above.

Most of the reports detailed further clinical appraisal of the individual and confirmation of conditions such as obstructive airways disease and chronic bronchitis.

Where the Chest X-ray was in the doubtful category of early nodular changes suggestive of pneumoconiosis, a further check in one or two years' time has been proposed.

Pneumoconiosis:

A total of seventy-five (75) cases of pneumoconiosis were reported. A number of these fell into the category of suspicion leaving the diagnosis as an indication for a detailed history of exposure and certainly as a recommendation for future routine supervision at reasonable intervals.

There will always be some disagreement at this level, but suspicious shadows can only indicate some divergence from the normal. Within any dust hazard industry of which coal and metalliferous mining are predominant, such cases should at least arouse suspicion of exposure. Any degree of reassurance can only be based on subsequent supervision.

Recognition of the early shadows of pneumoconiosis is quite difficult and is easily confused with, and indeed complicated by, associated conditions such as emphysema, chronic bronchitis and asthma, any of which may be present in particular patients.

The classification used was the ILO 1980 International Classification of Radiographs of the Pneumoconioses, published by the International Labour Office, Geneva, as Occupational Safety and Health Series No. 22. (Rev)

TABLE V - PNEUMOCONIOSIS

Classification	No.	Years Mining (Range)	Years (Mean)	Remarks
0/1	5	5 - 17	12	Doubtful category
1/1 p/p	30	9 - 49	22.7	Suspect category
1/1 q/q	8	6½ - 42	25.6	
2/1 q/q	3	13 - 36	25.6	
2/2 p/p	3	32 - 50	40	
2/2 q/q	7	25 - 35	29.1	
2/2 qr/qr	1	9	9	
3/3 q/q	3	13 - 34	22.3	

The above table relates to those cases where the only exposure reported is coal mining.

The following segment relates to those cases where United Kingdom/other exposure is reported.

TABLE V - PNEUMOCONIOSIS (Contd)

Classification	No.	Years Mining (Range)	Years (Mean)	Remarks
1/1 p/p	2	12 - 32	22	U.K. 25 years (1) Other 10 years (1)
1/1 p/q	1	39	39	U.K. 20 years
1/1 q/q	2	20	20	Gold, Quarry, Coal
2/1 q/q	1	13	13	Coal/Tin
2/2 q/q	2	15 - 31	23	U.K. 12 years (1) Copper 15 years (1)
3/3 q/q	1	20	20	U.K. 16 years
3A/3A r/r	1	30	30	14 Coal, 16 Metal
3 B ax qr/qr	1	20	20	Also 15 years (foundry)
MISCELLANEOUS				
2 t	1	14 years (brickworks)		Linear opacities
1/1 p/p	1	14 years (welding)		? Siderosis
2/2 qr/qr	1	9		Unlikely Pneumoconiosis
2/2 q/q	1	21		? Pneumoconiosis ? Chicken-pox etc.
TOTAL	75			

It is interesting to record that fifty-four (54) abnormal X-rays were reported out of one hundred and twenty-three (123) of the retired miners group, but that only three (3) of these were specifically pneumoconiosis.

These were 2/2 p/p (2 cases) - 44 years av. exposure, and 2/2 q/q/ (1 case) 35 years exposure.

COMMENT

It is manifest that any large-scale Survey will produce fortuitous benefits for individual cases, but the basic reason has been to ascertain the prevalence of pneumoconiosis of whatever category in the population surveyed.

Some incongruities became apparent during the course of the Survey. The number of retired miners reporting was small and a larger cross-section of this group would have better reflected incidence of recordable pneumoconiosis.

COMMENT (Contd)

Unfortunately there are no records which establish the number of retired miners and so the proper relativity of the results cannot be deduced.

In contrast, the population surveyed in the newer mines, or more isolated areas, showed a predominance of young fit men.

It is possible that the factors reported are overweighted towards the more optimistic end of the spectrum as a result, particularly as the Survey included the total workforce including all occupations and classifications, apart from the coal miners and other workers constantly exposed to coal dust as a consequence of their work.

As a rough estimate we have reported seventy-five (75) cases of suspect pneumoconiosis in ± 7 900 X-rays, an incidence of 1:105. Some of these may be proved to be other conditions on more detailed investigation, but suspicion of significant exposure must be postulated at this level.

Expectation:	75:7900 = 0.95%
Retired Miners:	3:123 = 2.4% (54 abnormal, 69 normal)

It will be noted that the largest category represented is 1/1 p/p (30 cases) where some uncertainty exists in interpretation of the findings. Years of exposure ranged from 9 - 49 years, and it may be said that it is amongst this group that regular supervision should be considered.

There are factors of technique, associated conditions such as chronic bronchitis, and physical habitus which may contribute to difficulties in making an exact statement.

It is to this very purpose that the category has been assigned. The implication is that such persons should be informed of their status and routine follow-up be adopted.

Any categories above 0/1 i.e. 1/1 p/p imply a positive interpretation of the X-ray, even though some may be shown on further investigation to be related to associated factors as noted above.

COMMENT (Contd)

From the point of view of the coal mining industry the incidence of pneumoconiosis reflects the excellence of regulations relating to dust control, and adherence to the regulations by miners in all circumstances where dust may be produced at a potentially hazardous level.

The Chest X-ray status of the mining population remains the only logical and acceptable yardstick of the long-term effectiveness of the controls demanded by the Department of Mines (Coal Mines Branch) and implemented by the industry and its workforce. Anomalies of interpretation, such as X-ray appearances in excess of stated exposure, have to be followed individually.

Explanations may be forthcoming in a detailed history, e.g. hard-rock exposure for 5 years may very well explain a minimal change in a miner newly recruited to coal (See 0/1) and a complicated case may resolve itself by reference to a history of foundry experience, metalliferous mining, tunnelling, or silica-hazard industry.

There are in addition medical conditions which may make it more difficult to interpret the Chest X-ray, particularly in the case of coal miners with a significant history of dust exposure. Sarcoidosis, rheumatoid arthritis with lung manifestations, chicken-pox pneumonia with residual calcification and various intra-pulmonary parasites may all mimic pneumoconiosis, or complicate the picture of an underlying nodularity or fibrosis due to dust exposure.

There is a need to establish early evidence of pneumoconiosis for a number of reasons which are obvious in the light of the history of the condition which has been so well documented and by the present trend of international and indeed Australian practice in this field.

It is important to realise that men with well defined pneumoconiosis do not necessarily evidence any disability. The discovery of the changes permits counselling - the avoidance of smoking in particular - which may delay the onset of symptoms and/or disability. Minor degrees of pneumoconiosis do not necessarily imply ill-health or premature death.

ADVANTAGES OF A PROGRESSIVE SCHEME FOR CHEST X-RAY WITHIN THE COAL INDUSTRY

1. Correlation of time, occupation, dust exposure, type of coal, mine location, hard-rock factors and others readily listed, with ultimate statistical statements.

2. A positive yardstick for assessment of the effectiveness of dust and ventilation control measures.

3. Constant knowledge of the exact or probable situation in relation to these matters at any time.

4. The ability to present the miner with a factual statement of his medical status for his own reassurance and necessary information.

5. A knowledge by the miners and associated work-force about mines, and their relative unions, by the coal industry itself, and the Department of Mines that these facts were available at both an overall and individual level.

6. No statement is offered on the influence of open-cut mining of coal on the prospective incidence of coal workers' pneumoconiosis. There is certainly the opportunity to investigate this aspect in conjunction with the proposed scheme outlined in this report.

RECOMMENDATIONS

The following recommendations are based on the fact that as from the first day of January, 1983, the Coal Miners' Health Scheme came into force.

The Order establishes compulsory medical examination of new entrants, and for the medical examination of employees of the Coal Industry under certain circumstances.

This system is now effectively in operation so that a medical record and Chest X-ray is available on all new entrants.

The results of the present Survey of men and women within the coal industry is available as discussed in this report.

RECOMMENDATIONS (Contd)

New entrants, whether at apprentice level or miners with any number of years of experience, may now be examined as required.

This set of circumstances limits the number of persons for whom we would suggest periodic Chest X-rays.

FUTURE PROGRAMMES FOR CHEST X-RAYS

1. Chest X-rays should be performed periodically at intervals of not less than five (5) years for the express purpose of detecting early evidence of pneumoconiosis.

2. Miners and other persons employed about mines who have been shown to have Chest X-rays demonstrating the features of overt pneumoconiosis or a pattern suggesting early changes due to the effects of coal dust/mineral dust exposure should be reviewed at more frequent intervals, preferably annual.

It will be seen that at present there are 75 persons who fall into the category described in paragraph (2) above as a direct result of the present Survey.

The ideal course is for this group of employees (that is pneumoconiosis proven or suspect) to be seen by a practitioner experienced in interpretation of Chest X-rays relating to occupation and pneumoconiosis in particular.

Certainly a means should be available for notification of those persons with pneumoconiosis as above described.

In the case of other abnormalties discovered, these would be handled in the usual way, and the individuals concerned would be advised by private practitioners, hospital clinics attended, or by the Chest Clinic, Department of Health.

3. All miners and others with significant exposure to coal dust, should be required to have a Chest X-ray performed on retirement from the industry, and the result reported to the person concerned, and filed for future reference by The Queensland Coal Board.

FUTURE PROGRAMMES FOR CHEST X-RAYS (Contd)

4. It is our firm belief that The Queensland Coal Board should consider establishing a Medical Service to co-ordinate programmes of this kind for the future.

The present Survey has provided a great deal of data on individuals, all of which is available in a haphazard fashion. There is no central authority for the storage of X-rays, or for recall of medical reports, or for notification of progress X-rays for persons where it is indicated.

In 1970 the total workforce in the coal mining industry was 2 264. (Data supplied by The Queensland Coal Board to Dr. E.M. Rathus at that time)

The present Survey has encompassed about 8 000 persons employed in the industry, and it is our view that an industry with a population of this order, with a defined occupational health hazard, requires the supervision of a Chief Medical Officer and auxiliary staff. This officer should be located either in Brisbane or Ipswich. Sub-centres could be established as needed in the future.

This officer would be responsible for the following duties:-

1. Co-ordination of the compulsory medical examination of new entrants to the coal mining industry, and liaison with medical practitioners in the various centres.

2. Organisation of periodic Chest X-ray Surveys of the workforce at appropriate intervals in the terms of the medical programme.

3. Arrange for periodic follow-up of retired miners by Chest X-ray and medical examination on a routine basis or at request.

4. Identify persons requiring further checks or for annual supervision on suspect X-ray findings.

5. Maintain a central register for the co-ordination of the programme and recording of data as required. It is most desirable that the medical examination of new entrants be centralised. This can only be done by making it a responsibility of the medical service of The Queensland Coal Board, as in New South Wales and the United Kingdom.

FUTURE PROGRAMMES FOR CHEST X-RAYS (Contd)

6. Be responsible for the investigation of occupational health problems in and about coal mines in co-operation with company activities and other Departmental agencies.

7. Medical examination of ex mine employees on request or for those ex employees identified as requiring further supervision.

8. Initiate research into occupational health problems of miners.

In 1970 Dr. E.M. Rathus prepared a report for The Queensland Coal Board in which he discussed "Proposals for a Medical Service for the Coal Mining Industry in Queensland".

Much of the detail discussed then would apply today, but it may be apposite to quote from that report in support of the present proposal to consider establishing a medical service in the coal mining industry.

"The periodic examinations are the biological yardstick of the effectiveness of dust control, and it is a sine qua non of the medical schemes envisaged that a coterie of dust-counting officers of appreciable technical expertise be appointed to maintain consecutive records of dust conditions in mines through Queensland, and to be available for special problems when needed.

This is the pattern set in the United Kingdom and by the Joint Coal Board, and it is essential to the whole scheme that the disciplines of medicine, the efforts of the dust suppression engineers, and the meticulous data of the dust sampling and ventilation officers be interwoven in a complementary manner.

We are fortunate in that acceptable standards have been proposed at an international level, and though absolute uniformity in outlook has not been attained, certainly a range of standards exists within which we may apply our ingenuities with some measure of success.

It is apparent then that a medical scheme of merit in this type of occupational hazard has no logical function without the back-up of the simultaneous collation of the relevant physical data and the prospective expectation that medical, dust, chemical and environmental factors will be available for statistical analysis."

FUTURE PROGRAMMES FOR CHEST X-RAYS (Contd)

In 1970 Dr. E.M. Rathus considered the possibility of utilising these medical services to the further benefit of the mining industry, and these observations are reproduced below:-

"In fact, once the medical services were established their application, utility and benefits to industry and the men employed, could quite conceivably be extended to embrace men exposed to pure silica in mines in addition to coal mines. The concept of X-ray Surveys of men in these industries is as well established as for coal miners".

As a total concept such a medical service would reflect Queensland's resource potential and its obligation to its workforce at the highest pinnacle of Australian and international standards.

We wish to acknowledge our thanks to the staff of the mining companies, and to the total workforce of the mines for their co-operation and interest. The co-operation of medical practitioners is also gratefully acknowledged.

Rathus — E.M. RATHUS

E.W. Abrahams — E.W. ABRAHAMS

Appendix: Original Order
Rescission of April 21, 1984.

* ORDER

COAL MINERS' HEALTH SCHEME

The Queensland Coal Board,
Brisbane, 8th December, 1982.

THE Queensland Coal Board acting in pursuance of authority vested in it under the Coal Industry (Control) Act 1948-1978, hereby makes the following Order, the provisions of which are to come into force on and from the first day of January, 1983.

P.J. CRANITCH, Secretary.

An order for the compulsory medical examination of certain employees in the Coal Mining Industry, made in accordance with the authority granted to The Queensland Coal Board by the Coal Industry (Control) Act 1948-1978.

The Queensland Coal Board pursuant to the authority granted to it by the Coal Industry (Control) Act 1948-1978, hereby orders as follows:-

All employees in the coal mining industry who are or who have been engaged in mining or associated operations shall have a chest X-ray - the X-ray being carried out by employees of the Department of Health under the auspices of the Director of Tuberculosis.

In conjunction with the X-ray examination there shall be a check for Emphysema.

Advice will be given to each colliery manager some six (6) weeks in advance of the programmed time of arrival of the X-ray mobile unit.

The colliery manager shall give adequate forward advice to all employees eligible for X-ray of the time table arrangements and shall be responsible for rostering of employees to allow all those eligible to be surveyed, and the colliery proprietor shall be responsible for all the costs of and any resultant or associated costs of those operations.

Employees will be contacted by the Department of Health if any follow up examination or further medical examination is necessary.

Should the Department of Health advise accordingly, The Queensland Coal Board will order a follow up X-ray and Emphysema check within five (5) years for the workforce or for such section or for such members of the workforce as necessary.

The manager of a colliery will issue to the eligible employees an X-ray identification voucher in a form approved by the Department of Health. The voucher will entitle the holder to a free X-ray and must clearly state the name, address, age and history of employment - particularly in the mining industry. Some questions on medical history also must be answered.

The Queensland Coal Board from its special fund is to meet the wage costs and travelling allowances of staff, running costs of the mobile unit, the costs of X-ray film, envelope packaging and storage, and a portion as agreed with the Department of Health of the cost of the X-ray mobile unit.

The Official Seal of The Queensland Coal Board was hereto affixed on the nineteenth day of October, 1982, by Patrick John Cranitch, Secretary to the Board, the officer designated to affix such seal, in the presence of Jack Tunstall Woods, Mervyn Lewis Noume and William James Platt.	J.T. WOODS, Chairman M.L. NOUME, Member W.J. PLATT, Member

P.J. CRANITCH, J.P., Secretary.

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ORDER

COAL MINERS' HEALTH SCHEME

The Queensland Coal Board,
Brisbane, 8th December, 1982.

THE Queensland Coal Board acting in pursuance of authority vested in it under the *Coal Industry (Control) Act* 1948–1978, hereby makes the following Order, the provisions of which are to come into force on and from the first day of January, 1983.

P. J. CRANITCH, Secretary.

An order for the compulsory medical examination of new entrants to the Coal Mining Industry and for the medical examination of employees of the Coal Industry under certain circumstances, made in accordance with the authority granted to The Queensland Coal Board by the *Coal Industry (Control) Act* 1948–1978.

The Queensland Coal Board pursuant to the authority granted to it by the *Coal Industry (Control) Act* 1948–1978 hereby orders as follows:—

Medical Examination of New Entrants—

All new entrants to the coal mining industry must be medically examined and certified fit for employment by an examining Medical Officer approved by The Queensland Coal Board before they are permitted to work in the industry.

This examination is compulsory for all workers before being employed in or about a coal mine engaged in mining operations.

The term "new entrant" means a person who has not previously worked in the industry, or who has not worked in the industry during the previous (2) years.

Other Definitions—

Authorised Employment Officer.—An officer of the colliery appointed by the Colliery Company to act on their behalf in employment matters.

Examining Medical Officer.—A medical practitioner nominated by the Colliery Company and approved by The Queensland Coal Board to carry out medical examinations in accordance with this order.

1. Procedure. When it is desired to employ a new entrant, the colliery management shall hand him a letter requesting an approved medical officer to examine him for employment in the coal mining industry.

The applicant is to be also handed a copy of the "Identification Card" which must be signed by him in the presence of the authorised employment officer of the colliery who must also affix his signature on the card.

The applicant must present this card to the authorised examining Medical Officer and again sign the card in his presence.

The card is to be completed by the examining Medical Officer and returned by registered mail in the envelope supplied with the card to—

The Secretary,
The Queensland Coal Board,
G.P.O. Box 384,
Brisbane, Q., 4001.

2. Result of Medical Examination—Issue of Medical Certificates. A person found fit by the authorised examining Medical Officer is to be given a letter on the letterhead of the examining Medical Officer in the following form:—

I have examined the bearer (*Name of Bearer*) and advise that I certify him fit for duty on a mine site.

Signed: Authorised Medical Officer.
Date:

The Certificate may be posted to his home address unless the applicant makes other arrangements.

A duplicate of the Certificate is to be forwarded both to the authorised employment officer of the colliery and to the Secretary, The Queensland Coal Board, together with the Identification Card.

NOTE.—The Medical Certificate so issued is of indefinite currency so long as the holder is employed in the coal mining industry and remains in employment in the coal mining industry without a break of continuity of more than two (2) years.

If a new entrant is found to be UNFIT for employment in the industry, he will be so informed by the examining Medical Officer and a letter advising of his unfitness will be sent to the colliery manager who referred him for medical examination.

The examining Medical Officer may find that an applicant is fit for light or specified limited duties and he may advise both the applicant and the colliery of his opinion.

If the manager of the colliery desires to employ such a person then the procedure for the issue of Restricted Medical Certificates shall apply.

The Restricted Certificate shall be issued in letter form in duplicate —one copy for the applicant and one for the colliery.

Restricted Medical Certificates—

Where a new entrant on examination is found to have a defect such as should render him unfit in accordance with the medical standards required by the Board, he may, in the case of certain types of defect, at the express request of a colliery manager, be issued with a "Restricted Certificate". Such a certificate will be endorsed with a notation that he is fit only for a specified range of duties and only at the particular colliery referring him for examination. The endorsement may also restrict the currency of the certificate, so that he will be required to present himself for further examination at intervals recommended by the examining Medical Officer for its renewal.

It is emphasised that such a restricted certificate will only be issued *at the express request of the colliery manager,* e.g. in the case of an office employee or a skilled tradesman or someone required for a particular type of duty. Colliery Managers are requested to state on the letter referring such a person that he is "particularly required for a specific job or range of jobs even though suffering from some minor defect". If this has not been done, and the new entrant when advised of his rejection states that he is required for a key position at the colliery, the matter may be referred back to the manager for further recommendation.

3. (a) Payment of Medical Examination Expenses. All costs are to be met by the colliery proprietor.

(b) Payment of Travelling Expenses for Medical Examination. The colliery proprietor will pay reasonable travelling expenses to cater for any out of town expenses to the applicant or provide the transport and other facilities by arrangement.

4. Medical Examination. The examining Medical Officer shall be versed in the fitness needs for employees in most job functions of the colliery for whom the examination is being made and the need to recognise that the employee may be required to serve in the more arduous areas must be understood.

All forms numbering Form No. 4 to Form No. 6 inclusive are to be completed. Examining Medical Officers are to take note of Form No. 1—Queensland Coal Board Pre-employment Medical Examination for the coal mining industry in Queensland and its attachment Form No. 2—Queensland Coal Board—Medical Examinations Guidelines, when carrying out their examinations.

Form No. 4 to Form No. 6 inclusive are to be coded for identification and (See requirement for Form No. 3 Section (1) Procedure) together with the large Chest X-ray are to be forwarded to—

The Medical Records Officer,
The Queensland Coal Board,
G.P.O. Box 384,
Brisbane, Q., 4001.

(NOTE.—Please ensure the X-ray is packaged to avoid folding or damage. Should the Medical Officer elect to receive only the X-ray report then the Radiographer should be requested to send the X-ray to the above shown address.)

If it can be shown to the Board's satisfaction that a mine worker examined as a new entrant misled the Bureau Medical Officer, at that examination, concerning his state of health, the Board may take action to withdraw his Certificate of Fitness and advise to that effect the colliery management currently employing him and the union concerned.

5. Issue and Handling of History of Employment and Medical Examination Card (Form No. 7). (a) On sighting of the Certificate of Fitness the manager of the colliery shall forthwith issue the applicant with a History of Employment and Medical Examination Card (Form No. 7).

The manager shall certify that the applicant is the holder of a Certificate of Fitness and shall show the date of commencement of employment.

(b) An employee is required to present his card to the employer—

(i) when ceasing employment at a colliery. Managers are requested to insert the date on which employment is terminated and return the card immediately to the employee;

(ii) when commencing employment at another colliery. The card is to be sighted by the manager, and the date of commencement inserted, after which it should be returned immediately to the employee. The employee will be required to produce the card for endorsement at each subsequent medical examination.

(iii) The colliery manager shall advise The Queensland Coal Board of the names and addresses of all terminating employees and all employees who are holders of a current Certificate of Fitness.

(c) Lost Certificates—Lost cards may be replaced on completion of a written declaration by the man concerned to the manager of the colliery at which he was last employed or is currently employed.

6. Medical Examination of Mineworkers Already in the Industry. (a) A mineworker may for good cause shown, request the manager of a colliery to arrange a full or partial medical examination. The manager of the colliery on being assured that the request is not of a frivolous nature and has likely bearing on his employment of the applicant shall make the necessary arrangements. Similarly, the manager of a colliery may require a mineworker to undergo a medical examination by an authorised examining Medical Officer and make all necessary arrangements.

(b) An employee who has not been given a pre-entry medical examination shall be deemed to be the holder of a Certificate of Fitness. However, such employee may be required to undergo an equivalent examination to provide health data.

(c) A colliery manager shall have the right to decide if medical examinations are to be carried out on employees. Such examinations may be repeatable approximately every five years and the costs are to be met by the colliery proprietor in accordance with the system laid down in Section 3.

The Secretary, The Queensland Coal Board, shall be notified of the intention to institute such examinations prior to implementation.

(d) An employee is to be given not less than two weeks notice of his requirement to attend for medical examination. The colliery management shall be responsible for making the necessary appointments and arrangements.

(e) The examining Medical Officer is required to return completed Forms No. 4 to No. 6 inclusive to The Queensland Coal Board and as for pre-entry examination the colliery management will issue Form 3 to the employee after deleting the words New Employees. Subsequently, the procedure for Form No. 3 as previously set out for pre-entry shall prevail to ensure privacy.

7. Reports of Medical Examinations. Following medical examinations the individual concerned, his doctor, or with his written permission some other agent, will be notified on requests of the results of his examination.

8. Abnormalities Involving Safety Found at Medical Examinations. Where the examining Medical Officer is of the opinion that an abnormal condition exists which when taking into account the mineworkers classification, would involve a serious risk to the safety of the mineworkers himself and/or his fellow workers if he were to continue at work or in his particular classification at a colliery, the examining Medical Officer shall inform the mineworker of his diagnosis and the danger involved and, at the same time, shall forthwith notify details of the danger involved, having regard to the man's classification to the colliery manager who shall immediately confer on the matter with the person concerned. Where medical evidence is such that the danger arising from the man's condition does not apply to all classifications at the colliery, every effort shall be made by both parties to see that suitable employment at the colliery is found.

9. Payment for Attendance for Medical Examination. For the purposes of payment for working time lost for such examinations the attendance shall be regarded as equivalent to time worked.

If the employee is examined when on a rostered day off or during the day when on afternoon or night shift and does not lose working time, he will be paid for time occupied with a maximum of one shift.

Payment is to be made by the employer at the rate the employee would have received had he attended for work.

10. Confirmation of Certificate. An authorised employment officer of a colliery is entitled to request of the Board, confirmation that a Certificate of Fitness exists.

11. Request for Copy of Medical Records. An approved examining Medical Officer may request from the Board a copy of previous medical examinations of a person, provided he submits an authority for such request signed by that person or alternatively has good medical reason to the satisfaction of the Board for the making of the particular request.

Medical records which the Board may have in its possession from time to time in pursuance of the operation of this order shall be classified as confidential by the Board.

An officer or employee of the Board shall not reveal any personal details of any medical record without the authority and consent of a Member of the Board.

12. Reciprocity—Joint Coal Board. The holder of a current Certificate of Fitness issued by the Joint Coal Board shall be regarded as the holder of a Certificate of Fitness pursuant to the respective Order of The Queensland Coal Board.

13. Form No. 1 to Form No. 8 are to be construed as being part of this Order.

The Official Seal of The Queensland Coal Board was hereto affixed on the nineteenth day of October, 1982, by Patrick John Cranitch, Secretary to the Board, the officer designated to affix such seal, in the presence of Jack Tunstall Woods, Mervyn Lewis Noume, and William James Platt.	J. T. WOODS, Chairman. M. L. NOUME, Member. W. J. PLATT, Member.

P. J. CRANITCH, J.P., Secretary.

Form No. 1

THE QUEENSLAND COAL BOARD

PRE-EMPLOYMENT MEDICAL EXAMINATION FOR THE COAL MINING INDUSTRY IN QUEENSLAND

To The Examining Medical Officer,

Dear Doctor,

I am advised that you have agreed to carry out pre-medical examinations of applicants seeking entry into the coal mining industry of Queensland. It will be necessary for you to familiarise yourself with the procedures required by The Queensland Coal Board as set out in the accompanying copy of the Order of the Board covering the Coal Miners' Health Scheme.

Certain health standards are needed to qualify for entry, these having been agreed upon by Colliery Proprietors, Mining Unions and The Queensland Coal Board.

A document has been prepared for your guidance in carrying out these medical examinations and copy is attached as also are symptom and industrial history questionnaires, and medical examination sheet. The symptom questionnaire is self explanatory and mainly can be completed by a tick in the appropriate yes or no column.

Under "Industrial History" since some of the applicants may have a mining past, it is desirable that the total number of years so employed be mentioned and if it can be ascertained—the length of time at the coal face, either underground or on the surface. All other jobs and length of time in them are to be listed.

The clinical examination is standard and if possible under respiratory function test a peak flow or F.E.V. should be recorded.

The full programme of examination involves a large chest X-ray to the appropriate standards and it is recognised that these may not be readily available at your centre. The Queensland Coal Board on the advice of the Director of Tuberculosis has approved the following X-ray clinics as capable of providing acceptable X-ray pictures:—

*
*
*
*

Obviously if the clinical examination reveals that the applicant is unfit there may be no need for the X-ray examination.

Any X-ray examination will only be carried out when authorised by you in the normal way. However, your referral should indicate that the X-ray is required for "a coal industry applicant". The colliery proprietor will make any special transport arrangements and pay the X-ray account.

Again an audiogram to prescribed standard is required. The colliery management will arrange for this to be done and a copy forwarded to you if you do not have the facilities yourself. A copy of the audiogram must be kept by the colliery and is to be provided should you carry out the examination.

As it is intended to avoid embarrassment to both the applicants and their prospective employers your co-operation is requested.

It is important that the applicant record his signature on the special "Identification" forms provided for future identification. All other records to be forwarded to the Board are to be code numbered to preserve privacy. The code number applied to those documents for any particular applicant shall match that given by the examining Medical Officer to the Identification Card.

It is strongly recommended that the coding system adopted by you be agreed with The Queensland Coal Board.

A simple suggested code would be—

First two letters from the name of the town in which you reside.

Next two letters from your name.

A number in sequence starting at 100 for each applicant.

For example—

Town	—	Blackwater
Officer's Name	—	John Smith
Applicant was the 22nd examined		
Code would be	—	BL JS 122

(Signed)
Secretary
The Queensland Coal Board

Form No. 2

THE QUEENSLAND COAL BOARD

MEDICAL EXAMINATIONS GUIDELINES

This document has been prepared as a guide for examining medical officers and indicates the main areas for rejection on medical grounds. It is emphasised that the finding of temporary disability in any of the areas which can be effectively treated may be grounds for suggesting that the applicant seek such treatment before re-applying for a vacancy.

If the temporary disability can be effectively treated forthwith and in the opinion of the examining medical officer that the disability or the treatment is not a barrier to employment then under such circumstances he may recommend accordingly.

Reference is also made to the paragraph dealing with Restricted Medical Certificates detailed in the Procedure Instructions Schedule. In the examination it would therefore seem reasonable to apply these guidelines with the examining officer using his own judgment on the applicant's suitability for the particular position.

It is emphasised that a medical examination should not be a mode for rejection, but rather the establishment of fitness for duty.

Guidelines are:—

(a) Any evidence, clinically or radiologically of present or past pulmonary disease. This includes a history of asthma necessitating appreciable loss of time from work.

The main concerns here are tuberculosis and pneumoconiosis, the latter being particularly important for men who have spent a number of years in coal or other mines. A history of asthma or established chronic bronchitis will render unacceptable.

(b) Cardiac disease—including hypertension and accept an upper limit of resting diastolic pressure as 100 mms. of mercury (90 mms. for men under 40 years of age). Hypertension requiring continued treatment for control may render unacceptable.

(c) Defective vision. There must be reasonable vision with each eye without the use of correction. The minimum standard is:—

(i) Uncorrect vision: Not less than 6/24 in one eye and not less than 6/60 in the other.

(ii) Corrected with glasses: Not less than 6/12 in both eyes.

If glasses are required, vision should comply with both the above standards. Loss of one eye rejects.

(d) Hearing—inability to hear ordinary conversation or with audiometry a binaural loss of 20% or greater will reject. Chronic otorrhoea is unacceptable.

(e) Epilepsy or a history of "fits"—self explanatory.

(f) Disability resulting from previous injury or disease with special attention to the back. A history of disc lesion causing loss of time or a previous laminectomy will reject.

This covers a wide variety of conditions. Amongst them are significant locomotor defects such as major amputation or if unable to wear heavy boots, work in cramped positions, kneel, stoop or crawl. A good hand grip is needed for efficient use of tools, manipulation of levers or controls. Under diseases we include diabetes, renal disease, anaemia, mental defect or hernia.

Diabetes—diabetics treated with diet alone or with oral blood sugar agents are generally capable of performing any job. Diabetics treated with insulin should not work underground or where an unexpected insulin reaction might cause injury to themselves or others. There is also the time distance problem to obtain assistance.

Control of diabetes must be acceptable to the examining medical officer.

(g) Should have reasonable general physique.

This is concerned mainly with ability to undertake a fair amount of physical exertion without severe strain.

(h) Any extensive chronic dermatitis which could be aggravated by dust, damp or perspiration—self explanatory.

(i) Any infection or venereal disease—this may involve temporary unfitness only.

(j) Glycosuria or albuminuria pending investigation—this may involve temporary unfitness only.

(k) Demonstrable hernia—self explanatory. However, a successful operation would be grounds for review.

It is suggested that where there are doubts concerning the fitness of a new entrant, consultation with a colleague, the Director of Industrial Medicine, or a consultant selected by The Queensland Coal Board should be carried out.

Form No. 3

THE QUEENSLAND COAL BOARD

IDENTIFICATION CARD—(Medical Examination—New Employees)

NAME OF COLLIERY:

Applicant's Name:

Address:

Date of Birth: Place of Birth:

Signature of Applicant:

Signature of Colliery Authorised Employment Officer:

EXAMINING MEDICAL OFFICER:

Name:

Address:

Signature of Applicant:

Signature of Medical Officer:

Code Number assigned by Examining Medical Officer for Applicant:

OFFICE USE ONLY
Code Numbers assigned by The Queensland Coal Board
No. Date

REVERSE SIDE:

This card is to be sent Registered Mail in the special envelope provided to:—

The Secretary,
The Queensland Coal Board,
G.P.O. Box 384,
Brisbane, Q., 4001.

Form No. 4

THE QUEENSLAND COAL BOARD

PRE-EMPLOYMENT MEDICAL EXAMINATION

Office Use Only

Code Number of Applicant:
(Refer Form No. 3)

Date and Place of Birth:

Name of Examining Doctor:

Previous illness—year:

Pneumonia
Pleurisy
Bronchitis
Asthma
Rheumatic Fever
Fits
Peptic Ulcer
Other

Operations—nature and year:

Injuries—nature and year:

INDUSTRIAL HISTORY

Mine and/or Locality	From Year	To Year	No. of Years	Coal Mining—Occupation			Other Mining —State Occupation and material	Non-Mining Occupation
				Face	Underground Non-face	Surface		

Form No. 5

THE QUEENSLAND COAL BOARD

SYMPTOM QUESTIONNAIRE

Examining Doctor

Date

Type of Examination
Pre
Routine
Retired or Special
(Tick to indicate)

		Answers			Code No.
		Yes	No	Other	
Cough:					
Do you usually cough when you get up, or first thing in the morning, in winter?	1				
Do you usually cough during the day and/or at night in the winter?	2				
If "Yes" to either of questions 1 and 2 or both Do you cough like this on most days for as much as three months of each year?	3				
Do you ever become dizzy or faint when you cough?	3a				
Have you ever fallen down when coughing? ..	3b				
Phlegm or Sputum:					
Do you bring up any phlegm when you get up or first thing in the morning in the winter? ("Yes" if estimated at least 2 cc. daily)	4				
Do you bring up any phlegm during the day, or at night in the winter?	5				
If "Yes" to either question 4 or 5 or both Do you bring up phlegm like this on most days for as much as three months each year?	6				
Estimated daily volume of sputum?	7				
Is it ever blood-stained?	8				
If "Yes", within the past year?	9				
Breathlessness on Exertion:					
Indicate Dyspnoea Grade at best time of day, average winter condition (1, 2, 3, 4, 5) after asking appropriate questions.	10				
Are you more breathless on waking or retiring than at any other times of day?	11				
How many pillows do you need for sleeping? ..	12				
Dyspnoea Grades 1 = nil, 2 = on slopes, 3 = unable to keep up on level, 4 = unable to walk on level at own pace, 5 = at rest					
Wheezing:					
Does your chest ever sound wheezy or whistling?	13				
If "Yes" to 13:— Do you get this most days or nights	14				
At what time of day does wheezing usually occur: (1) Only on waking or retiring?	15				
(2) throughout day and/or night	16				
Have you ever had attacks of shortness of breath with wheezing?	17				
If "Yes" to 17:— Is/was your breathing absolutely normal between attacks?	18				

Form No. 5 (*Continued*)

THE QUEENSLAND COAL BOARD

SYMPTOM QUESTIONNAIRE

Examining Doctor

Date

Type of Examination
Pre
Routine
Retired or Special
(Tick to indicate)

		Answers			Code No.
		Yes	No	Other	
Effect of Weather:					
Does the weather affect your chest?	19				
Only record " Yes " if adverse weather definitely and regularly causes chest symptoms: If " Yes " to 19					
Does this weather make you short of breath? ..	20				
Specify type of weather, e.g. fog, damp, cold, hot, west winds, north-east winds, stuffy atmospheres, underground work places, other ..	21				
Nasal Catarrh:					
Do you have a stuffy nose or post-nasal discharge at any time of the year?	22				
If " Yes " to 22					
Do you have this on most days for as much as three months of each year?	23				
Have you ever had any nasal operations? ..	24				
Do you have hayfever or seasonal attacks of sneezing and nasal congestion?	25				
Chest Pain and Tightness:					
Do you have any chest pain, tightness or discomfort?	26				
If " Yes " to 26					
Does pain occur only or mainly with exertion?	27				
Does the pain cause you to cease activity? ..	28				
And then eases off?	29				
What brings it on:					
(1) gentle level walking	30				
(2) hurrying or heavy lifting, etc.?	31				
Indicate by underlining type of pain—whether characteristically anginal, doubtful anginal, dyspeptic, pleuritic or pleurodynia, muscular, neuritic or osteoarthritic, chest tightness, cough soreness, etc.	32				
Chest Illnesses:					
During the past three years have you had any chest illness that has kept you from your usual activities for as much as a week?	33				
How many times?	34				
In the past three years have you had a period of increased cough and phlegm lasting three weeks or more?	35				
How many times?	36				

Form No. 5 (*Continued*)
THE QUEENSLAND COAL BOARD
SYMPTOM QUESTIONNAIRE

Examining Doctor

Date

Type of Examination
Pre
Routine
Retired or Special
(Tick to indicate)

		Answers			Code No.
		Yes	No	Other	
Back Injury, Backstrain, Lumbago:					
In the past three years have you had any trouble with your back that has kept you off work or from usual activities?	37				
If " Yes " what did the doctor say it was? ..	38				
Have you lost more than two weeks work or activity with this back trouble on any occasion during the past three years?	39				
Did you receive Workers' Compensation for any such absence from work?	40				
Tobacco Smoking Questionnaire:					
Do you smoke? (" Yes " or " No ")	41				
Do (did) you inhale?	42				
(If " No " to question 41 ask:—)					
When did you stop? (Never started, less than 2 years ago. Two or more years ago)	43				
If ever smoked, ask 44 and 45					
For how many years have you been a smoker? (Under 10 years. 10 to 20 years. Over 20 years)	44				
How much do you smoke? No. of cigarettes per day					
(average including week-ends):	45				
gm. of tobacco per week (hand-rolled) ..	45a				
gm. of tobacco per week (pipe)	45b				
Cigars per week	45c				
Alcohol:					
What do you drink? (T.T., Beer, Spirits, Wine)	46				
Are you a regular daily drinker?	47				
If " No " week-ends regularly?	48				
Occasional only?	49				
Average consumption per week? (grams alcohol)	50				
If " No " to question 47 and 48					
Were you ever a regular drinker?	51				

FOR INFORMATION

Tobacco

1 cigarette is taken as equivalent to 1 gm. tobacco
1 small cigar approximately = 2 gms. tobacco
1 large cigar approximately = 5 gms. tobacco

Alcohol

Beer equivalent:—1 ounce of beer	= 1 gm. alcohol
Light beer equivalent	= 2/3 beer equivalent
1 nip of spirits	= approximately 10 gms. alcohol
1 glass of table wine	= approximately 17 gms. alcohol
1 ounce measure of liqueur	= approximately 17 gms. alcohol

Form No. 6

MEDICAL EXAMINATION

General Appearance

Cyanosis Finger-clubbing

Height: Cms. (ft. ins.) Weight: Kgms. (st. lbs.)

Vision (uncorrected) Distant: VR VL Near: Colour Vision:

If wearing constant correction VR VL

Hearing and ears (Refer Form 8)

CAL % Loss Right ear Loss Left ear Binaural

Dental Condition

Respiratory System

Shape of thorax

Wheeze: at rest on forced breathing

Resonance: increased impaired dull site

Breath sounds Adventitiae

Respiratory Function: (Vitalograph)

	Predicted (L)	Observed (L)
Forced Exp. Vol. 1 sec FEV_1 (L)		
Forced Vital Capacity FVC (L)		
Vital Capacity VC (L)		
FEV_1/VC %		

Cardiovascular System

Pulse rate regular irregular

Blood pressure Position of apex beat

Cardiac dullness: normal increased diminished

Heart sounds Murmurs

Oedema

Central Nervous System

Pupils Superficial reflexes

Tremor Other

Hernia *Varicose Veins*

Skin

Musculo Skeletal System (N.B.: spine)

Urine *Albumen* *Sugar*

Comments (where applicable)

X-ray Report: ILO Pneumoconiosis Classification: 0/-, 0/0, 0/1, 1/0, 1/1, 1/2, 2/1, 2/2, 2/3, 3/2, 3/3, 3/+

Fit Fit restricted duty Unfit

Signature

Order—Coal Miners' Health Scheme

Form No. 7 15

HISTORY OF EMPLOYMENT AND MEDICAL EXAMINATION CARD

I certify I have sighted the Certificate of Fitness issued to—

Name:

Address:

Date of Birth:

Place of Birth:

by

Examining Medical Officer

On

(*Date*)

Employment commenced at

Colliery on

day of 19 .

Signature of Manager:

Name of Colliery:

EMPLOYMENT RECORD

Colliery	Ceased Employment	Commenced Employment

RECORD OF MEDICAL EXAMINATIONS

Date	Signature of Medical Officer

Signature of Holder:

16 *Order—Coal Miners' Health Scheme*

Form No. 8 (See Reverse)

THE QUEENSLAND COAL BOARD

Operator: Colliery:

Name: Date:

Address: Age: Date of Birth: / /19

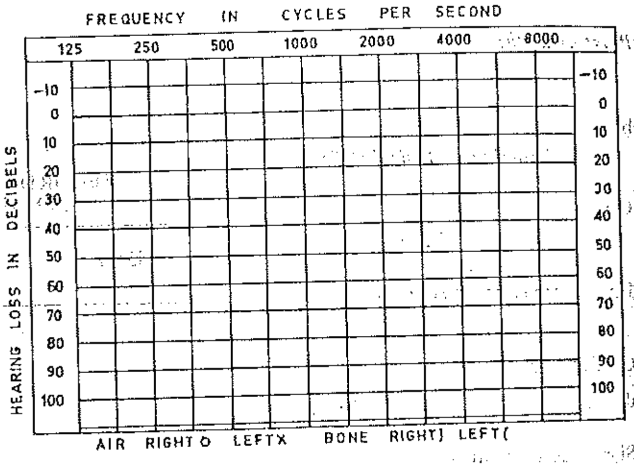
HEARING LOSS %

(C.A.L. SCALE)

R %

L %

OPINION



NOTE.—(1) Where this examination is carried out by a person other than the Examining Medical Officer, a copy shall be provided for that Examining Medical Officer.

(2) A copy shall be provided to and retained by the Colliery Company.

(AID SHEET FOR REVERSE SIDE OF FORM No. 8)

1. *Audiogram*:

Frequency	500	1000	1500	2000	3000	4000
Left ear						
Right ear						

2. *Presbyacusis Adjustment*: Subtract 0.5 decibel for every year above 50 years of age.

Frequency	500	1000	1500	2000	3000	4000
Left ear						
Right ear						

3. *Percentage Loss of Hearing*: Obtained from N.A.L. Monaural Tables.

	Left Ear		Right Ear	
	HL	PHL	HL	PHL
500				
1000				
1500				
2000				
3000				
4000				
		%		%

4. *Binaural Percentage Loss of Hearing*:

$$\frac{4 \times \% \text{ loss better ear} + \% \text{ loss of worse ear}}{5}$$

$$\frac{(4 \times \qquad) + \qquad}{5} = \qquad \%$$

ORDER

COAL MINERS' HEALTH SCHEME

The Queensland Coal Board,
Brisbane, 8th December, 1982.

THE Queensland Coal Board acting in pursuance of authority vested in it under the *Coal Industry (Control) Act* 1948–1978, hereby makes the following Order, the provisions of which are to come into force on and from the first day of January, 1983.

P. J. CRANITCH, Secretary.

An order for the compulsory medical examination of certain employees in the Coal Mining Industry, made in accordance with the authority granted to The Queensland Coal Board by the *Coal Industry (Control) Act* 1948–1978.

The Queensland Coal Board pursuant to the authority granted to it by the *Coal Industry (Control) Act* 1948–1978, hereby orders as follows:—

All employees in the coal mining industry who are or who have been engaged in mining or associated operations shall have a chest X-ray—the X-ray being carried out by employees of the Department of Health under the auspices of the Director of Tuberculosis.

In conjunction with the X-ray examination there shall be a check for Emphysema.

Advice will be given to each colliery manager some six (6) weeks in advance of the programmed time of arrival of the X-ray mobile unit.

The colliery manager shall give adequate forward advice to all employees eligible for X-ray of the time table arrangements and shall be responsible for the rostering of employees to allow all those eligible to be surveyed, and the colliery proprietor shall be responsible for all the costs of and any resultant or associated costs of those operations.

Employees will be contacted by the Department of Health if any follow up examination or further medical examination is necessary.

Should the Department of Health advise accordingly, The Queensland Coal Board will order a follow up X-ray and Emphysema check within five (5) years for the workforce or for such section or for such members of the workforce as necessary.

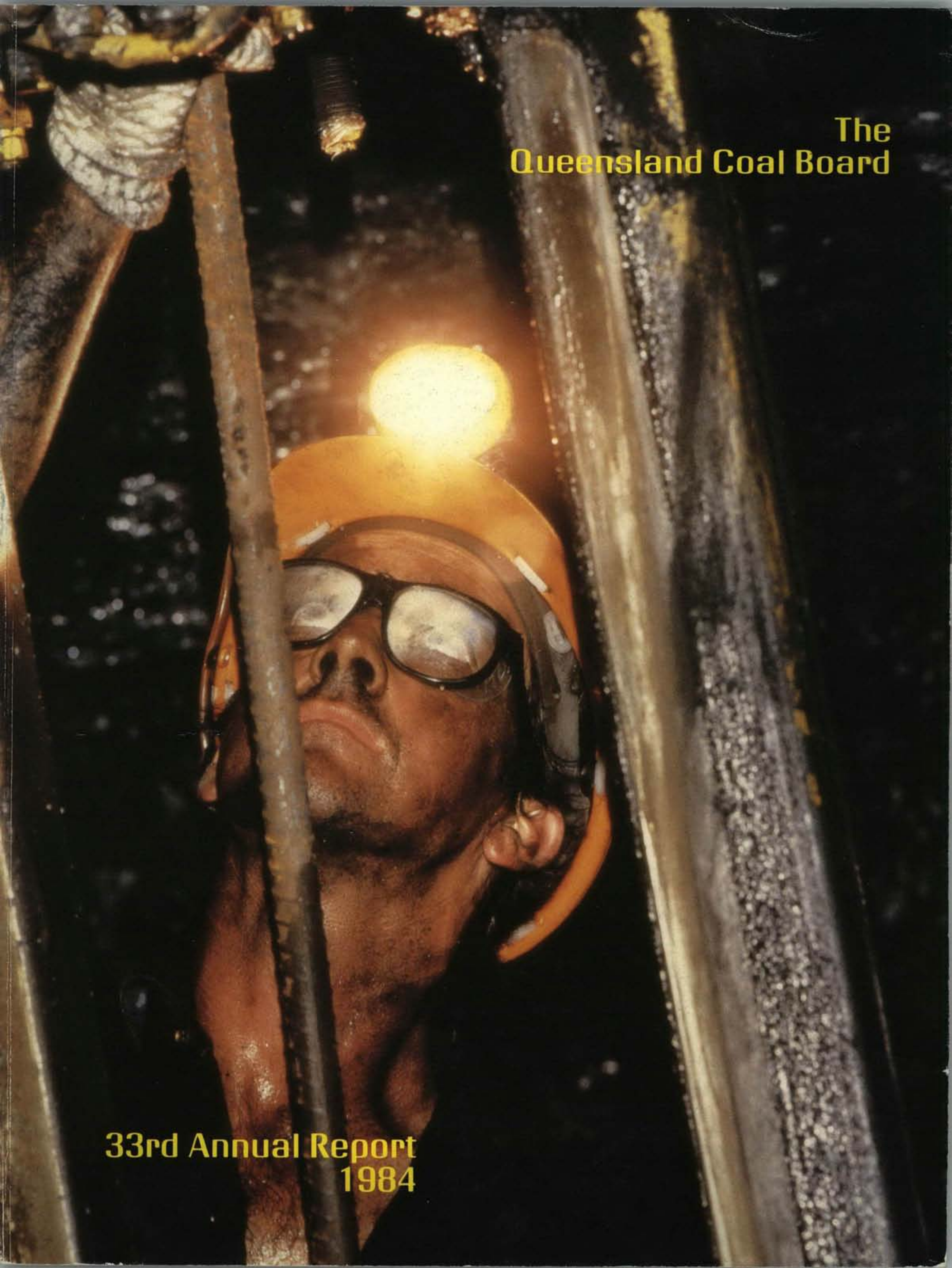
The manager of a colliery will issue to the eligible employees an X-ray identification voucher in a form approved by the Department of Health. The voucher will entitle the holder to a free X-ray and must clearly state the name, address, age and history of employment—particularly in the mining industry. Some questions on medical history also must be answered.

The Queensland Coal Board from its special fund is to meet the wage costs and travelling allowances of staff, running costs of the mobile unit, the costs of X-ray film, envelope packaging and storage, and a portion as agreed with the Department of Health of the cost of the X-ray mobile unit.

The Official Seal of The Queensland Coal Board was hereto affixed on the nineteenth day of October, 1982, by Patrick John Cranitch, Secretary to the Board, the officer designated to affix such seal, in the presence of Jack Tunstall Woods, Mervyn Lewis Noume and William James Platt.	J. T. WOODS, Chairman. M. L. NOUME, Member. W. J. PLATT, Member.

P. J. CRANITCH, J.P., Secretary.

51284—By Authority: S. R. Hampson, Government Printer, Queensland



The Queensland Coal Board

33rd Annual Report 1984

This train carrying approximately 4 700 tonnes of export coal to the Port of Abbot Point, consists of 82 bottom-dump wagons hauled by 4 diesel-electric locomotives. (COVER Roofbolting at Collinsville Underground Mine — Photo by Format Photographics, Brisbane)

Rj[illegible]

THE QUEENSLAND COAL BOARD

288 EDWARD STREET,
BRISBANE.
QUEENSLAND, 4000.
AUSTRALIA.

October 12, 1984

Sir,

The Queensland Coal Board herewith presents its Thirty-third Annual Report which covers the year ended June 30, 1984.

J.T. WOODS, Chairman
M.L. NOUME, Member
W.J. PLATT, Member

P.J. CRANITCH, Secretary

The Hon. IVAN J. GIBBS, M.L.A.,
Minister for Mines and Energy,
Brisbane.

Blair Athol

APPRECIATION

The Chairman and Members desire to record their appreciation for the co-operation and assistance received during the year from:

The Honourable the Minister.

The Chief Government Geologist and Officers of the Department of Mines.

The Government Analyst and Staff

The Solicitor General and Staff

Other Government Departments, Mining Companies, Electricity Generating Boards, Coal Consumers, the Queensland Coal Association, the Queensland Colliery Employees' Union and the Joint Coal Board

CONTENTS

STATISTICAL SECTION

THE COAL INDUSTRY 1984

Several highlights were achieved in the Queensland coal mining industry during the 1983–84 year, and the Board is pleased to report a continuing growth of activity.

Saleable coal production reached 44 million tonnes — the largest quantity mined in any 12 month period. Seven of the ten mining districts show increased output. New mines, further development of some mines which began operations during the previous year and an improved overall State output per manshift all contributed. Large new mines which came on stream were Meandu, Riverside, Curragh, Newlands and Blair Athol.

The number of employees continued to rise and at the close of the year 9 674 persons were engaged although 19 men were retrenched in the southern division. The redeployment programme which commenced the previous year continued with good relations by all parties.

Manshifts possible rose to 2.59 million of which 2.41 million or 93.05% were worked. The number of shifts lost through industrial problems shows a small increase of 0.81% over last year. The continuing co-operation between management and unions in industrial matters is again evident.

The quantity of coal used by industry in the State increased by 14.1%. Total consumption exceeded 9.8 million tonnes of which 7.6 million tonnes were burned at the power stations.

A record 33.1 million tonnes of coal was exported to 24 countries. The export comprised 29.6 million tonnes of coking coal and 3.5 million tonnes of steaming coal. Japanese trade continued to increase and sales to that country were 19.87 million tonnes.

Operations commenced at two additional export coal terminals — Dalrymple Bay, near Hay Point and Abbot Point, north of Bowen. Both facilities have been designed for fast loading and large bulk carriers.

The Chest X–ray survey of mining personnel was completed and involved 7784 X–rays being taken. An additional 123 workers also participated. A report by the Board's Medical Consultants was published and distributed.

Although no major new mines are currently being developed, existing and expanding mines have a designed production capacity exceeding 60 million tonnes of saleable coal per year. Five coal ports are now operational and duplication of railway lines used for the coal export trade is continuing. These ports and the railway system can adequately handle that production capability.

1984 IN BRIEF

EMPLOYMENT Total

DISTRICT	
West Moreton	1 069
Darling Downs	12
Maryborough	12
Nanango	103
Kianga-Moura	872
Callide	393
Blackwater	3 076
Blair Athol	175
Mackay	3 272
Bowen	690

NET PRODUCTION Tonnes

DISTRICT	
West Moreton	2 936 671
Darling Downs	9 833
Maryborough	17 013
Nanango	602 980
Kianga-Moura	2 251 206
Callide	3 736 661
Blackwater	15 398 887
Blair Athol	934 174
Mackay	16 956 945
Bowen	1 191 721

OUTPUT PER MANSHIFT State

OVERALL Tonnes	
Underground Mines	7.05
Open-cut Mines	21.27

9 674

COAL CONSUMPTION Tonnes

9.8 MILLION

*Electricity Generation	7 635 636
Metal Processing	1 436 994
Building Materials	273 744
Ships' Bunkers	183 827
Food Processing	107 362
Paper and Board Mills	80 998
Coke Works	66 742
Miscellaneous	45 515

*Includes Mica Creek, Mt. Isa

COAL EXPORTS Tonnes

33.1 MILLION

44.0 MILLION

Japan	19 871 766
Italy	2 187 044
France	1 821 197
Korea	1 531 696
Taiwan	1 371 878
Spain	1 135 328
Netherlands	1 050 019
United Kingdom	761 426
Hong Kong	704 477
Romania	588 427
Brazil	483 109
Iran	397 836
Belgium	263 342
Egypt	259 791
Turkey	240 157
F.R. Germany	159 946
Yugoslavia	81 245
Algeria	54 649
India	49 700
Chile	27 267
Malaysia	20 257
Fiji	20 090
Burma	8 954
Indonesia	5 737

18.25

COAL VALUE

$1.7 BILLION

The mine site value of coal produced is estimated at Australian $1 668 595 974.

OPERATING COAL MINES

JUNE 30, 1984

DISTRICT	COMPANY	MINES	OPERATION
WEST MORETON	Allied Queensland Coalfields, G.P.O. Box 1692, BRISBANE. QLD. 4001.	New Whitwood No.3	Open-cut
	Jeebropilly Collieries Pty. Ltd., P.O. Box 47, IPSWICH. QLD. 4305.	Amberley	Open-cut
	New Hope Collieries Pty. Ltd., P.O. Box 47, IPSWICH. QLD. 4305.	New Hope Nos. 4A, 6, 7 & Western Leases	U/ground
		New Hope No. 1	Open-cut
		New Hope Area No. 2	Open-cut
	Oakleigh Colliery Pty. Ltd., P.O. Box 25, ROSEWOOD. QLD. 4340.	Oakleigh No. 3	U/ground
		Oakleigh	Open-cut
	Rhondda Collieries Pty. Ltd., P.O. Box 109, IPSWICH. QLD. 4305.	Rhondda No. 1	U/ground
		Rhondda No. 5	U/ground
		M.W. Haenke	U/ground
		M.W. Haenke No. 2	U/ground
		Wattle Glen Extnd.	Open-cut
	Southern Cross Collieries, P.O. Box 47, IPSWICH. QLD. 4305.	Southern Cross No. 12	U/ground
		Southern Cross No. 14	U/ground
		Southern Cross No. 15	U/ground
		Southern Cross No. 3	Open-cut
	Westfalen Colliery Pty. Ltd., P.O. Box 215, BOOVAL. QLD. 4304.	Westfalen No. 3	U/ground
		Box Flat No. 8	U/ground
		Box Flat No. 9	U/ground
		Box Flat Extnd. No. 2	Open-cut
DARLING DOWNS	Acland Coal Company Pty. Limited, P.O. Box 138, TOOWOOMBA. QLD. 4350.	Acland No. 3	U/ground
NANANGO	Pacific Coal Pty. Limited, G.P.O. Box 391, BRISBANE. QLD. 4001.	Meandu	Open-cut
MARYBOROUGH	Burgowan Collieries Pty. Ltd., 386 Albert Street, MARYBOROUGH. QLD. 4650.	Burgowan No. 12	U/ground

OPERATING COAL MINES (Continued)

JUNE 30, 1984

DISTRICT	COMPANY	MINES	OPERATION
KIANGA-MOURA	Thiess Dampier Mitsui Coal Pty. Ltd., G.P.O. Box 2206, BRISBANE. QLD. 4001.	Moura No. 2 Moura No. 4 Moura	U/ground U/ground Open-cut
CALLIDE	Thiess Bros. Pty. Limited, G.P.O. Box 18, BRISBANE. QLD. 4001.	Boundary Hill Callide	Open-cut Open-cut
BLACKWATER	Capricorn Coal Management Pty. Limited, G.P.O. Box 1410, BRISBANE. QLD. 4001.	German Creek Central German Creek	U/ground Open-cut
	Central Queensland Coal Associates, G.P.O. Box 1389, BRISBANE. QLD. 4001.	Blackwater	Open-cut
	Coal Resources of Queensland Pty. Ltd., G.P.O. Box 2692, SYDNEY. NSW. 2001.	Cook	U/ground
	Curragh Queensland Mining Limited, G.P.O. Box 807, BRISBANE. QLD. 4001.	Curragh	Open-cut
	Gregory Joint Venture, G.P.O. Box 1389, BRISBANE. QLD. 4001.	Gregory	Open-cut
	Oaky Creek Coal Pty. Ltd., G.P.O. Box 856, BRISBANE. QLD. 4001.	Oaky Creek	Open-cut
	Thiess Bros. Pty. Limited, G.P.O. Box 18, BRISBANE. QLD. 4001.	South Blackwater No. 1 South Blackwater Yarrabee	U/ground Open-cut Open-cut
BLAIR ATHOL	Blair Athol Coal Project, G.P.O. Box 391, BRISBANE. QLD. 4001.	Blair Athol	Open-cut

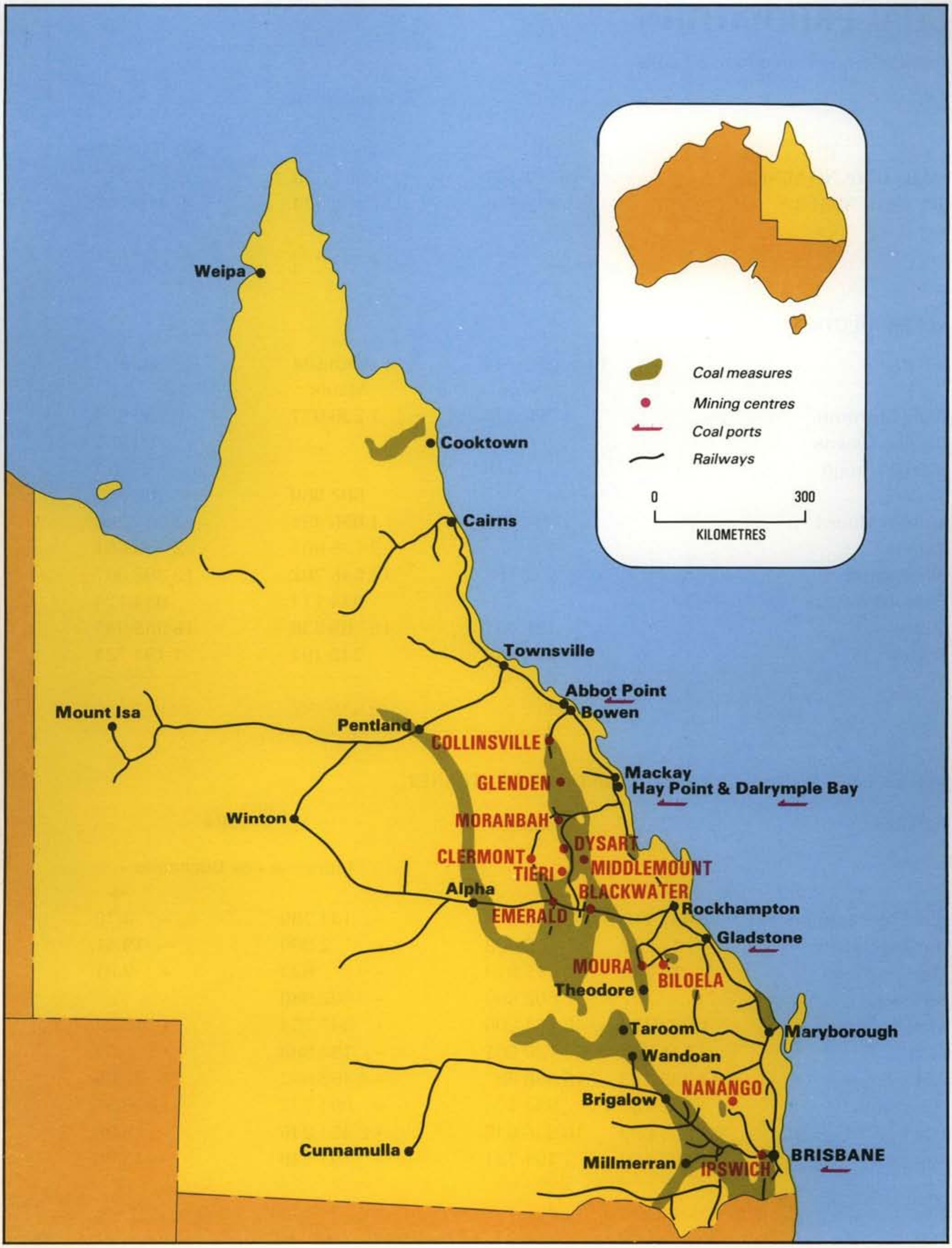
OPERATING COAL MINES (Continued)

JUNE 30, 1984

DISTRICT	COMPANY	MINES	OPERATION
MACKAY	Central Queensland Coal Associates, G.P.O. Box 1389, BRISBANE. QLD. 4001.	Harrow Creek Goonyella Norwich Park Peak Downs Saraji	U/ground Open-cut Open-cut Open-cut Open-cut
	Newlands Coal Pty. Ltd., G.P.O. Box 1042, BRISBANE. QLD. 4001.	Newlands	Open-cut
	Thiess Dampier Mitsui Coal Pty. Ltd., G.P.O. Box 2206, BRISBANE. QLD. 4001.	Riverside	Open-cut
BOWEN	Collinsville Coal Company Pty. Ltd., G.P.O. Box 1433, BRISBANE. QLD. 4001.	Bowen No. 2 Bowen No. 3 Bowen Central No. 3 Garrick West & Scott Denison	U/ground U/ground Open-cut Open-cut

German Creek.

QUEENSLAND


Weipa
Cooktown
Cairns
Townsville
Abbot Point
Bowen
Mount Isa
Pentland
COLLINSVILLE
GLENDEN
Mackay
Hay Point & Dalrymple Bay
Winton
MORANBAH
DYSART
CLERMONT
MIDDLEMOUNT
TIERI
BLACKWATER
Alpha
EMERALD
Rockhampton
Gladstone
MOURA
BILOELA
Theodore
Taroom
Maryborough
Wandoan
NANANGO
Brigalow
Cunnamulla
BRISBANE
Millmerran
IPSWICH
Coal measures
Mining centres
Coal ports
Railways
0
300
KILOMETRES

COAL PRODUCTION

Tonnes—Year Ended June 30, 1984

ALL DISTRICTS

	RAW	DISCARD	NET SALEABLE
UNDERGROUND MINES	5 279 703	1 662 356	3 617 347
OPEN-CUT MINES	51 917 818	11 499 074	40 418 744
	57 197 521	13 161 430	44 036 091

NET PRODUCTION

District	Underground Mines	Open-Cut Mines	Total
West Moreton	1 700 594	1 236 077	2 936 671
Darling Downs	9 833	..	9 833
Maryborough	17 013	..	17 013
Nanango	..	602 980	602 980
Kianga-Moura	394 775	1 856 431	2 251 206
Callide	..	3 736 661	3 736 661
Blackwater	852 185	14 546 702	15 398 887
Blair Athol	..	934 174	934 174
Mackay	196 407	16 760 538	16 956 945
Bowen	446 540	745 181	1 191 721
	3 617 347	40 418 744	44 036 091

DISTRICT NET PRODUCTION 1982-83 and 1983-84—TONNES

District	1982-83	1983-84	1984 Increase + or Decrease −	1984 Increase + or Decrease − %
West Moreton	3 081 410	2 936 671	− 144 739	− 4.70
Darling Downs	12 202	9 833	− 2 369	− 19.41
Maryborough	16 389	17 013	+ 624	+ 3.81
Nanango	..	602 980	+ 602 980	..
Kianga-Moura	1 903 452	2 251 206	+ 347 754	+ 18.27
Callide	3 541 673	3 736 661	+ 194 988	+ 5.51
Blackwater	11 235 225	15 398 887	+ 4 163 662	+ 37.06
Blair Athol	132 437	934 174	+ 801 737	+ 605.37
Mackay	14 505 699	16 956 945	+ 2 451 246	+ 16.90
Bowen	1 383 469	1 191 721	− 191 748	− 13.86
	35 811 956	44 036 091	+ 8 224 135	+ 22.96

PRODUCTION OF SALEABLE COAL

INCREASE

With the opening of new mines and increased utilisation of productive capacity overall within the industry, production of saleable coal increased to 44 million tonnes, which is 22.96% higher than 1982–83.

While underground production has declined by approximately 200 000 tonnes, the open–cut output rose by 26.35% from 31.99 million tonnes to 40.42 million tonnes.

Due to improved overall efficiency of the industry, together with the output of the new mines, the average output per employee per year rose from 4 082 tonnes in 1983 to 4 552 tonnes. The average State overall output per manshift of 18.25 is the highest ever achieved within the Queensland coal industry. The basis used for calculating this figure is a 35 hour week worked five days by seven hour shifts.

VALUE

The mine site value of coal produced within the State during the year is estimated at $A1 669 million.

STATISTICAL INFORMATION

Statistical information and data for the year covers 52 weeks or 239 working days. The preceding year, for statistical purposes, covered 53 weeks or 242 working days. The 1984 statistical year commenced on July 3, 1983 and closed on June 30, 1984.

EMPLOYMENT

Employees at the underground mines were 109 fewer than last year. The workforce at the open–cuts increased by 1 010, and the total number of employees at the end of the year was 9 674, the highest number engaged in the industry.

MANSHIFTS LOST THROUGH INDUSTRIAL PROBLEMS

Manshifts lost through industrial disputes increased by less than 1% to 1.97% of manshifts possible during the year.

In the report for 1982–83 it was stated that industrial harmony between management and labour had achieved outstanding results during that year. Although there was only a slight increase in the percentage of manshifts lost during the year, it reflects the continuing effort being made by relevant parties to keep industrial action down to a minimum. Goodwill in the area of industrial relations is providing direct benefits to the coal industry as is shown by the upturn in the output per manshift figures and in the average production per man.

Disputes at the underground mines, as a percentage of manshifts possible, declined on District bases in West Moreton, Darling Downs, Maryborough and Bowen. A small increase of 0.6% was recorded in the Kianga–Moura District. An increase of 1.7% in disputes occurred in the Blackwater District. As production from the underground mines in this District was 23.6% of the total underground output the increased number of Blackwater disputes only had a small effect on the overall State production and general upturn in efficiency.

The percentage of manshifts lost at the open–cut mines increased from 1.09% to 2.05% of manshifts possible. The largest percentage lost was in the Mackay District where 2.33% was recorded. However, overall manshifts possible at the open–cut mines in this District increased by 92 725.

WEST MORETON DISTRICT

In this District, 21 mines operated of which 13 were underground and 8 were open–cut. Combined production was 2.9 million tonnes, comprising 1.7 million from underground mines and 1.2 million from open–cuts. District production fell by 4.7%.

PRODUCTION OF SALEABLE COAL (Continued)

WEST MORETON DISTRICT (Continued)

Overseas exports increased from 787 040 tonnes to 803 956 tonnes. An accelerated growth rate in export coal will be required in 1985 to offset anticipated reductions in coal requirements for Brisbane and Swanbank Power Stations. It is believed West Moreton exports could be increased to a level slightly in excess of one million tonnes in 1985.

The number of persons employed in the District dropped by 13.3% from 1 233 to 1 069. Some men will be retrenched owing to the closure of the Southern Cross mines towards the end of 1984. However, retrenchments will be modified by natural attrition within the workforce.

NANANGO DISTRICT

Mining commenced during the year and production from Meandu open–cut totalled 602 980 tonnes. The coal was sold under contract as an unwashed product to the adjacent Tarong Power Station. As it is a captive mine to this Power Station development, sales to other outlets are not envisaged.

At June 30, 1984, 103 people were employed at the mine.

Manshifts lost during the year were 1.5% of overall possible manshifts, the lowest in the State. There were no industrial disputes at the mine.

MOURA DISTRICT

Moura District production increased from 1.9 million tonnes to 2.25 million tonnes, a rise of 0.35 million tonnes or 18.42%. The additional production was achieved with less manpower which declined by 41 to 872 employees at June 30. The reduced manpower was due in part to natural attrition, but in the main to men being transferred to the new open–cut mine at Riverside which is operated by the same company.

Production per man increased from 2 085 to 2 582 tonnes. Underground output fell from 0.51 million to 0.39 million tonnes or 23.53%. This decline was offset by the increase from the open–cut mines from 1.4 million to 1.86 million tonnes, a rise of 0.46 million tonnes or 32.86%.

The number of manshifts lost due to industrial disputes rose at the underground mines from 1.18% to 1.78% and from 0.74% to 2.22% at the open–cut mines. Notwithstanding the slight increase in industrial disputation, the output per manshift worked at the underground mines increased from 7.57 to 8.01 tonnes, and at the open–cuts from 7.27 to 11.7 tonnes.

Coal exports totalled 2.23 million tonnes. All of the coking coal exported (1.65 million tonnes) went to Japan. Steaming coal is also sold to consumers in Japan and Hong Kong.

The producing mines are Moura Undergrounds Nos. 2 and 4, and the Moura Open–cut, which now incorporates the Kianga Open–cut.

CALLIDE DISTRICT

During the year the Callide District mines, Boundary Hill, Dunn Creek and Trap Gully, approached their designed capacity and production was increased by 5.6% from 3.54 million tonnes in 1983 to 3.74 million tonnes in 1984.

Total employment as at June 30, reached 393, resulting in an output per man of 9 508 tonnes compared with 9 345 tonnes last year. The output per manshift rose from 34.47 to 35.33 in the year under review.

Manshifts lost in total, expressed as a percentage of manshifts possible, increased by a small margin to 5.44%, while industrial disputes declined to 0.65%.

Callide coal is sold to the Callide and Gladstone Power Stations, Queensland Alumina Limited and to other sundry markets. The Callide mines also supply coal for the coal–fired ships which ply between Gladstone and Weipa on the Gulf of Carpentaria. The District has an estimated production capacity of 4.5 million tonnes of saleable coal per year.

PRODUCTION OF SALEABLE COAL (Continued)

BLACKWATER DISTRICT

The Blackwater District has ten operating mines, of which three are underground and seven are open–cuts. Saleable coal produced through the year was 0.85 million tonnes from underground mines and 14.55 million tonnes from the open–cut mines. The District produced both coking and steaming coals which are mainly exported. Exports for the mines for 1983–84 are as follows:–

Mine	Million Tonnes
Blackwater	3.08
German Creek	2.52
Oaky Creek	2.11
Gregory	1.96
South Blackwater	1.63
Curragh	0.36
Cook	0.21
Yarrabee	0.20
	12.07

Exports comprised 10.87 million tonnes of coking coal and 1.2 million tonnes of steaming coal. The largest market was Japan, and other sales were made to customers in Europe, Asia, etc.

The Curragh open–cut mine commenced operation during the year and the development programme at Oaky Creek increased production at that mine from 0.5 million tonnes in 1983 to 2.5 million tonnes in 1984.

Employment in the Blackwater District increased by 550 (21.8%) from 2 526 to 3 076. Most of this gain is attributable to the commissioning of Curragh and the continuing development of Oaky Creek. Total manshifts lost as a percentage of manshifts possible declined from 11.46% to 10.81% at the underground mines, while a slight increase from 6.18% to 6.34% is shown at the open–cut mines.

South Blackwater and Yarrabee

Production from the South Blackwater mines was 0.28 million tonnes from the underground operation and 1.2 million tonnes from the open–cut

Productivity increased at the open–cut and the average output per day increased from 4 617 to 5 023 tonnes. The underground mine showed a decline in the overall output per manshift and average daily production.

Exports from the South Blackwater mines rose from 1.5 million tonnes to 1.6 million tonnes in 1984. The quantity of steaming coal sold increased from 147 843 tonnes to 532 359 tonnes, while coking coal sales decreased.

Production from the Yarrabee open–cut showed a gain of 9% on last year. This was achieved with less staff and so resulted in a higher overall O.M.S.

Exports of Yarrabee semi–anthracite improved slightly with the majority of the coal being shipped to Japan. A small quantity was consigned to Indonesia.

Cook

Production at this colliery increased from 0.36 million tonnes to 0.52 million tonnes in 1984. At the same time productivity per manshift rose by 30.4%. Industrial disputes and total manshifts lost declined appreciably.

Exports totalled 0.21 million tonnes compared with 0.28 million tonnes in 1983. All the exports were made to the Republic of Korea.

Gregory

Gregory, which is now managed by the Utah Development Company produced 2.01 million tonnes compared with 2 million tonnes in 1983. This, as with many other mines was achieved with reduced staff levels which fell from 425 employees as at July 2, 1983 to 415 as at June 30, 1984. The lowering of manpower was reflected in the increased O.M.S. from the mine. Manshifts lost increased fractionally.

PRODUCTION OF SALEABLE COAL (Continued)

BLACKWATER DISTRICT (Continued)

GREGORY (Continued)

Exports exceeding 1.9 million tonnes were made to four countries, the largest sales being made to consumers in Japan.

Blackwater

Combined production at this mine fell from 4.15 million to 4.02 million tonnes. While coking coal production increased from 2.39 million tonnes to 2.92 million tonnes, steaming coal output fell from 1.76 million tonnes to 1.1 million tonnes. This was achieved with lower staff levels and reflects a marked increase in the output per manshift.

Exports from the Blackwater mine were the fourth largest in the State and shipments were made to 10 countries. Coking coal sales were 2.67 million tonnes and steaming coal sales were 0.41 million tonnes. Steaming coal was exported to 3 countries, the largest tonnage being consigned to Hong Kong (0.26 million tonnes). These sales were made following approval by the Queensland Government.

The quantity of steaming coal supplied to the power station at Gladstone totalled 1.1 million tonnes.

German Creek

German Creek open–cut production increased from 2.3 million tonnes to 2.46 million tonnes. A small amount of coal produced was supplied to the power station at Gladstone, although the majority of output was for export. Production from the underground mine rose to 0.05 million tonnes. This coal was for the export trade.

Export sales from the two mines for the year under review totalled 2.53 million tonnes. Coal is now being shipped through the new export terminal at Dalrymple Bay. During the year sales were made to eight countries, with the largest quantity going to Japan.

Shift losses due to all causes throughout the year were still maintained at a low level.

German Creek Mines are designed for an output of 4 million tonnes from both underground and open–cut operations.

The open–cut had an employment figure of 485 and the underground 93 as at June 30.

Oaky Creek

Development of the Oaky Creek open–cut continued during the year and production rose from 0.54 million tonnes to 2.46 million tonnes. The number of persons employed increased from 245 to 328.

2.11 million tonnes of Oaky Creek coal were exported during 1984 to six countries in Europe and Asia. Shipments were made through Gladstone and the new export terminal at Dalrymple Bay.

The mine has a designed annual production capacity of 3 million tonnes.

Curragh

The Curragh open–cut mine commenced operations at the beginning of the financial year and the first coal was extracted during August, 1983. Production for the year under review amounted to 2.17 million tonnes.

Sales totalled 1.89 million tonnes of which 0.36 million tonnes of coking coal was exported. The balance was supplied to the Gladstone Power Station for steam raising.

The mine is designed to produce 2.8 million tonnes of coking coal and 4 million tonnes of steaming coal per year. The steaming coal will be used by Queensland Power Stations, and the coking coal will be for the export trade.

The coal is shipped through the Port of Gladstone.

PRODUCTION OF SALEABLE COAL (Continued)

BLAIR ATHOL DISTRICT

The new mine is being developed to service a long–term steaming coal contract with electricity authorities in Japan. The mine has a planned annual productive capacity of 5 million tonnes. The Blair Athol seam contains in excess of 200 million tonnes of recoverable reserves of good quality steaming coal.

Production at Blair Athol increased from 0.13 million to 0.93 million tonnes of coal during 1983–84. The workforce engaged at the mine has risen to 175, and further expansion in employment is envisaged as export trade grows.

Exports during the year were 440 602 tonnes to Japan and 63 404 tonnes to Hong Kong. The overall output per manshift rose to 26.29 tonnes during the year.

The Blair Athol Project, as a large steaming coal development will in future make a major contribution to satisfying export market demands.

MACKAY DISTRICT

Central Queensland Coal Associates Mines

Production from these mines, which include Harrow Creek underground and the open–cuts of Goonyella, Peak Downs, Saraji and Norwich Park, totalled 14.42 million tonnes compared with 14.51 million tonnes in 1983, and a peak of 16.23 million tonnes achieved in 1981. The recession in the coking coal market is responsible for the decline.

Employment figures of 2 574 are the lowest for the last 4 years and the output per man per year rose slightly to 5 603 tonnes.

Exports from the mines totalling 15.3 million tonnes were made to 15 countries.

Newlands

The new Newlands mine has been designed to produce 4 million tonnes of steaming coal per year for the export market.

Production commenced during February, 1984 and 0.52 million tonnes were mined to June 30.

Employment was 313 and will continue to grow as production from this mine increases to full capacity.

Overseas exports commenced in March, 1984 and 0.41 million tonnes were shipped to consumers in Europe and Hong Kong. Newlands coal is railed to the new Abbot Point Terminal.

Newlands will add considerably to the State's steaming coal potential to meet this growing market.

Riverside

The Riverside mine is an open–cut operation designed for an annual output of 3.3 million tonnes of coking coal. Long–term contracts have been signed with Japanese steel mills and the first export of 55 561 tonnes was made through Hay Point on October 5, 1983. Shipments continued via Hay Point until the middle of November,1983 when the Dalrymple Bay facility became operative. Exports have since been made through this terminal.

Saleable production from the mine totalled 2.02 million tonnes. Employment at June 30,1984 was 385. Exports to Japan totalled 1.67 million tonnes.

Riverside was brought into production with a minimum of industrial problems. Less than 1% of total available manshifts was lost through disputes. A large number of employees were transferred from the Moura mines as part of the company's redeployment policy.

PRODUCTION OF SALEABLE COAL (Continued)

BOWEN DISTRICT

Two underground and two open–cut mines were operated at Collinsville. Combined production fell from 1.38 million tonnes to 1.19 million tonnes for the 1983–84 year. Underground output increased by 6.9%, while open–cut tonnage declined by 22.8%

Employment at the mines was 433 at the open–cut areas and 257 for the undergrounds. These figures are reasonably consistent with the preceding year.

The overall output per manshift for the underground mines increased, while the open–cut figures showed a fall. The continued development of the open–cut mines contributed to the reduced O.M.S. in this sector.

Industrial disputes declined further during the year and a drop of 0.71% is shown. Manshifts lost overall also fell and resulted in a reduction of 0.6%.

On the domestic market coal was sold to the Queensland Electricity Generating Board, Mount Isa Mines Limited, Queensland Nickel Pty. Ltd., North Australian Cement Ltd. and to other industries. Consumption requirements for metal processing declined.

The contract for the supply of 1 million tonnes of coking coal per year for Japan commenced. During the year 68 443 tonnes were shipped through the new Port of Abbot Point.

OUTPUT PER MANSHIFT AND MANSHIFTS WORKED AND LOST

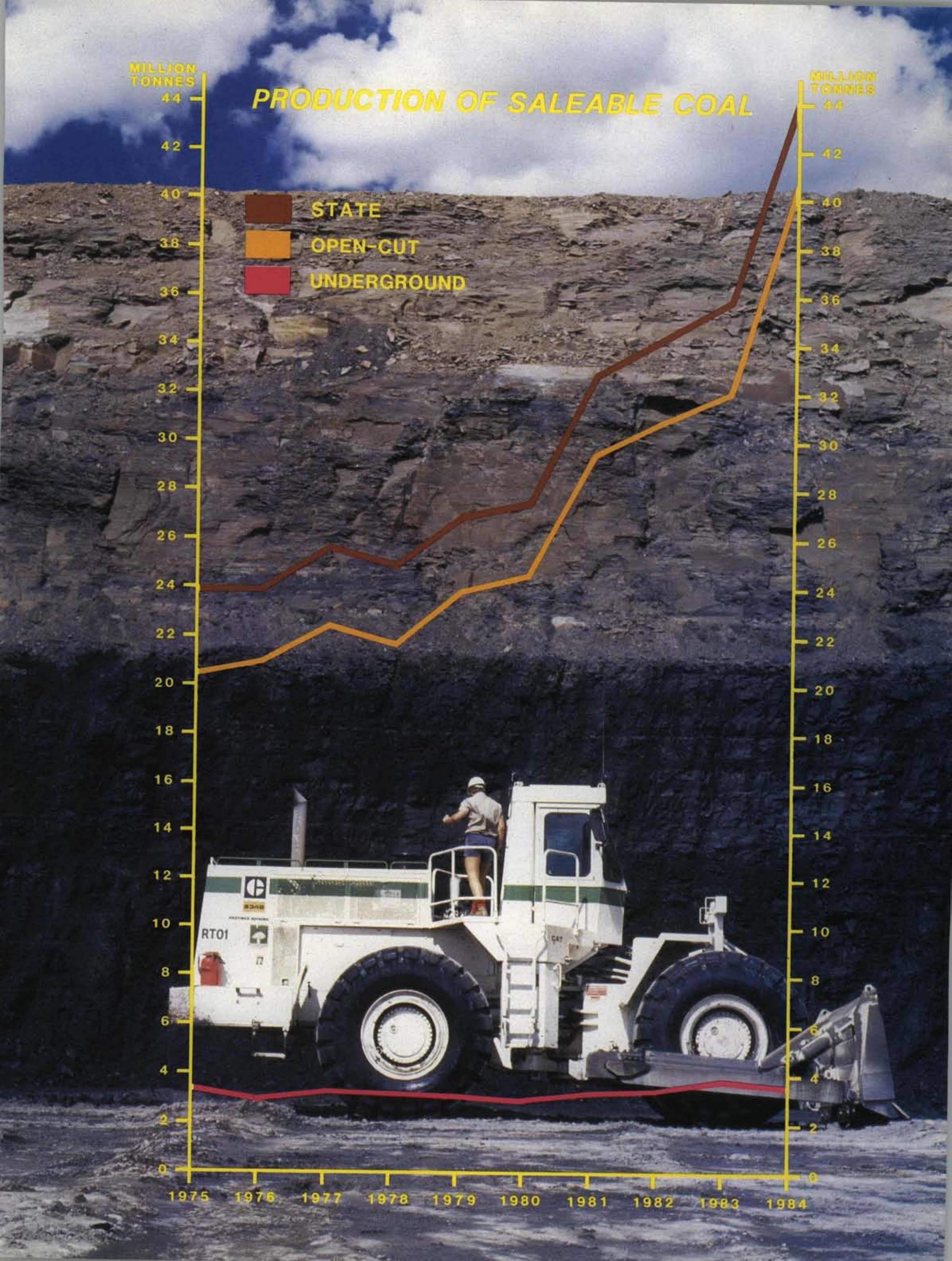
State figures for the financial years 1982-83 and 1983-84 are as follows: –

OUTPUT PER MANSHIFT

	1982-1983 Tonnes	1983-1984 Tonnes
Underground		
Coal Face	22.70	24.45
Overall	6.53	7.05
Open-cut		
Overall	18.99	21.27
STATE		
Overall	15.78	18.25

MANSHIFTS WORKED AND LOST

	1982-1983	1983-1984
Manshifts Possible	2 437 162	2 593 687
Number Worked	2 270 241	2 413 495
Number Lost	166 921	180 192
— Disputes	28 190	51 153
— Sickness	68 162	65 785
— Compensation	27 788	26 040
— Absenteeism	40 654	37 061
— Other	2 127	153



PRODUCTION OF SALEABLE COAL
MILLION TONNES
STATE
OPEN-CUT
UNDERGROUND
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
RT01

RAW COAL PRODUCED AND DISCARD

Year Ended June 30, 1984—Tonnes

DISTRICT AND MINE	RAW	DISCARD	SALEABLE	% DISCARD
WEST MORETON				
UNDERGROUND				
Box Flat No. 8	111 312	30 032	81 280	26.98
Box Flat No. 9	253 921	74 049	179 872	29.16
New Hope	735 279	368 513	366 766	50.12
Oakleigh	204 848	90 521	114 327	44.19
Rhondda No. 1	209 590	104 505	105 085	49.86
Rhondda No. 5	201 420	63 728	137 692	31.64
M.W. Haenke No. 1	359 149	176 412	182 737	49.12
M.W. Haenke No. 2	283 863	139 262	144 601	49.06
Southern Cross No. 9	18 957	7 582	11 375	40.00
Southern Cross No. 12	123 334	52 798	70 536	42.81
Southern Cross No. 14	91 697	46 118	45 579	50.29
Southern Cross No. 15	11 951	6 741	5 210	56.41
Westfalen No. 3	362 564	107 030	255 534	29.52
OPEN-CUT				
Amberley	571 620	242 444	329 176	42.41
Box Flat	141 885	56 753	85 132	40.00
New Hope	100 239	68 587	31 652	68.42
New Whitwood	1 031 041	576 253	454 788	55.89
Oakleigh	87 698	26 772	60 926	30.53
Southern Cross No. 3	376 123	196 437	179 686	52.23
Wattle Glen	178 507	87 314	91 193	48.91
Wattle Glen Extd.	6 707	3 183	3 524	47.46
DARLING DOWNS				
UNDERGROUND				
Acland No. 3	10 699	866	9 833	8.09
MARYBOROUGH				
UNDERGROUND				
Burgowan No. 12	19 254	2 241	17 013	11.64
NANANGO				
OPEN-CUT				
Meandu	602 980	. .	602 980	. .
KIANGA-MOURA				
UNDERGROUND				
Moura No. 2	363 634	117 015	246 619	32.18
Moura No. 4	226 030	77 874	148 156	34.45
OPEN-CUT				
Moura	2 387 741	531 310	1 856 431	22.25
CALLIDE				
OPEN-CUT				
Boundary Hill	1 481 858	18 273	1 463 585	1.23
Callide	2 274 277	1 201	2 273 076	0.05

DISTRICT AND MINE	RAW	DISCARD	SALEABLE	% DISCARD
BLACKWATER				
UNDERGROUND				
Cook	567 208	47 756	519 452	8.42
German Creek Central	70 830	16 010	54 820	22.60
South Blackwater No. 1	342 685	64 772	277 913	18.90
OPEN-CUT				
Blackwater	4 563 145	542 042	4 021 103	11.88
Curragh	2 173 099	. .	2 173 099	. .
German Creek	3 442 096	979 938	2 462 158	28.47
Gregory	2 571 108	558 760	2 012 348	21.73
Oaky Creek	3 141 073	683 475	2 457 598	21.76
South Blackwater	1 445 480	244 982	1 200 498	16.95
Yarrabee	219 898	. .	219 898	. .
BLAIR ATHOL				
OPEN-CUT				
Blair Athol	934 174	. .	934 174	. .
MACKAY				
UNDERGROUND				
Harrow Creek	264 938	68 531	196 407	25.87
OPEN-CUT				
Goonyella	5 426 356	975 009	4 451 347	17.97
Newlands	687 872	172 851	515 021	25.13
Norwich Park	3 105 617	607 715	2 497 902	19.57
Peak Downs	4 956 965	1 680 599	3 276 366	33.90
Riverside	3 657 146	1 636 099	2 021 047	44.74
Saraji	5 433 345	1 434 490	3 998 855	26.40
BOWEN				
UNDERGROUND				
Bowen No. 2	309 182	. .	309 182	. .
Bowen No. 3	137 358	. .	137 358	. .
OPEN-CUT				
Bowen Central No. 3	412 129	15 275	396 854	3.71
Garrick West S/D	507 639	159 312	348 327	31.38
TOTAL — UNDERGROUND	**5 279 703**	**1 662 356**	**3 617 347**	**31.49**
OPEN-CUT	**51 917 818**	**11 499 074**	**40 418 744**	**22.15**
STATE	**57 197 521**	**13 161 430**	**44 036 091**	**23.01**

Loading berths:– top, Dalrymple Bay; centre and lower, Hay Point.

COAL EXPORTS

During 1984 coal exports from the State reached a record 33.09 million tonnes compared with 26.4 million tonnes in 1983. The increase of 6.7 million tonnes is the highest in any financial year since exports of coking coal commenced in 1959–60.

Sales to Japan have again risen and 19.87 million tonnes were shipped to that country. Coking and steaming coal sales to Italy involved 2.19 million tonnes, the first year exports exceeded 2 million tonnes to another country, other than Japan.

The high growth rate in exports was made possible by further diversification of markets by some coal producers and new mines commencing production.

Exports from 23 mines were consigned to 24 overseas countries. A break–up of the exports shows that coking coal sales were 29.62 million tonnes and steaming coal were 3.47 million tonnes. The latter was supplied to 12 countries, compared with only 4 in 1983. The largest quantity of steaming coal, 2 million tonnes, went to Japan, followed by 704 477 tonnes to new markets in Hong Kong. Consumers in 5 European countries purchased steaming coal.

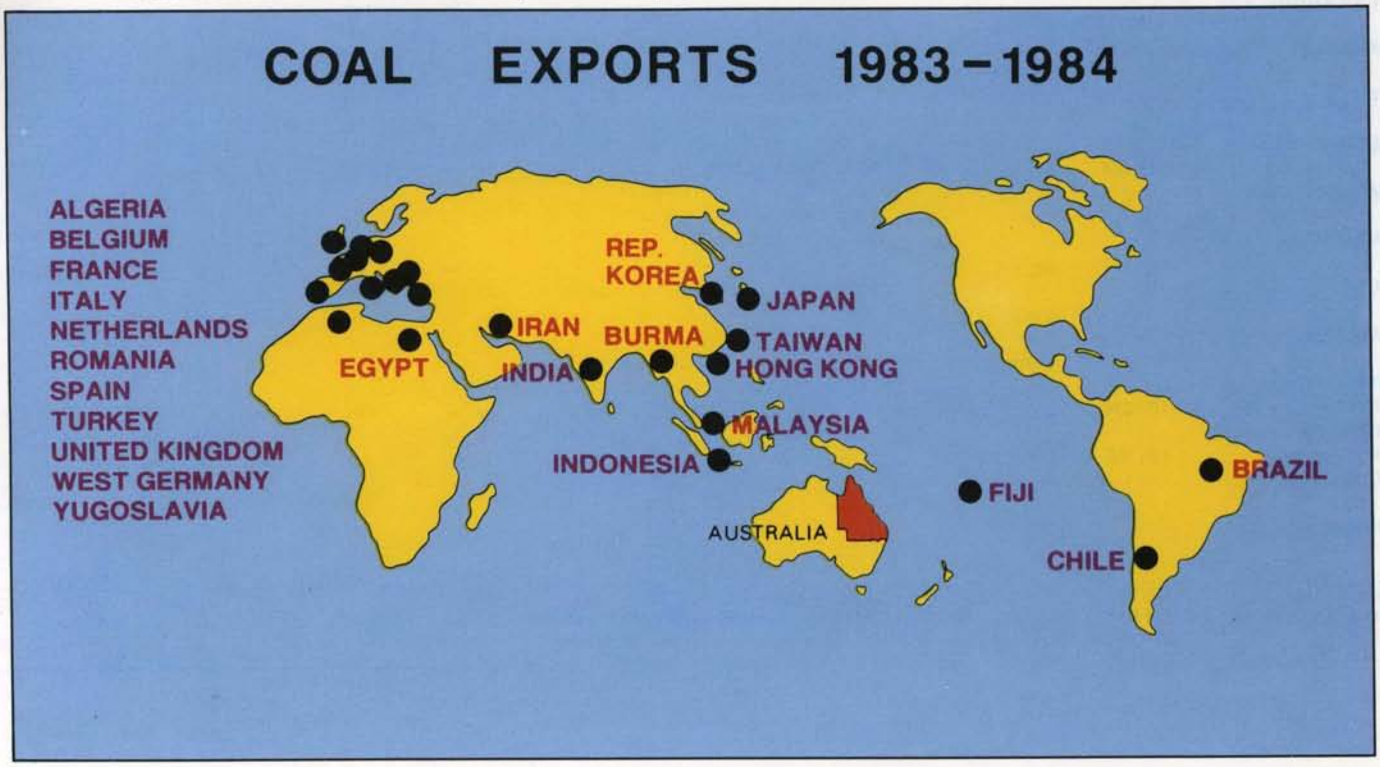
The table overleaf, indicates exports to Algeria, Malaysia, Yugoslavia, Burma and Indonesia. Such exports are the first to these countries.

Shipments through the Ports were as follows:–

Port	Million Tonnes
Brisbane	0.80
Gladstone	11.98
Hay Point	15.66
Dalrymple Bay	4.17
Abbot Point	0.48

Dalrymple Bay and Abbot Point are the two new export facilities where operations commenced in the second half of the financial year. Abbot Point is used for shipments from Newlands and Collinsville mines and Dalrymple Bay accommodates shipments from German Creek, Oaky Creek, Blair Athol and Riverside mines.

The industry is favourably placed to continue expanding during 1985. Steaming coal projects which commenced during 1984, have still to reach production capacity and additional output is available from coking coal mines. Coal ports throughout the State have designed capacity for increased trade well in excess of the estimated production potential.



COAL EXPORTS

Year Ended June 30, 1984

EXPORTS BY MINES TO OVERSEAS COUNTRIES

	Tonnes
Coking Coal	29 622 036
Steaming Coal	3 473 302
TOTAL	33 095 338

*Point of redistribution for agents

Designated port of shipment
(A) Abbot Point
(Br) Brisbane
(D) Dalrymple Bay
(G) Gladstone
(H) Hay Point

	JAPAN	ITALY	FRANCE	REP. OF KOREA	TAIWAN	SPAIN	*NETHER-LANDS	UNITED KINGDOM	HONG KONG	ROMANIA	BRAZIL	IRAN	*BELGIUM	EGYPT	TURKEY	F.R. OF GERMANY	YUGO-SLAVIA	ALGERIA	INDIA	CHILE	MALAYSIA	FIJI	BURMA	INDONESIA	SUB-TOTAL COKING AND STEAMING	TOTAL	PORT
GOONYELLA	2 902 694	—	159 143	326 005	263 815	—	442 080	99 896	—	—	80 772	—	—	—	94 902	—	14 650	27 098	24 850	—	—	—	—	—	4 435 905	4 435 905	(H) GOONYELLA
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
SARAJI	1 979 416	1 217 202	—	—	34 580	102 579	—	312 274	—	136 049	28 401	—	162 896	—	—	—	—	—	—	—	—	—	—	—	3 973 397	3 973 397	(H) SARAJI
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
PEAK DOWNS	2 238 415	—	887 165	—	—	121 670	—	—	—	378 287	—	—	6 323	—	145 255	—	—	27 551	24 850	—	—	—	—	—	3 829 516	3 829 516	(H) PEAK DOWNS
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
BLACKWATER	1 944 538	—	153 833	104 107	100 867	—	—	—	—	—	56 798	—	—	259 791	—	—	—	—	—	27 267	20 257	—	—	—	2 667 458	3 080 908	(G) BLACKWATER
	24 137	—	—	—	—	133 299	—	—	256 014	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	413 450		
NORWICH PARK	1 114 838	96 945	488 488	418 389	313 030	236 833	—	114 671	—	—	—	—	70 599	—	—	—	—	—	—	—	—	—	—	—	2 853 793	2 853 793	(H) NORWICH PARK
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
GERMAN CREEK	995 023	—	—	90 343	313 727	61 612	114 968	234 585	—	—	317 138	397 836	—	—	—	—	—	—	—	—	—	—	—	—	2 525 232	2 525 232	(D) GERMAN CREEK
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
MOURA	1 650 324	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1 650 324	2 233 219	(G) MOURA
	456 509	—	—	—	—	—	—	—	126 386	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	582 895		
OAKY CREEK	387 526	810 136	—	41 940	35 200	407 283	424 067	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2 106 152	2 106 152	(D) OAKY CREEK
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
GREGORY	1 351 690	—	—	339 949	219 039	47 907	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1 958 585	1 958 585	(G) GREGORY
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
RIVERSIDE	1 672 542	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1 672 542	1 672 542	(D) RIVERSIDE
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
SOUTH BLACKWATER	1 096 923	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1 096 923	1 629 282	(G) SOUTH BLACKWATER
	193 990	62 761	—	—	91 620	—	31 087	—	132 811	—	—	—	—	—	—	—	—	—	—	—	—	20 090	—	—	532 359		
BLAIR ATHOL	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	504 006	(D) BLAIR ATHOL
	440 602	—	—	—	—	—	—	—	63 404	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	504 006		
NEWLANDS	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	412 091	(A) NEWLANDS
	—	—	88 466	—	—	—	37 817	—	125 862	—	—	—	—	—	—	159 946	—	—	—	—	—	—	—	—	412 091		
CURRAGH	294 871	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	66 595	—	—	—	—	—	—	—	361 466	361 466	(G) CURRAGH
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
NEW WHITWOOD	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	304 124	(Br) NEW WHITWOOD
	304 124	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	304 124		
HARROW CREEK	70 418	—	44 102	—	—	24 145	—	—	—	74 091	—	—	23 524	—	—	—	—	—	—	—	—	—	—	—	236 280	236 280	(H) HARROW CREEK
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
AMBERLEY	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	214 386	(Br) AMBERLEY
	205 432	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	8 954	—	214 386		
COOK	—	—	—	152 963	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	152 963	210 963	(G) COOK
	—	—	—	58 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	58 000		
YARRABEE	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	199 602	(G) YARRABEE
	193 865	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5 737	199 602		
WESTFALEN GROUP	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	127 034	(Br) WESTFALEN GROUP
	127 034	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	127 034		
NEW HOPE GROUP	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	125 355	(Br) NEW HOPE GROUP
	125 355	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	125 355		
COLLINSVILLE	68 443	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	68 443	68 443	(A) COLLINSVILLE
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
RHONDDA	33 057	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	33 057	33 057	(Br) RHONDDA
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
Coking Coal	17 800 718	2 124 283	1 732 731	1 473 696	1 280 258	1 002 029	981 115	761 426	—	588 427	483 109	397 836	263 342	259 791	240 157	—	81 245	54 649	49 700	27 267	20 257	—	—	—	29 622 036		
Steaming Coal	2 071 048	62 761	88 466	58 000	91 620	133 299	68 904	—	704 477	—	—	—	—	—	—	159 946	—	—	—	—	—	20 090	8 954	5 737	3 473 302		
TOTAL	19 871 766	2 187 044	1 821 197	1 531 696	1 371 878	1 135 328	1 050 019	761 426	704 477	588 427	483 109	397 836	263 342	259 791	240 157	159 946	81 245	54 649	49 700	27 267	20 257	20 090	8 954	5 737	33 095 338	33 095 338	TOTAL

EXPORT COAL PRICES

The following table shows variations in prices for coking coal exports to Japan during the past few years. The list of such movements is not complete.

All prices are expressed in United States of America dollars per tonne F.O.B. (Note: CQCA and Gregory prices are expressed at a nominal US/AUST exchange rate of $1.10.)

CENTRAL QUEENSLAND COAL ASSOCIATES (CQCA)

Date	Blackwater	Goonyella	Norwich Park	Peak Downs	Saraji
	$	$	$	$	$
1.7.81	63.00	57.02	55.42	56.47	56.27
1.7.82	66.00	59.09	66.48	59.49	58.33
1.7.83	54.00	62.04	69.25	61.72	60.69
1.7.84	51.00	62.75	61.29	62.60	62.29

THIESS DAMPIER MITSUI COAL PTY. LTD.

Date	Moura	Riverside
	$	$
1.4.81	51.83	—
1.4.82	66.00	—
1.4.83	54.00	—
1.4.84	51.50	69.47

THIESS BROS. PTY. LIMITED

Date	South Blackwater	Date	South Blackwater
	$		$
1.4.81	55.65	1.4.83	54.00
1.4.82	66.00	1.4.84	51.50

GREGORY JOINT VENTURE

Date	Gregory	Date	Gregory
	$		$
1.7.81	62.53	1.4.83	71.22
1.4.82	66.46	1.4.84	54.50

CAPRICORN COAL MANAGEMENT PTY. LTD.

Date	German Creek	Date	German Creek
	$		$
1.4.82	64.56	1.4.84	70.31
1.4.83	67.92		

CURRENT EXPORT CONTRACTS

COMPANY	COUNTRY	TONNES	PERIOD (YEARS)	EXPIRY DATE
Central Queensland Coal Associates	Japan	128 100 000	13	1984-85
	Europe	36 000 000	1 to 15	1974 to 1988
	Other	16 700 000	1 to 15	1978 to 1992
Thiess Dampier Mitsui Coal Pty. Ltd.				
Moura — Coking Coal	Japan	1 600 000	1	1985
— Coking Coal	Japan	800 000	8	1992
— Steaming Coal	Japan	5 445 000	10	1994
— Steaming Coal	Japan	1 550 000	10 (commencing 1985)	1995
— Steaming Coal	Various	1 250 000	1	1985
Riverside — Coking Coal	Japan	46 200 000	14	1998
Thiess Bros. Pty. Limited				
— Coking Coal	Japan	22 000 000	15	1984-85
— Steaming Coal	Japan	20 000	1	1983-84
— Tee Coal*	Japan	50 000	1	1983-84
— Steaming Coal	Taiwan	2 650 000	10	1989
Gregory Joint Venture	Japan	25 220 000	13	1995
	Korea	6 500 000	13	1995
	Taiwan	3 250 000	13	1995
German Creek Coal Pty. Ltd.	Japan	15 000 000	10	1992
	Taiwan	3 200 000	10	1992
	Korea	2 000 000	10	1992
	Other	12 500 000	10	1992
Oaky Creek Coal Pty. Ltd.	Japan	1 500 000	3	1986
	Europe	25 500 000	15	1998
Collinsville Coal Company Pty. Ltd. — Coking Coal	Japan	15 000 000	15	1999
Newlands Coal Pty. Ltd. — Steaming Coal	Various	39 750 000	2 to 17	2001
Blair Athol Coal Pty. Ltd.	Japan	72 000 000	15	1999
Curragh Queensland Mining Ltd.	Japan	1 500 000	3	1987
	Other	500 000	1 to 5	—
Aberdare Collieries Pty. Ltd.	Japan	3 000 000	6	1990
	Japan	210 000	3	1987

* *For briquetting*

QUEENSLAND COAL PORTS

EXISTING

PORT	ANNUAL LOADING CAPACITY* (tonnes)	HOURLY LOADING RATE (tonnes)	VESSEL SIZE (d.w.t.)	LENGTH OF BERTH (metres)	DEPTH AT BERTH BELOW L.W.D. (metres)	DEPTH OF APPROACH BELOW L.W.D. (metres)
BRISBANE						
— FISHERMAN ISLANDS	3 000 000	1 500	60 000	240.0	13.0	11.6
GLADSTONE						
— AUCKLAND POINT	5 000 000	1 600	60 000	183.0	11.3	14.7
— BARNEY POINT	8 000 000	2 000	70 000	205.0	15.0	14.7
— CLINTON	14 500 000	4 000	140 000	330.0	17.2	15.0
HAY POINT						
— NO. 1 BERTH	11 000 000	4 000	150 000	204.0	16.8	13.4
— NO. 2 BERTH	14 000 000	6 000	160 000	189.0	17.0	13.4
DALRYMPLE BAY	15 000 000	6 600	200 000	254.0	20.0	13.4
ABBOT POINT	6 500 000	4 600	165 000	264.0	19.3	17.3

*See Table 19, page 131 for utilisation capacity.

Part of the conveyor system at Dalrymple Bay

UNDER CONSTRUCTION AND PLANNED

PORT	PLANNED ANNUAL LOADING CAPACITY (tonnes)	HOURLY LOADING RATE (tonnes)	PLANNED VESSEL SIZE (d.w.t)	INITIAL DEPTH AT BERTH (metres)	PLANNED DEPTH AT BERTH (metres)	PLANNED OPERATION DATE
BRISBANE						
— FISHERMAN ISLANDS						
(Stage 2)	5 000 000	1 500	60 000	13.0	13.0	—
GLADSTONE						
— CLINTON	18 000 000/	8 000	140 000	17.2	17.2	--
(Stage 2)	20 000 000					
(Stage 3)	30 000 000	8 000	140 000	17.2	17.2	--
DALRYMPLE BAY						
— (Stage 2)	15 000 000	6 600	200 000	20.0	20.0	—
ABBOT POINT						
— (Stages 2 & 3)	17 500 000	4 600	165 000	19.3	19.3	

COAL EXPORT FACILITIES

GLADSTONE

December, 1983 commemorated Gladstone's first year as a 20 million tonne Port, with in excess of 23 million tonnes of cargo being handled through the Port for the 1983/84 financial year of which 12.2 million tonnes were coal exports.

Clinton Coal Facility

Development of the facility has continued with the completion and commissioning of Stockpile No. 7, which has a capacity of 200 000 tonnes made up of two separate storage areas.

Total storage capacity of the facility is 2 million tonnes — (6 x 300 000 and 1 x 200 000).

Engineering plans have been commissioned for Stockpile No. 8, with separate storage areas similar to Stockpile No. 7 and having a capacity of 180 000 tonnes, with completion expected by 1985.

The first shipment of coal from Curragh Mine was shipped through the Port in March, 1984. This shipment is the beginning of a long–term contract with Curragh Coal Sales Company Pty. Ltd.

Port Turn–around Times

The Gladstone Harbour Board is justifiably proud of its record in achieving excellent vessel turn–around times from the three coal facilities.

Coal handling operations carried out by the Gladstone Harbour Board at Clinton and Auckland Point, and by Thiess Dampier Mitsui Coal Pty. Ltd., at Barney Point, have experienced, over many years, only minimal disruption through either industrial disputes or operating failure.

Indicative in–berth times are as shown:–

CLINTON — 4 000 tonnes/per hour capacity
82/83 average in–berth time: 37.9 hours — Average cargo size: 67 265tonnes
83/84 average in–berth time: 37.3 hours — Average cargo size: 78 551 tonnes

AUCKLAND POINT — 1 600 tonnes/per hour capacity
82/83 average in–berth time: 50.4 hours — Average cargo size: 37 898 tonnes
83/84 average in–berth time: 47.3 hours — Average cargo size: 32 351 tonnes

BARNEY POINT — 2 000 tonnes per hour capacity
82/83 average in–berth time: 58.5 hours — Average cargo size: 53 829 tonnes
83/84 average in–berth time: 62.0 hours — Average cargo size 48 738: tonnes

ABBOT POINT

The first stage of the Abbot Point Coal Facility, which was commenced in July, 1981 was completed on April 30, 1984 although a number of shipments of commissioning coal were effected before this date.

On February 25, 1984 the "Fukukawa Maru" became the first ship to berth at Abbot Point and loaded 34 280 tonnes of coking coal for Japan from the Collinsville Mine and since that first shipment to June 30, 1984 some 429 982 tonnes of coal have been shipped in 7 vessels.

The first stage of the Abbot Point Coal Facility, which can accommodate vessels from 15 000 to 165 000 d.w.t. and which has an annual throughput capacity of 6.5 million tonnes, was constructed at a total cost of around $180 million.

Further expansion of the Abbot Point Facility to 10 million tonnes per annum, and ultimately 24 million tonnes per annum, will proceed when additional throughput capacity is required. The Abbot Point Facility is at the northern extremity of the Bowen Basin and potential new users of this Facility may be drawn from the northernmost prospects under investigation, namely Hail Creek, Kemmis Walker, Bee Creek, South Walker, Lancewood and Wards Well should they proceed to development stage.

The Abbot Point Port Facility is owned and administered by the Harbours Corporation of Queensland which provided the funds for the offshore works while M.I.M. Holdings Limited funded the onshore works. The Port Facility is operated by Abbot Point Bulkcoal Pty. Ltd., a wholly owned subsidiary of M.I.M. Holdings Limited, on behalf of the Harbours Corporation of Queensland.

DALRYMPLE BAY

On November 5, 1983 the "Horyu Maru" became the first vessel to berth at the Dalrymple Bay Coal Terminal and received 55 962 tonnes of coking coal from the Riverside Mine as the initial commissioning shipments from the new Terminal. Stage One of the Dalrymple Bay Coal Terminal was officially completed on December 22,1983 and to June 30, 1984, 4 336 538 tonnes of coal were exported from the Terminal in 63 ships. Vessels from 20 000 to 200 000 d.w.t. can be accommodated at this Terminal.

Stage One of the Terminal which was completed at a cost of around $250 million has a throughput capacity of at least 15 million tonnes per annum which mainly is committed to accommodate the exports of four companies, namely Capricorn Coal Management Pty. Ltd., (German Creek Mine — 3.25mtpa), Oaky Creek Coal Pty. Ltd., (Oaky Creek Mine — 3.0mtpa), Thiess Dampier Mitsui Coal Pty. Ltd., (Riverside Mine — 3.3mtpa), and Blair Athol Coal Pty. Ltd., (Blair Athol Mine — 5.0mtpa).

The Dalrymple Bay Coal Terminal is owned and administered by the Harbours Corporation of Queensland which funded the offshore works while the onshore works were funded by the Harbours Corporation from contributions received from the four coal companies committed to exporting through the Terminal. The Terminal is operated on behalf of the Harbours Corporation by Dalrymple Bay Coal Terminal Pty. Ltd., which is a company formed for this purpose by the four committed coal exporters.

Expansion of the Terminal to Stage 2, which would increase the throughput capacity from 15 million tonnes per annum to 30 million tonnes per annum, has been planned but no date will be set for commencement until export commitments through the Terminal exceed the existing available capacity of Stage 1.

Stacker – Reclaimers — Dalrymple Bay.

COAL EXPORT FACILITIES (Continued)

HAY POINT

This port is owned by Central Queensland Coal Associates and is operated by its subsidiary Hay Point Services Pty. Ltd.

The port is situated eleven nautical miles south of Mackay Harbour. Hay Point is one of the largest coal ports in the world and was designed for a throughput exceeding 20 million tonnes per year.

Coal is railed from the company's mines at Goonyella, Peak Downs, Saraji, Norwich Park and Harrow Creek. Trains comprise up to 148 wagons in which up to 8 500 tonnes may be hauled.

The port has two berths where ships may be loaded simultaneously. The hourly rates of loading are 4 000 tonnes at No. 1 berth and 6 000 tonnes at No. 2 berth.

Like other Queensland coal ports Hay Point experiences only minor disruptions caused through industrial disputation.

What is believed to be the largest single coal shipment in the world was made on January 21, 1984, when the "ELGIN" destined for Europe, was loaded with 179 526 tonnes of coking coal at Hay Point.

BRISBANE

The Coal Export Facility at Fisherman Islands, Brisbane, known as QBH (Queensland Bulk Handling Pty. Limited) is a joint venture between Surrey Properties Pty. Ltd. and TNT Bulkships Limited.

All coal exported through the QBH Facility during 1984 was received by rail from mines in the well established West Moreton Coal Fields.

Coal received by rail is distributed to individual stockpiles utilising a system of overhead conveyors. Bulldozers are then used to push coal into large rectangular stockpiles of up to 75 000 tonnes capacity each. During shiploading operations bulldozers are again used to push the coal into below–ground reclaim pits.

Total stockpile capacity is a nominal 260 000 tonnes.

Fine tuning of the plant and increasing operator experience since the facility commenced operations in February, 1983 has enabled QBH to reduce the average in–berth time from 51 hours 13 minutes, for an average cargo size of 31 600 tonnes over the first six months of operation to 36 hours 20 minutes, for an average cargo size of 31 500 tonnes over the last six months of operation. Further reductions are expected to be made as more minor plant improvements increase the efficiency of the shiploading system.

The facility has been industrially stable over the past twelve month period and only two operating shifts totalling 16 hours have been lost due to inclement weather.

HYDROGRAPHERS PASSAGE — NEW CHANNEL FOR COAL SHIPPING

The Board's 1983 Annual Report described the proposal to establish navigational aids to mark a deep draught channel through the Great Barrier Reef to the north east of Mackay, known as Hydrographers Passage. The Federal Department of Transport is responsible for providing the navigational aids, utilising the services of the Department of Housing and Construction to design and arrange the erection of the required structures.

Hydrographers Passage is being developed to reduce steaming distances for ships operating between central Queensland coal ports and Northern Pacific markets. (For example, use of the passage will shorten the distance from the Hay Point and Dalrymple Bay coal terminals to Japan by 220 nautical miles.) The consequent reduction in shipping costs should assist in making Queensland coal more competitive in international markets.

The Commonwealth Government referred the project to the Parliamentary Standing Committee on Public Works (PWC) for examination. The Committee examined information provided by the Department of Transport and the Department of Housing and Construction, together with submissions from the Queensland Government, the Queensland Coal Association, the Dalrymple Bay Coal Terminal Pty. Limited, the Queensland Chamber of Mines Ltd., the Australian Chamber of Shipping, the Queensland Coast and Torres Strait Pilot Service, the Great Barrier Reef Marine Park Authority and Southern Pacific Petroleum N.L. All supported the project.

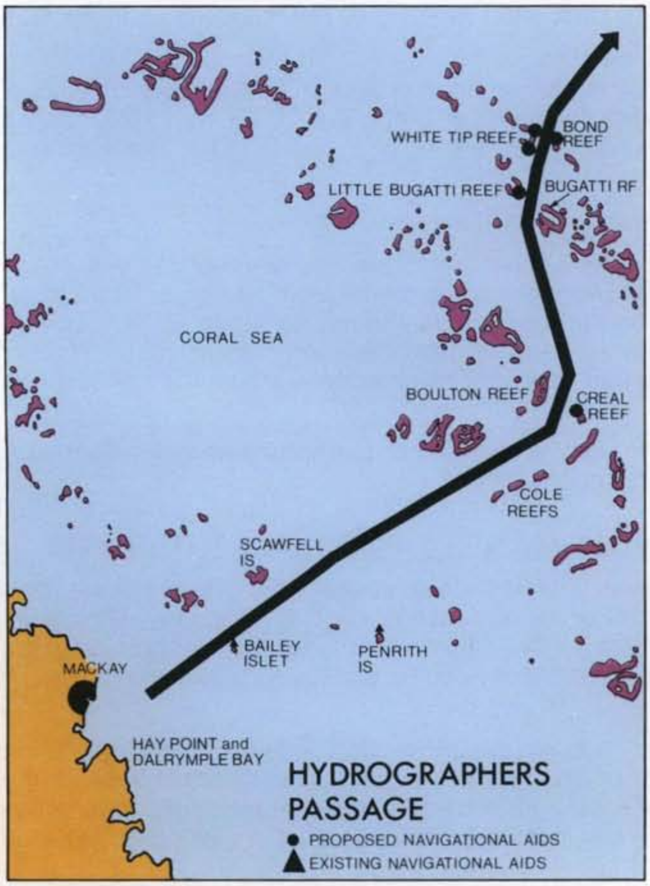
HYDROGRAPHERS PASSAGE (Continued)

The PWC reported to Parliament in December, 1983 recommending that the project proceed as planned, and this was supported by the Commonwealth Government.

One of the Committee's recommendations was that the Department of Transport pursue, through the International Maritime Organisation (IMO) agreement to compulsory pilotage through the passage but with provision for exemptions. However, compulsory pilotage for the area would be extremely difficult to implement and sustain due to the Passage being in international waters, through which ships have the right of innocent passage. The Department is, however, preparing a submission to IMO strongly recommending the utilization of pilots for ships using the Passage and the Inner Barrier Reef north of Cairns. The Queensland Coast and Torres Strait Pilot Service will be providing a pilot service for ships using Hydrographers Passage.

Another recommendation made by the PWC was that a risk analysis should be undertaken to assess the likely impact of long-term shipping operations in the passage. A comprehensive report has been prepared by consultants commissioned by the Department of Transport.

The Department of Transport has produced Sailing Directions to assist ships in navigating Hydrographers Passage. This publication provides information on the recommended route, the navigational aids, tidal currents and weather conditions.



The contract for fabrication of the stainless steel lattice towers to be used at three of the five navigational aid sites, was awarded to Walkers Limited in Mackay. The contract for the supply and erection of the reinforced concrete platforms at each of the five sites, and the erection of the three towers, was awarded to John Holland Constructions Pty. Limited. The total cost of all these civil works involved is expected to be well within the original cost estimate of $4.75 million. A further amount of $0.75 million has been made available to meet the cost of the navigational aids equipment. The platform and the towers are scheduled to be erected by November, 1984, and the navigational aids are due to be installed in April, 1985.

The aids consist of lights at the northern and southern sides of White Tip Reef, at Little Bugatti Reef and at Creal Reef. An unlit structure, surmounted by a radar reflector, is to be established at Bond Reef. Racons (radar transponder beacons) will be installed at White Tip Reef (South) and Creal Reef. All the equipment will be solar powered. Provision has been made for the Queensland Coast and Torres Strait Pilot Service to install the radio communication equipment at two of the sites.

The Department of Transport is pleased to have the carriage of this project which will improve the competitiveness of Australian exports.

The Department is most satisfied with the progress achieved to date and with the co-operation provided by industry and other Government bodies.

(By courtesy Federal Department of Transport)

ELECTRIFICATION OF COAL RAILWAYS

One of the largest electric rail construction projects in the world is currently being undertaken between the east coast of Central Queensland and the coal basins of the central west by Queensland Railways.

It is the Central Queensland Main Line Electrification Project for which the Queensland Government has already approved an expenditure of $600 million for the first two stages.

Stage 1 is the electrification of the main line from the port of Gladstone to Blackwater and the coal mines in that area. Stage 2 starts at the ports of Hay Point and Dalrymple Bay, and embraces the line travelling west up the Goonyella Mines System, then splits, travelling south–west to Blair Athol and south–east to Gregory, where it will link up with Stage 1.

In all, some 1 000 route km will be involved; however, a total of 1 490 actual track km will be electrified.

Queensland Railways advise that there will be obvious benefits to the coal industry, the Government and the taxpayer.

Operationally, more coal trains will be scheduled and a faster turn around achieved. The 146 new electric locomotives will each have a power rating of 3 000 kilowatts compared with the most powerful diesel–electric loco presently in service which has a rating of 1 650 kilowatts.

Queensland Railways studies show that the new electric locomotives will halve the maintenance costs of the present diesel–electrics.

The Railway Department estimates that approximately 93 million litres of fuel will be saved each year through electrification — that is, half the present state–wide consumption.

Major contracts for the provision and construction of the overhead electric wiring, power supply transformers and 50 kW/25kV switchgear have been let at a total cost of $43 309 761. Electric locomotive contracts costing $188 million are expected to be announced shortly.

Preliminary civil engineering works on the main lines have already commenced as curves are lessened (for the faster electric trains), bridges lifted to accommodate the electric overhead wiring and track duplicated for more frequent train–passing. Work on the overhead system is scheduled to commence in September, 1984.

The first electrically hauled coal trains are scheduled to run in late 1986. By December, 1987 it is anticipated that Stages 1 and 2 of the scheme will be completed.

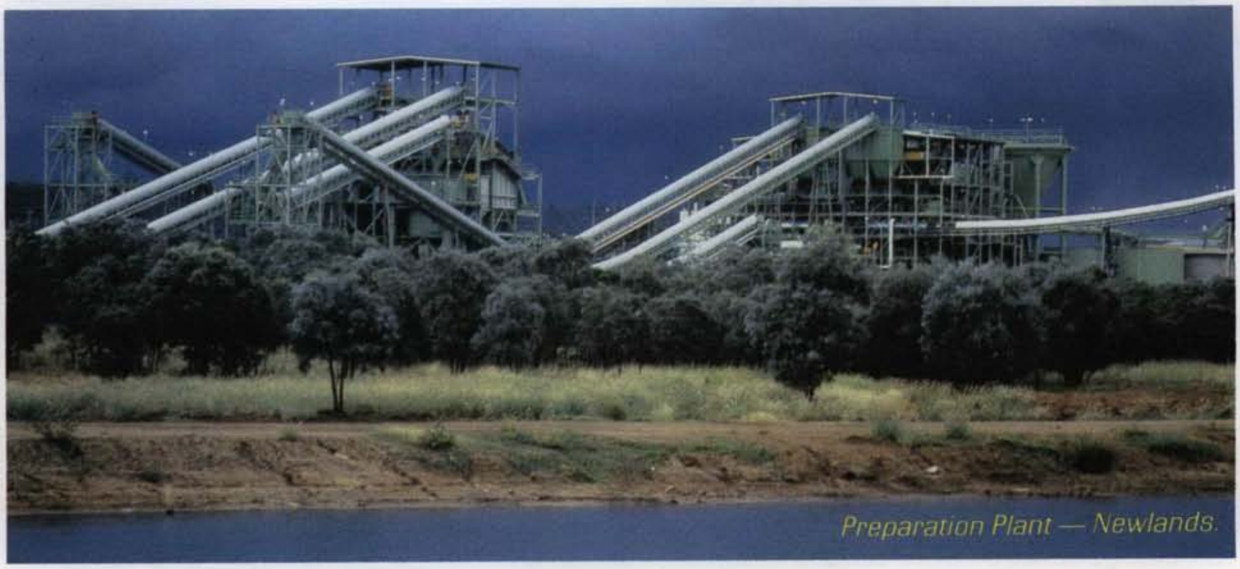
(By Courtesy, Queensland Railways)

Loading Export Coal — Gregory Mine

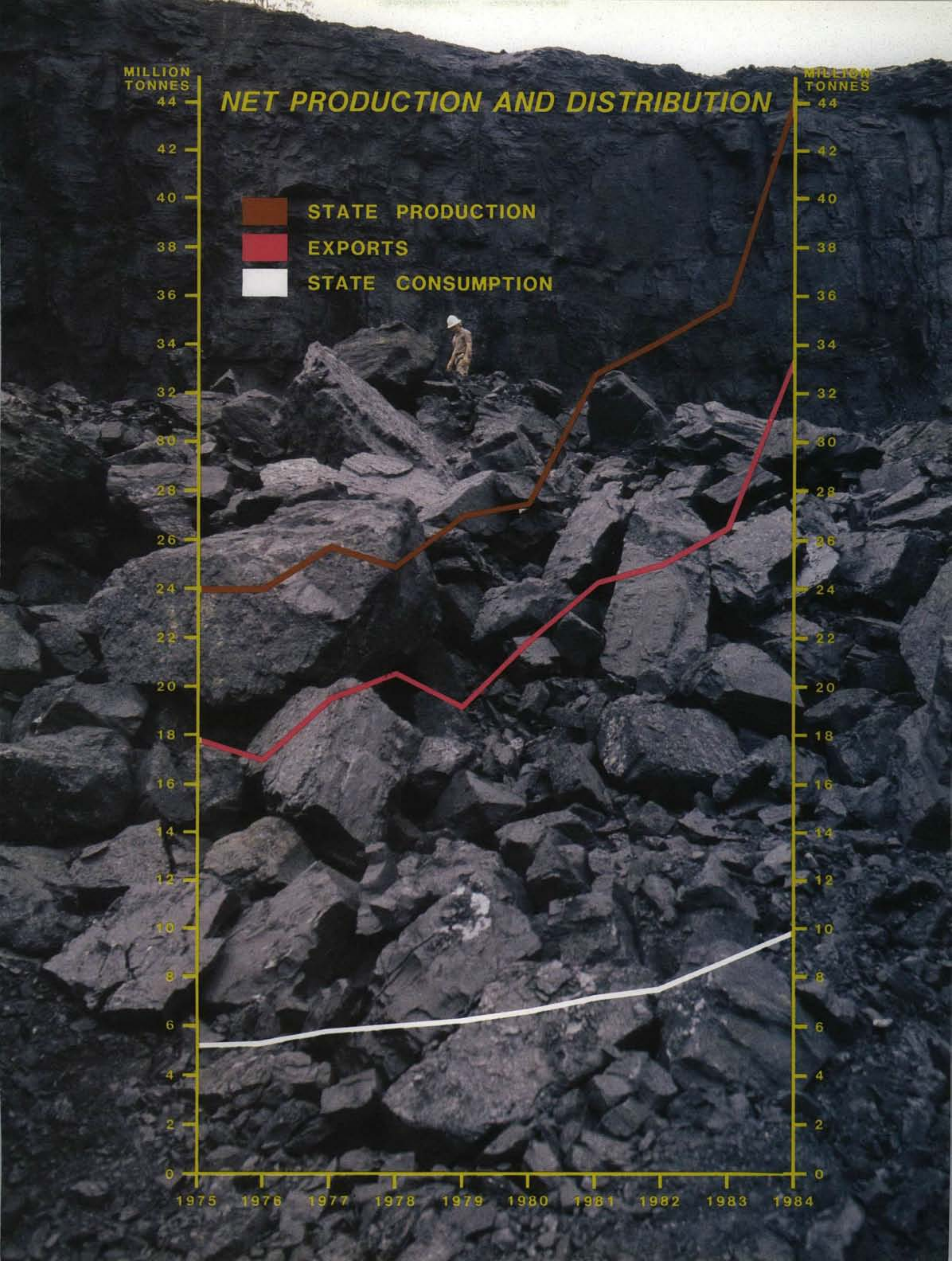
CAPITAL EXPENDITURE BY SOME COMPANIES

Year Ended June 30, 1984

COMPANY	MINES — Including Plant, Equipment & Development $	POWER & WATER $	ROAD, RAIL AND PORT FACILITIES $	TOWNS $	OTHER CAPITAL EXPENDITURE $
Central Queensland Coal Associates	11 963 000	—	562 000	2 003 000	58 000
Thiess Dampier Mitsui Coal Pty. Ltd.					
— Moura	14 095 000	10 000	—	10 000	89 000
— Riverside	48 010 000	1 206 000	23 690 000	2 829 000	—
Thiess Bros. Pty. Limited	4 825 000	—	25 000	296 000	—
— Callide Joint Venture	3 462 000	—	—	108 000	—
Capricorn Coal Management Pty. Ltd.	38 416 000	105 000	10 789 000	1 044 000	—
Oaky Creek Coal Pty. Ltd.	32 295 000	376 000	27 956 000	1 894 000	99 000
Curragh Queensland Mining Limited	19 202 000	806 000	10 500 000	489 000	6 221 000
Pacific Coal Pty. Limited	3 616 000	—	—	—	23 978 000
Blair Athol Coal Project	48 625 000	—	92 577 000	5 591 000	12 268 000
Collinsville Coal Company Pty. Ltd. and Newlands Coal Pty. Ltd.	111 269 000	5 650 000	103 785 000	23 978 000	--
Gregory Joint Venture	3 126 000	5 000	12 000	329 000	—
Coal Resources of Queensland Pty. Ltd.	5 012 000	—	—	167 000	537 000



Preparation Plant — Newlands.


NET PRODUCTION AND DISTRIBUTION
STATE PRODUCTION
EXPORTS
STATE CONSUMPTION
MILLION TONNES
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16
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42
44
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984

COAL CONSUMPTION

Tonnes—Year Ended June 30, 1984

STATE TOTAL 9 830 818

CONSUMER INDUSTRIES	Brisbane Metropolitan	Southern Queensland	Central Queensland	North Queensland
*Electricity	327 008	1 808 448	4 822 569	677 611
Metal Processing	..	..	1 173 896	263 098
Building Materials	81 967	12 246	125 050	54 481
Food Processing	63 037	30 242	7 064	7 019
Paper and Board Mills	..	80 998	..	..
Coke Works	..	..	..	66 742
Ships' Bunkers	..	..	183 827	..
Miscellaneous	30 839	10 544	3 117	1 015
	502 851	1 942 478	6 315 523	1 069 966

COAL CONSUMPTION 1982-83 AND 1983-84 — TONNES

CONSUMER INDUSTRIES	1982-83	1983-84	1984 Increase + or Decrease –	%
*Electricity	6 708 818	7 635 636	+ 926 818	+ 13.81
Metal Processing	1 223 880	1 436 994	+ 213 114	+ 17.41
Building Materials	357 291	273 744	– 83 547	– 23.38
Food Processing	101 895	107 362	+ 5 467	+ 5.37
Paper and Board Mills	80 084	80 998	+ 914	+ 1.14
Coke Works	66 153	66 742	+ 589	+ 0.89
Ships' Bunkers	28 250	183 827	+ 155 577	+ 550.72
Miscellaneous	49 609	45 515	– 4 094	– 8.25
	8 615 980	9 830 818	+ 1 214 838	+ 14.10

** Includes Mica Creek, Mt. Isa.*

COAL CONSUMPTION

The accompanying Consumption tables show that during 1983–84 coal used totalled 9.83 million tonnes — an extra 1.21 million (14.1%) on last year.

Requirements for State electricity generation rose by 13.81%. Electricity output from all Stations increased from 14 647 GWh in 1983 to 16 503 GWh in 1984, a lift of 12.67%. The commencement of operations at Tarong accounted for some of the increase by the Stations. Initially the Tarong Power Station started generation using oil–firing before switching completely to coal–firing. The percentage increase in power output compares favourably with that between 1982 and 1983 which showed 11.89% additional generation.

Metal processing plants used an additional 17.41% coal. While consumption at the Gladstone Alumina Refinery rose to 1.17 million tonnes, it declined for lead smelting and nickel refining.

The combined building industries group shows a drop in burn by 23.38%. Food processing plants increased coal usage during the year by 5.37%. Some sugar mills in Central and Northern Districts are utilising slightly more coal as base–energy feed stock. It is hoped that this trend will continue to grow. Certain meatworks had higher requirements, occasioned by a partial recovery of the depressed conditions in preceding years.

A significant increase of 550.72% in fuel used by the four coal–fired vessels plying between Gladstone and Weipa is shown. These ships are being used full–time on the bauxite run and the proven viability of this operation could be the forerunner of additional coal–fired ships on coastal and overseas routes.

Domestic coal consumption has more than doubled over the ten year period 1974–1984.

The following table shows the burn by Power Stations during 1983 and 1984 fiscal years.

	1983 Tonnes	1984 Tonnes
Brisbane	211 822	327 008
Swanbank	1 310 858	1 513 814
Tarong	–	294 634
Gladstone	3 989 100	4 314 350
Callide	580 990	508 219
Mica Creek	326 675	323 029
Collinsville	289 373	354 582
	6 708 818	7 635 636

FUTURE POWER STATIONS

The first of four 350 MW units at Tarong Power Station went into commercial service on May 1, 1984. Construction of the station has continued on schedule. The second is due to go into service in May, 1985 and the remaining plant in 1986. When completed, the 1400 MW station will burn up to 4.8 million tonnes of coal a year. The fuel will be brought to the power station by conveyor belt from the Meandu open–cut coal mine about 1.5 km distant.

Construction of the Callide 'B' Power Station in Central Queensland was also on schedule. This station will require more than two million tonnes of coal a year which will be transported by a 1.7 km conveyor belt from the South Callide open–cut mine. The first of the Station's two 350MW boiler–turbo generator units is due to enter service in March, 1988 and the second a year later.

About 3.6 million tonnes of coal a year will be used by a third power station now being built — the 1400 MW Stanwell Power Station, 24 km west of Rockhampton. The coal will be railed to the station from the Curragh mine, near Blackwater. First of the station's four 350 MW units is scheduled to commence operation in the early 1990's.

The three power stations will cost an estimated $3 520 million at 1984 prices. The programme will provide an additional nine 350 MW coal–fired generating units between 1985 and the mid–1990's.

NEW BOILER TECHNOLOGY — COAL–FIRED FLUIDISED BED

The basic principles of fluidised bed combustion have been known for a long time, although only in recent years the full potential of the system's ability to use a wide range of coal types and extract from them the utmost available energy has been realised.

In principle the system operates as follows. Fine particles such as sand are subjected to an upward flow of air, and become suspended when the air flow reaches a certain velocity. This state is the minimum fluidising velocity and is variable according to particle size and bed depth. When the particles are fluidised, the bed resembles a boiling liquid. Depth of the bed is variable according to air velocity used. The bed is heated and the temperature can be quickly and uniformly raised to an ignition stage by hot gas or indirect firing by oil or gas burner and is readily controlled and kept below the ash fusion temperature of the coal to be burned (usually about 900°C). Fuels when fed to the bed mix rapidly and combustion takes place evenly and in a controlled manner. The bed mass acts as a 'thermal flywheel' and assists in reducing the effect of fuel quality fluctuations. By increasing bed depth and adding limestone it is possible to retain a high proportion of sulphur and nitreous oxides in the ash thus reducing atmospheric pollution. High heat transfer rates are achieved from the heating surface immersed in the bed material.

With system design and control it is possible to keep heating surfaces clean for longer periods and maintain efficiency at optimum levels. Fluidised bed combustion systems are inherently safer for limited attendance operation than other forms of firing as approximately only one percent of combustible fuel is carried within the total bed material at any time during operation. By shutting off the air supply the bed material slumps, combustion is smothered or extinguished immediately. Fast restart is attainable due to heat retention in the bed, within certain time periods, or one–quarter of an hour from cold.

The Metropolitan Regional Abattoir Board (M.R.A.) in Brisbane commenced experimenting with a small fluidised bed combustor (F.B.C.) in the late 1970's and has now replaced its aged conventional boiler system with two F.B.C. boilers. Each of the boilers in the system has a capacity of 12.6 tonnes/hour of saturated steam at 1100 kPa. It is believed that this is the first application of F.B.C. technology in the Southern Hemisphere.

The units which were installed by Babcock Australia Limited have been designed for limited attendance operation and have fully integrated ancillary systems for this purpose. Major features of the installation include solid fuel receiving and storage facilities, dense phase transportation, lighting up oil equipment and a water tube boiler with water walled furnace fitted with an integral fluidised bed package. Flue gas clean–up equipment has received special attention which includes a gas conditioning tower, two stages of mechanical grit collection and a side stream baghouse. Flue gas recirculation, local to the dust collection equipment, is employed.

The design of the fluidised bed includes features of the shallow bed system developed by Babcock for the smaller range of boilers and which has the advantage of the in–bed tubing being readily incorporated into the furnace wall circuits, rapid response to changes in boiler load and minimum risk of erosion of the in–bed tubes.

The equipment was planned for outdoor installation and special care was taken to build–up weatherproofing and provide for high wind loadings. Being located at a meatworks complex the choice for dense phase fuel handling and vacuum removal of ash into sealed hoppers was adopted to eliminate dust emission. Filters have been provided on handling air exhausts.

The overall installation is of interest for the following reasons:–

- Fluidised bed technology
- Extensive automation and supervisory equipment to achieve maximum performance and minimal attendance.
- The ultimate utilisation of the available space to achieve economy of the latter without sacrificing facilities and achieving a pleasant appearance with reasonable maintenance access.
- To provide proof of the feasibility of the overall concept in the industrial arena where daily production throughout the year is imperative.
- To provide an opportunity to complete research work with alternative fuels especially in the areas of particulate matter removal and control.

The project was funded by M.R.A., Babcock Australia Limited and the Australian Research Development Incentives Board, in recognition of the new technology being employed.

It is hoped that the successful operation of this equipment at the Abattoir will convince public authorities and industrial management of the environmental desirability of this new concept, with special emphasis on economical fuel supply and variables.

EMPLOYMENT—Queensland Coal Industry

June 30, 1984 STATE TOTAL 9 674

	Below Ground		Above Ground		
	Coal Face	Elsewhere	General	Admin. & Clerical	TOTAL
UNDERGROUND MINES					
DISTRICT:					
West Moreton	357	209	184	137	887
Darling Downs	4	1	6	1	12
Maryborough	6	2	2	2	12
Kianga-Moura	78	61	45	20	204
Blackwater	175	200	56	113	544
Mackay	13	36	3	14	66
Bowen	39	110	52	56	257
	672	619	348	343	1 982
OPEN-CUT MINES					
DISTRICT:					
West Moreton	..	..	170	12	182
Nanango	..	..	52	51	103
Kianga-Moura	..	..	518	150	668
Callide	..	..	292	101	393
Blackwater	..	..	1 838	694	2 532
Blair Athol	..	..	115	60	175
Mackay	..	..	2 328	878	3 206
Bowen	..	..	316	117	433
			5 629	2 063	7 692

Utah workers relax in a Moranbah park after mine shift.

EMPLOYMENT

Employment increased by 10.3% from 8 773 to 9 674. The number of men engaged in underground mines declined by 109 (5.2%), while open-cut employees increased from 6 682 to 7 692 (15.1%)

The underground workforce fell in the West Moreton, Moura, Mackay and Bowen Districts, with the largest reduction being in West Moreton mines. This District recorded a drop of 173. Some of the Moura underground personnel were transferred to the Riverside operation, Mackay district.

Table 7 in the Statistical Section shows that all Districts, excepting Moura, enjoyed an increased employment figure at the open-cut mines. The principal gains were at the Bowen Basin mines with the major rises at Blackwater, Blair Athol and Mackay Districts. Most of the manpower increases at the open-cut mines were related to the build-up of production at the developing mines and expansion of established projects. Curragh, Meandu and Newlands came on stream while extensions at Oaky Creek, Blair Athol, Collinsville and Callide continued.

Although manpower for production requirements at some central area mines was reduced, an active redeployment programme, which was in operation, ensured a minimum of job losses. Employees were transferred or relocated to other mines. It is believed that the redeployment method resulted in no employees being retrenched in the central area. The co-operative approach by all parties to overcome what could have developed into a major industry problem has had outstanding results.

Nineteen men were retrenched at two West Moreton mines. Three men were remaining from a mine which closed last financial year and the other sixteen from the Southern Cross mines, which supplied a reduced quantity of coal to the Swanbank Power Station. Some reduction in mine workers may occur in this District as the demand for power house coal is reduced during 1985.

REDEPLOYMENT — VISIT TO BLACKWATER

The Queensland Government has actively encouraged mine employees facing retrenchment to relocate in other districts where long-term employment in the industry is available.

Following Cabinet Approval of a Submission by its Minister, the Board sponsored a visit by some twenty West Moreton miners and their wives to Blackwater during March, 1984. The purpose of the visit was to assess employment and community conditions and to see the new coal-mining towns.

At Blackwater an inspection was made of the Curragh mine, together with viewings of the local amenities, shopping facilities, etc. Company–provided housing was a particular feature of the inspections. The visitors were also given the opportunity to meet local residents.

Appreciation is extended to the Curragh Mine management and officials of the Combined Mining Unions for their co-operation which greatly contributed to the favourable impression gained by the visiting West Moreton miners.

FATAL ACCIDENTS

The Board regrets to report that one fatal accident occurred during the year. A contract truck driver died as the result of a dump truck falling approximately 21 metres at the New Whitwood No. 3 Open-cut on March 7, 1984.

The Board extends sympathy to the family of the deceased worker.

During the past five years ended June 30, the number of fatal accidents was as follows:–

1980	1981	1982	1983	1984
1	2	3	nil	1

ACTIVITIES OF THE BOARD

CONSTITUTION

The Queensland Coal Board is a body corporate constituted under the Coal Industry (Control) Act 1948–1978. The Board is administered through the portfolio of the Minister for Mines and Energy.

LEGISLATION

There were no amendments to the Coal Industry (Control) Act during the year.

BOARD APPOINTMENT

While this report was in preparation Mr. Jack T. Woods, was reappointed as Chairman for a period of one year from October 30, 1984.

STAFFING

At June 30, 1984 sixteen officers were employed by the Board.

FINANCIAL ASSISTANCE

(1) Colliery Loans

An amount of $230 000 was loaned to a mining company to assist in the purchase of mining equipment and building construction.

(2) Welfare

Grants totalling $13 689 were approved for a variety of welfare projects. Most of this expenditure was occasioned by the visit to Blackwater of some West Moreton miners and their wives.

Since inception of the welfare programme $422 000 have been provided from the Welfare Fund.

(3) Severance Pay Fund

During the year a total of $216 172 was paid from the Severance Pay Fund to 19 men who were retrenched from the industry.

(4) Health Scheme

Payments totalling $67 000 were made from the Health Scheme Fund. Most of the expenditure related to the compulsory X–ray programme.

COAL MARKETING

As reported last year there are few industries available which may be converted from oil fuel to coal usage. However the ongoing marketing programme was continued. A number of firms were contacted and a southern area abattoir previously using oil has converted to coal.

There are industries which presently use large quantities of gas. With the rising costs relating to exploration the price per therm of gas is increasing. Coal, therefore, provides an economic alternative and it is the Board's intention to acquaint users of gas of the cost effectiveness of coal.

COAL QUALITY CONTROL

The Board continued to monitor and investigate the quality of coal to consumers. Visits were made to collieries, consumers' premises and stockpile areas to check on quality and investigate complaints.

The coal samplers made 460 visits to mines and consumers. A total of 493 samples were prepared for analyses by the Government Analyst.

RESEARCH

The Board continued to participate in the following Committees:–

- Queensland Coal Mines Safety Research Advisory Committee
- Mining Technology Committee
- Co–Ordinating Committee on Outburst Research

These Committees are primarily involved with mines safety and improvement of mining technology.

The Board also represented the State Government at meetings of the Queensland Coal Mining Industry Consultative Committee. As a representative of all active participants in the industry, the Board made a significant contribution to resolving potential industrial problems through discussion and co–operation which led to greater understanding by the parties concerned. This has been particularly evident where relocation of displaced mineworkers has been necessary.

The weighted average price for West Moreton includes the contract prices for coal supplied to Swanbank Power Station.

COAL MINERS' HEALTH SCHEME

The Compulsory Chest X–ray Programme commenced in March, 1983 and continued until April, 1984. The following month the two Medical Consultants engaged by the Board presented their Report on the findings of the Survey.

A total of 7 784 mine workers and 123 former miners particpated in the Survey. The programme was accomplished largely by a mobile clinic, supplied and manned by the Queensland Department of Health. The mobile visited 33 mine sites and 6 towns.

The Medical Consultants identified 499 cases of abnormality and appropriate action was taken in each instance. A complete follow–up involved 75 cases of pneumoconiosis and suspect pneumoconiosis and 47 emphysema diagnoses. All other personnel were advised that their X–ray was considered to be quite satisfactory.

The purpose of the X–ray Survey was principally to identify the incidence and severity of lung disorders which might be related to coal mining and to seek recommendations.

The primary conclusion was that while the problem of dust in mines is well in hand, there is no room for complacency and appropriate dust control measures should be maintained.

Copies of the Medical Consultants' Report have been widely circulated and the Board has requested comments on the findings and recommendations.

The pre–entry medical examination of persons seeking employment in the coal mining industry is an on–going requirement. During the calendar year 1983, 637 people were examined and from January to June, 1984 the number was 564.

X-ray in progress in mobile van

PRICE OF COAL

The establishment and maintenance of domestic coal prices is an important function of the Board. Its responsibility extends to all coal sold within the State. In respect of sales on the export market, the companies concerned negotiate the terms of contracts for the supply of coal. However, the prices for coal sold overseas are subject to the approval of the Honourable the Minister for Trade, Canberra.

General Comment

The pithead selling prices of all coal supplied to domestic consumers have increased. General increases in selling prices were granted to recoup the cost of the following:–

National Wage Increase; Coal Miners' Fund

(i) An increase of 4.3% in the National Wage applying from October 10, 1983.

(ii) An increase of $1.05 per man/week in colliery owners' contributions to the Coal Miners' Pensions Fund from July 4, 1983.

Escalation

Escalation of costs other than wages and wages oncosts resulted in price increases being granted at various times during the financial year.

Severance Pay Fund Contributions

Those colliery companies which contribute to the Queensland Coal Industry Employees Severance Pay Fund were granted a price increase to offset the cost of increased contributions as a result of a decision handed down by the Coal Industry Tribunal which varied the severance and retrenchment pay provisions of the Coal Mining Industry Awards.

Weighted Average Pithead Prices – Local Markets

Set out below is a comparison of the weighted average pithead prices of coal based on sales during June in the years 1982, 1983 and 1984:

DISTRICT	WEIGHTED AVERAGE PITHEAD PRICE PER TONNE AT JUNE 30		
	1982 $	1983 $	1984 $
West Moreton	33.19	36.47	39.50
Darling Downs	37.39	39.53	40.74
Maryborough	32.45	34.91	36.74
Callide	17.52	17.59	19.09
Blair Athol	18.97	19.50	19.92
Bowen	34.76	35.86	38.51

WEST MORETON COAL FIELD

Following concern expressed to the Government from a number of sources on the future of the West Moreton coal field, the Board's Minister established a committee to receive formal submissions and report to him on the matter. The Committee's terms of reference were to examine and report on –

1. The current situation prevailing in the West Moreton coal field, with regard to reserves, mining techniques and legislation, employment, production and productivity, markets, transport, costs and profitability.
2. The factors influencing the future commercial viability of coal mining in the area, with particular reference to market availability, production costs including transport costs and Government charges, industrial problems, land use and environmental conflicts, and mineability of the resource.
3. The future prospects of the coal mining industry in the area, both in the shorter and longer terms, with particular reference to all potential domestic and export markets for coal and its by–products; and overall employment, social and economic implications.

WEST MORETON COAL FIELD (Continued)

By public advertisement written submissions were sought from Government Departments, Authorities, the electricity industry, coal mining companies, trade unions, consumers of coal, community groups and any other interested organisations or individuals to further the work of the Committee within the terms of reference. In all 71 submissions were received.

The Committee (which was chaired by the Board's Chairman) included Members of the Board, representatives of the Combined Mining Unions, Queensland Coal Association, coal consumers and West Moreton Exporters.

The findings of the committee were presented in a report to the Minister on June 30,1984.

Drilling — Acland, Darling Downs

COAL DRILLING

Summary of Coal Drilling Operations 1983–84

Five Mines Department rigs were used to drill 84 holes, including six redrills and one deflection, and a further three holes were in progress at the end of the year. Total drilling amounted to 20 084.21 m, of which 13 150.26m were cored, in the following Districts.

North Bowen Basin	3 438.44 m
North Central Bowen Basin	2 829.60 m
South Central Bowen Basin	12 630.82 m
South West Bowen Basin	1 185.35 m

The reduction in the number of holes and metreage drilled in 1983–84 is a reflection of the change in emphasis in exploration from detailed drilling to proven reserves, to reconnaissance to define targets for future detailed exploration.

NORTH BOWEN BASIN

Red Hill

A reconnaissance programme of eight fully cored holes (including a redrill and deflection) was completed in the Red Hill area, some 12 km north–east of Goonyella. Drilling totalled 2 232.80 m of which a total of 2 048.85 m was cored. The full section of the Rangal Coal Measures and the uppermost seam (Girrah) in the Fort Cooper Coal Measures were intersected where possible. There is now a line of holes at approximately 4 km spacing over the subcrop of the Rangal Coal Measures along a strike length of 35 km from Lenton Downs in the north to Broadmeadow in the south.

No basalt was penetrated although there are outcrops in the area. Tertiary cover is commonly less than 20 m and the base of weathering is less than 30 m. Regional dip appears to be less than 6° with local steeper dips, and fracturing and faulting is evident in some cores.

In the most prospective central part of the area, the Leichhardt seam is between 2.2 m and 2.8 m in thickness. The Vermont seam consists of two plies 1.0 m to 1.9 m thick separated by a tuff bed up to 1.5 m thick. The seams split and deteriorate to the north.

The Girrah seam is over 50 m in thickness in some holes, and contains thin coal plies with thick carbonaceous mudstone and tuffaceous beds.

Assessment of results of drilling in this area is at a very preliminary stage. However, because of the thinness of seams, there is little potential for open–cut mining.

Annandale

A preliminary study of the geology of the Annandale area indicated there was a possible 14 km of subcrop of the Rangal Coal Measures between Coppabella Junction and Daunia. Field mapping showed the coal measures were well exposed and steeply dipping in the southern part and were masked by younger sediments in the northern part. The steep dips lowered the potential of the area for open–cut mining. However, a limited drilling programme was planned to assess the coal quality and to test the potential for underground mining.

Six holes, including one redrill, were completed on two drill–lines which were some 6 km apart along the strike. Total metreage was 1 169.78 m, of which 1 110.42 m were cored.

As many as five seams were intersected and ranged in thickness from 0.38 m to 6.60 m. The dip was to the west at 22°. The coal has a moderately high inherent ash (14 to 30 per cent) and low volatile matter content (approximately 12 per cent). A record is being prepared. No further drilling is warranted.

COAL DRILLING (Continued)

Burton Downs

This area is located approximately 30 km north–east of the Goonyella Mine industrial area. Further exploration was proposed, downdip of the previous drilling by Utah, to core the full section of the Rangal Coal Measures and the uppermost seam of the Fort Cooper Coal Measures, to clarify seam correlation, and to obtain additional information on coal quality. Drilling (35.86 m) was in progress at the first of four sites at the end of the year.

NORTH CENTRAL BOWEN BASIN

Vermont North

The Vermont North area lies to the north–east of Saraji between two shallow coal deposits in the Rangal Coal Measures, Winchester South and Lake Vermont. Six fully cored holes, including one redrill, were completed and a further hole was in progress. Aggregate metreage was 2 094.69 m (1 898.92 m cored).

These holes were sited to investigate, in two separate parts of the area, the subcrop of the Rangal Coal Measures at shallow depth, and to continue to the base of the Girrah seam in the Fort Cooper Coal Measures. One hole was deepened to the upper beds of the Moranbah Coal Measures.

In the western part of the area to the north of the Lake Vermont deposit, the Leichhardt seam is 1.6 m to 2.4 m thick but deteriorates to carbonaceous mudstone to the south. The Vermont seam ranges in thickness from 2.6 m to 3.9 m. In one hole it splits into two piles, the lower of which is intruded. The Girrah seam is a banded seam up to 35 m thick and lies some 30 m to 80 m below the Vermont seam.

In the eastern part of the area, to the east of the major fault bounding the Lake Vermont deposit, the only hole (uncompleted) intersected the Vermont seam some 4.5 m thick. Additional drilling has been approved for 1984–85.

Lake Vermont

All previous exploration in the Lake Vermont area, which lies some 20 km north–east of Dysart, was assessed and a record prepared.

In situ reserves in the Rangal Coal Measures were upgraded to measured category and amount to 276 million tonnes, of which 78 million tonnes occur at depths of less than 60 m. Reserves are contained in the Leichhardt and Vermont seams with average thicknesses of 2.9 m and 5.8 m respectively.

Two aspects of the geology requiring special consideration are the coal quality and structure. Coal quality has been well–defined. The raw coal from both seams may be beneficiated in a coal preparation plant to produce steaming coal with an ash content of approximately 11 per cent. Alternatively the coal may be washed to yield both steaming and coking products.

The geological structure of the area reflects its tectonic setting close to the Folded Zone. The strata dip gently to the east, but this pattern is interrupted by major reverse and normal faults which generally sub–parallel the north–westerly strike of the deposit. Because of the complexity of the structure, the density of drilling is not sufficient to determine the structure with a high degree of confidence. Further drilling in conjunction with geophysical exploration must precede any mining feasibility study.

Gravity surveys were used in the Winchester South area to detect structural disturbances. In a joint project with the Geophysical Services Section, a gravity survey was carried out on three drill–lines at Lake Vermont. Results are being evaluated.

COAL DRILLING (Continued)

Rugby

The Rugby area lies some 30 km to the south–west of Moranbah. Previous drilling intersected a coal seam, approximately 9 m thick and at depths exceeding 107 m, in a formation considered the equivalent of the Collinsville Coal Measures and Blair Athol Coal Measures. A scout drilling programme was planned to prospect for shallow occurrence of the seam.

Six holes were drilled for a total 734.91 m (734.66 m cored) and thick coal seams were penetrated in two holes approximately 2 km apart. Preliminary results of analyses indicate the coal may be classified as medium volatile bituminous (ASTM) with a low raw coal ash content and a high sulphur content greater than 2 per cent. Additional drilling is required to determine the extent of this seam.

SOUTH CENTRAL BOWEN BASIN

Mount Stuart Girrah

A programme of seven widely spaced and fully cored holes was proposed for the Mount Stuart-Girrah area, north of Blackwater, to provide additional stratigraphic information in areas of poor reliability in the Cooroorah 1:100 000 sheet area, and to evaluate the coal-bearing German Creek Formation and Rangal Coal Measures. Four holes were completed and another was in progress at the end of the year. Total metreage was 1 570.35 of which a total of 1 527.77 m was cored.

Three of these holes were drilled to the west of the Jellinbah Fault between the Curragh and Lake Lindsay areas to test for possible development of the Rangal Coal Measures in a setting analagous to Curragh. Unfortunately only strata of the underlying Burngrove and Fairhill Formations were intersected. Drilling will be completed early in the 1984-85 year.

North-east Blackwater

Previous drilling in the Jellinbah-Blackwater area proved indicated reserves, suitable for underground mining in the Rangal Coal Measures. Additional drilling, at approximately 2 km spacing, was designed to extend these reserves downdip to 400 m in the area to the north-east of Blackwater. Ten holes, including one redrill, were drilled for a total of 3 125.11 m (2 226.68 m cored).

The area proved to be structurally complex. Although many seams were of workable thickness and quality, all seams were affected by faulting in some parts of the area. Faulting may be low angle thrusts similar to that encountered in the nearby Curragh mine. Reserves are considered to be large inferred. No further drilling is warranted.

Emerald North

Drilling in 1980 and 1981 in the Emerald North and adjoining Ensham area, downdip of the open-cut deposit, was planned and assessed by officers who subsequently left the Department. Additional data was presented, plans were modified, and a record was issued in September, 1983.

Indicated *in situ* reserves of coal in seams of the Rangal Coal Measures, thicker than 1.5 m and at depths generally greater than 100 m, amount to 913 million tonnes. These reserves occur mainly in the Aries and Aries/Castor Seams. The coal is low ash, low sulphur, high volatile bituminous and suitable for use in power generation.

A review of reserves in the Emerald North area, upgraded in category by a drilling programme terminated early in 1983, was in progress.

COAL DRILLING (Continued)

SOUTH CENTRAL BOWEN BASIN

Ensham

A geological reassessment of all data pertaining to the potential open-cut coal deposit in the Ensham area, east of Emerald, was completed and a record prepared. The main points of this reassessment are summarised below.

In situ reserves of 161 million tonnes in seams of the Rangal Coal Measures greater than 1.5 m in thickness were proven to the 100 m overburden isopach of the Aries-Castor/Castor seams. Approximately 70 per cent of these reserves is contained in the Aries/Castor seam which has an average thickness of 5.39 m, an average raw coal ash of 12.2 per cent, and an average volatile matter content of 25.9 per cent (air dried basis). All seams have low sulphur values and relatively low and variable ash fusion temperatures. The coal from all seams is non-coking and is most suitable for use in power generation.

Regionally dips range from 2° to 5° to the west-north-west. Although the structure of the deposit appears to be relatively simple, numerous apparently laterally extensive normal faults with displacements from 5 m to 10 m were identified. Fault orientations were not firmly established.

The deposit was included in Authority to Prospect 426C granted to a consortium in February, 1984 and all data on the Ensham project was given to the operating company.

Togara

Evaluation of the coal resources of the Pollux seam of the Rangal Coal Measures in the area was completed with the drilling of 41 holes including two redrills. Aggregate metreage was 7 935.36 m, of which 2 634.16 m was cored. Results of preliminary coal analyses have been received and computer encoding of borehole data is complete. A geological assessment of results is in progress.

The Department of Mines in association with the Department of Mapping and Surveying undertook a successful trial of the Litton Auto Surveyor Dash II system, with control provided by Doppler stations, in surveying holes in this area. In a three day field period 68 stations (stations approximately 2 km apart) were located and levelled.

SOUTH-WEST BOWEN BASIN

Arcturus

The Arcturus area is located north of Rolleston and west of the Comet River. A drilling programme of seven holes was designed to investigate the Rangal Coal Measures to the west of the Togara area. Control for this programme was based on previous Departmental coal exploration in the Emerald-Springsure area and seismic and petroleum exploration data.

Three holes, totalling 1 185.35 m (936.74 m cored), were drilled before the end of the year and have provided useful stratigraphic and structural information, but no coal seams of economic thickness were intersected. Drilling is continuing.

(By Courtesy — The Chief Government Geologist)

QUEENSLAND RESERVES OF BLACK COAL 1984

Estimates by the Department of Mines for the total of proven reserves of black coal in Queensland, as at June, 1984 amounted to 30 010 million tonnes, of which 14 270 million may be classed as coking coal.

These reserves, as calculated according to the Department's parameters for the calculating and reporting of reserves (1968; Mengel, 1977), are tabulated in Table 1 (Permian basins) and Table 2 (Mesozoic basins). Only demonstrated reserves of measured and indicated first-class categories are reported as proven reserves. Indicated second-class and inferred reserves are not quantified. Additional drilling will be necessary to quantify such reserves, and for this reason the present figures are held to be conservative.

The reserves computed in the above categories are also classified into coal suitable for open-cut (O-C) and underground (U-G) mining. In general, an arbitrary maximum depth of 60 m has been used for the purpose of calculating open-cut coal reserves. The present figures for this category are also held to be conservative.

Reserves in the tables are progress totals in millions of tonnes for raw coal *in situ,* and no allowance has been made for losses in mining and beneficiation. The reserves are reported to:

— the nearest 1 million for quantities up to 10 million tonnes,
— the nearest 5 million for quantities up to 500 million tonnes,
— the nearest 10 million for quantities greater than 500 million tonnes.

Currently proven reserves in the various Authorities to Prospect (AP) and Mining Leases (ML) in Queensland are shown in the tables. Companies holding these mining tenures are listed below.

1. Theodore Coal Pty. Ltd.
2. Thiess Dampier Mitsui Coal Pty. Ltd.
3. Brigalow Mines Pty. Ltd.
4. Baralaba Coal Pty. Ltd.
5. Bluff Collieries Pty. Ltd.
6. Mines Administration Pty. Ltd.
7. Mount Isa Mines Ltd.
8. Griffin Queensland Exploration N.L.
9. Central Queensland Coal Associates
10. The Coal Cliff Collieries Pty. Ltd. and others
11. Capricorn Coal Management Pty. Ltd.
12. Tenneco Oil and Minerals of Aust. Inc.
13. BHP Minerals Ltd.
14. Utah Development Co.
15. Sirius Creek Coal Pty. Ltd.
16. Thiess Bros. Pty. Ltd.
17. Pacific Coal Pty. Ltd.
18. Brigalow Mines Pty. Ltd. & Rio Grande Group
19. Shell Company of Australia Ltd., Oilmin N.L., Transoil N.L., Petromin N.L.
20. Oilmin N.L., Transoil N.L.
21. Shell Company of Australia Ltd.
22. Millmerran Joint Venture
23. Hail Creek Joint Venture
24. State Electricity Commission of Queensland
25. Bridge Oil Ltd. and others
26. White Industries (Qld.) Pty. Ltd.
27. BP Aust. Ltd,. Drayton Mining Development Pty. Ltd., Westfield Ltd.
28. Kennecott Explorations (Australia) Ltd. and others
29. Hancock Prospecting Pty. Ltd. Wright Prospecting Pty. Ltd.
30. Mount Isa Mines Ltd. and others
31. German Creek Joint Venture
32. Marathon Petroleum Australia Ltd.
33. McIlwraith McEacharn Operations Pty. Ltd.
34. Bligh Coal Ltd. and others
35. New Hope Collieries Group

TABLE I

RESERVES — PERMIAN BASINS

(Figures are progress totals in millions of tonnes for raw coal *in situ;* losses will occur in mining and washing)

AREA AUTHORITY TO PROSPECT OR MINING LEASE	COKING COAL								NON-COKING COAL							
	MEASURED			INDICATED First Class			TOTAL M+I	INFERRED	MEASURED			INDICATED First Class			TOTAL M+I	INFERRED
	O-C	U-G	TOTAL	O-C	U-G	TOTAL			O-C	U-G	TOTAL	O-C	U-G	TOTAL		
BOWEN BASIN																
Theodore																
AP 202C[1]	—	—	—	—	—	—	—	—	125	500	625	20	590	610	=1 235	Large U-G
Moura/Kianga																
(a) Moura Franchise Area[2]	110	750	860	—	—	—	860	Large U-G	40	10	50	—	185	185	235	Large
(b) West Moura	—	—	—	—	365	365	365	—	—	—	—	—	—	—	—	—
Baralaba																
Mining Leases, AP257C[4]	—	—	—	—	—	—	—	—	12	65	77	2	55	57	134	Large
Bluff																
(a) Mining Leases[5]	—	—	—	—	—	—	—	—	—	—	—	—	10	10	10	—
(b) AP 190C[6]	—	—	—	—	—	—	—	—	—	—	—	9	—	9	9	Very Small
Yarrabee																
(a) ML 196[6]	—	—	—	—	—	—	—	—	25	—	25	—	—	—	25	Very Small
(b) AP 123C[3]	—	—	—	—	—	—	—	—	—	—	—	15	—	15	15	Small
Hail Ck/Lake Elphinstone																
ML 312[23]	160	—	160	15	635	650	810	—	—	—	—	—	—	—	—	—
Collinsville																
Mining Leases[7]	30	140	170	5	—	5	=175	—	4	40	44	7	—	7	=51	—
Newlands																
ML 365[7]	—	—	—	—	—	—	—	—	70	85	155	—	10	10	165	Small
Eastern Creek																
MLs 381, 382[7]	—	—	—	—	—	—	—	—	12	15	27	—	—	—	=27	—
Suttor Creek	—	—	—	—	30	30	30	—	—	—	—	30	—	30	30	—
Nebo Project[2]																
(a) Bee Creek, ML 368	—	—	—	—	—	—	—	—	20	25	45	—	35	35	80	
(b) South Walker, ML 368	—	—	—	—	—	—	—	—	85	—	85	—	190	190	275	Large U-G
(c) Walker Ck, ML 367	—	—	—	—	—	—	—	—	40	40	80	—	40	40	120	
(d) Kemmis Ck, ML 367	—	—	—	—	—	—	—	—	15	—	15	—	—	—	15	
(e) Lancewood, ML 370	—	—	—	—	75	75	75	—	—	4	4	—	—	—	4	—
(f) Wards Well, ML 260	—	340	340	—	—	—	340	—	—	85	85	—	—	—	85	—
(g) Riverside, ML 152	95	—	95	—	—	—	95	—	—	—	—	—	—	—	—	—
(h) Poitrel, ML 366	80	35	115	—	—	—	*115	—	—	—	—	—	—	—	—	—
(i) Winchester, ML 261	4	—	4	—	—	—	*4	—	—	—	—	—	—	—	—	—
(j) Moranbah, ML 441	—	—	—	—	—	—	—	—	6	7	13	—	—	—	13	—
Moranbah	—	—	—	—	2 050	2 050	†2 050	Large U-G	—	—	—	—	—	—	—	—
C.Q.C.A. Areas[9]																
(a) Goonyella, ML 127	135	30	165	65	1 110	1 175	1 340	Large U-G	—	—	—	—	—	—	—	—
(b) Peak Downs, ML 210	165	15	180	370	1 230	1 600	1 780	Large U-G	—	—	—	—	—	—	—	—
(c) Daunia, ML 244	55	50	105	20	35	55	160	Large U-G	—	—	—	—	—	—	—	Small
(d) Norwich Park, ML 245	125	30	155	150	450	610	765	—	—	—	—	—	—	—	—	—
Burton Downs	—	—	—	45	70	115	115	—	—	—	—	—	—	—	—	—

Winchester South AP 352C[27]	—	—	—	—	—	—	—	—	90	60	150	—	—	—	=150	—
Blair Athol ML 315[10]	—	—	—	—	—	—	—	—	245	—	245	—	—	—	//245	—
Wolfang AP 294C[26]	—	—	—	—	—	—	—	—	—	‡220	220	—	—	—	=220	—
German Creek ML 1306[31]	††90	220	310	††3	280	283	593	Large U-G	—	—	—	25	—	25	25	—
Middlemount AP 315C[11]	—	—	—	—	—	—	—	—	20	95	115	—	30	30	145	Small
Roper Creek AP 414C[11]	—	—	—	—	—	—	—	—	—	—	—	•40	585	625	=625	—
Lake Lindsay AP 388C[28]	15	60	75	—	10	10	=85	—	20	40	60	2	6	8	=68	—
Oaky Creek AP 408C, ML 1315[30]	**90	270	360	—	195	#195	555	Large U-G	—	—	—	—	—	—	—	—
Gregory																
(a) ML 259[13]	45	15	60	10	55	65	=125	—	—	—	—	—	—	—	—	—
(b) AP 209C[13]	—	—	—	—	170	170	=170	Large U-G	—	—	—	—	—	—	—	—
Gordonstone AP 389C[28]	—	—	—	—	555	555	=555	Large U-G	—	—	—	—	85	85	=85	—
Emerald/Ensham AP426C[34]	—	—	—	—	—	—	—	—	—	—	—	155	1 260	1 415	1 415	Large U-G
Capella AP 418C[10]	30	—	30	9	—	9	=39	Large	30	—	30	40	—	40	=70	Large
Blackwater																
(a) Departmental areas																
(i) Jellinbah/Caledonia	—	—	—	—	—	—	—	—	—	—	—	—	90	90	=90	—
(ii) Minyango	—	—	—	—	265	265	265	—	—	—	—	—	15	15	15	—
(iii) Togara	—	—	—	—	—	—	—	—	—	—	—	—	970	970	970	Large U-G
(b) Company areas																
(i) AP 369C[24]	90	—	90	30	100	130	=220	—	120	25	145	270	1 240	1 510	=1 655	—
(ii) ML 110[14]	70	—	70	—	525	525	595	—	35	—	35	—	205	205	240	—
(iii) ML 121[14]	35	—	35	—	380	380	415	Large U-G	2	—	2	—	65	65	67	—
(iv) MLs 194, 195, 242, 296[33]	—	105	105	—	635	635	740	Large U-G	—	—	—	—	—	—	—	—
(v) MLs197, 1866[15]	—	130	130	—	360	360	=490	Large U-G	—	—	—	—	—	—	—	—
(vi) AP 261C, MLs 193, 198, 199, 284, 622 1110, 1768, 1773[16]	35	300	335	5	—	5	=340	Large U-G	4	—	4	—	370	370	=374	—
Rolleston AP 57C[16]	—	—	—	—	—	—	—	—	275	—	275	—	150	150	425	Small
TOTAL—BOWEN BASIN	**1 459**	**2 490**	**3 949**	**727**	**9 590**	**10 317**	**14 266**	**Very Large**	**1 295**	**1 316**	**2 611**	**615**	**6 186**	**6 801**	**9 412**	**Very Large**
GALILEE BASIN																
AP 245C[25]	—	—	—	—	—	—	—	—	220	1 015	1 235	—	—	—	1 235	Large
AP 244C[29]	—	—	—	—	—	—	—	—	125	155	280	140	490	630	910	Large
TOTAL—GALILEE BASIN	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**345**	**1 170**	**1 515**	**140**	**490**	**630**	**2 145**	**Very Large**
TOTAL—PERMIAN BASINS	**1 459**	**2 490**	**3 949**	**727**	**9 590**	**10 317**	**14 266**	**Very Large**	**1 646**	**2 486**	**4 126**	**755**	**6 676**	**7 431**	**11 557**	**Very Large**

* Crucible swelling number. 3. † Includes 555 million tonnes which yield washed product of ash 11-14%. • To 50 m in depth
†† Includes 30 million tonnes in seams < 1.5 m thick. ** Includes 45 million tonnes in seams < 1.5 m thick. # Departmental estimate.
= Under review. ‡ May be open cut in future. // Excludes seam < 6 m thick.

RECOVERABLE RESERVES — PERMIAN BASINS

On the assumption that 90 per cent of open-cut coal and 50 per cent of underground coal are extracted by mining, and using existing experimental data, or otherwise an arbitrary figure of 65 per cent, for the recovery of coking coal after washing, recoverable reserves are
COKING COAL — 5 560 million tonnes, NON-COKING COAL — 5 840 million tonnes.

TABLE 2

RESERVES — MESOZOIC BASINS

(Figures are progress totals in millions of tonnes for raw coal *in situ*; losses will occur in mining and washing)

AREA AUTHORITY TO PROSPECT OR MINING LEASE	NON-COKING COAL							
	MEASURED			INDICATED First Class			TOTAL M + 1	INFERRED
	O-C	U-G	TOTAL	O-C	U-G	TOTAL		
IPSWICH BASIN								
IPSWICH								
Mining Leases	—	440	440	17	190	207	*647	Large
TARONG BASIN								
TARONG								
AP 235C[17]	245	15	260	10	10	20	*280	Large
CALLIDE BASIN								
CALLIDE								
AP 188C Mining Leases[16]	76	94	170	6	29	35	205	Large
MULGILDIE BASIN								
MULGILDIE								
AP 303C[3]	—	—	—	20	—	20	=20	Small
SURAT/MORETON BASIN								
INJUNE-TAROOM								
Bymount	—	—	—	20	—	20	20	Small
Glen Arden	—	—	—	35	—	35	35	Small
TAROOM-WANDOAN								
AP 189C[16]	115	—	115	55	—	55	=*170	Large
AP 152C[18]	—	—	—	55	—	55	=55	Small
AP 157C[3]	280	—	280	200	—	200	=480	Large
AP 182C[18]	110	—	110	25	—	25	135	Small
AP 138C[18]	35	—	35	45	—	45	80	Large
WANDOAN-DALBY								
AP 312C[19]	—	—	—	—	60	60	=60	Large
AP 102C[18]	30	—	30	45	—	45	=*75	Large
AP 150C[18]	25	—	25	5	—	5	*30	Very Small
AP 401C[20]	120	—	120	115	—	115	*235	Large
AP 413C[32]	265	—	265	120	—	120	*385	Large
DALBY-MILLMERRAN								
AP 205C[19]	—	—	—	330	40	370	*370	Large
AP 129C[21]	145	—	145	85	—	85	=*230	Large
Acland mining leases	—	10	10	—	—	—	10	—
Rosewood mining leasesAP								
416C[35]	2	14	16	50	—	§50	66	—
AP 215C[12]	—	—	—	15	5	20	=*20	—
AP 203C[22]	175	—	175	400	—	400	=*575	Large
TOTAL — SURAT/ MORETON BASIN	1 302	24	1 326	1 600	105	1 705	3 031	Large
STYX BASIN								
STYX	—	4	4	—	—	—	4	—
TOTAL — MESOZOIC BASINS	1 623	577	2 200	1 653	334	1 987	4 187	Large

* Washing may be required to produce a marketable coal = Under review § Reserve status under review

RECOVERABLE RESERVES — MESOZOIC BASINS

On the assumption that 90 per cent of open-cut coal and 50 per cent of underground coal are extracted by mining, and using existing experimental data or otherwise an arbitrary figure of 65 per cent, where washing is required to produce a marketable coal, recoverable reserves are NON-COKING COAL — 2 435 million tonnes.

ACIRL RESEARCH

THICK SEAM MINING

Australian Coal Industry Research Laboratories Ltd. (ACIRL) has continued investigations into coal rib stability at Box Flat No.9, CSR Lemington No. 1 and Huntly West Mine (New Zealand).

Instability in coal ribs has been primarily controlled by visible structural features in the coal, as cleats present prior to mining and as induced fractures created by the mining process. The effects of cleat and the virgin stress field, being pre–mining features, can be minimised by the choice of a suitable mining direction and the pattern of induced fracturing can be modified by change to excavation shape, cutting sequence and advance rates.

A trial of various rib supports was undertaken in headings close to modified Wongawilli extraction. Rib supports trialled include timber dowels, fibreglass dowels, spray tecrete, mesh bolts, steel and polycarbonate straps, and chain–mesh wire in a number of different combinations successfully demonstrated the capability of artificial supports for rib stabilisation. These trials were extensively instrumented for the purposes of inter–comparison of different supports. An ACIRL published report is being compiled to disseminate the results of this work.

In June,1983 a new project was commenced at Ulan, New South Wales, in relation to the proposed multi–slice longwall operation at the Ulan No. 3 mine. The research will concentrate on various technology aspects associated with the design and technical assessment of a descending multi–slice longwall mining method. Initial work is concentrating on mathematical modelling and goaf consolidation studies to optimise longwall design and sequencing respectively.

HARROW CREEK — THICK SEAM MINING

Geotechnical studies have been continued to investigate the possibilities of using a multi–lift method of mining the Harrow Creek Seam. A major concern for mining the thick seam in a proposed single pass has been the stability of ribs. The mechanism of considerable rib spall effects has been determined together with a rib classification scheme which relates to increasing depth of cover.

Preliminary, long–term uniaxial creep tests which have been completed indicate possible sudden failure of the coal at 8MPa loading. These investigations are providing important background information upon which a future, high recovery thick–seam mining method may be based.

MONITORING SYSTEM FOR OPEN–CUT MINING EQUIPMENT

A monitoring system for a bucket wheel excavator (BWE) was developed and field tested at Goonyella Mine. The system is capable of producing and storing summaries of BWE operation at every shift at the mine office. Current and past BWE data can also be displayed on a VDU screen or printed from the same office.

The system consists of a high speed on–board monitoring unit which collects BWE production and structural loading. This unit is linked to a base station via an UHF radio link for real–time data analysis and summaries generation. As part of further in–house development, a dragline monitoring system has also been built and installed at an open–cut mine in Central Queensland.

THE WALLOON COAL STUDY

Various difficulties anticipated with the large scale production of coal from the Walloon coal measures of the Surat Basin, Queensland, are being researched. These measures contain bentonitic clays which degrade on contact with water to form sticky lumps and stable suspensions. The project is concentrating on the prediction of the occurrence of the problem, claystone band and methods of handling the coal.
Much of the work to date has included extensive filtration and flocculation studies conducted on laboratory and pilot plant scales.

IMPROVED PRECISION OF LABORATORY FROTH FLOTATION TESTING

This project has investigated the various procedures for testing the floatability of coal in the laboratory and has sought to correlate the results with pilot plant and full scale commercial processes. Three coals have been extensively investigated, including two from New South Wales and one from the Bowen Basin of Central Queensland. The experimental section of the project has been completed and the results are currently being analysed.

THE BENEFICIATION OF FINE COAL BY DENSE MEDIUM CYCLONES

An efficient and controllable process for fine coal beneficiation is being developed. A test circuit containing a 200 mm diameter dense medium cyclone has been installed at the ACIRL Coal Preparation Research Station at Maitland, New South Wales. Instrumentation has been added to the circuit containing the cyclone and has been interfaced with a micro–computer for data collection and process control.

ALTERNATIVE MAGNETITE SUPPLIERS AND TECHNOLOGY FOR USE IN DENSE MEDIUM COAL PREPARATION

Australia currently imports approximately 75% of the 80 000 tonnes of magnetite consumed by the coal industry each year. It is anticipated that the major sources in Australia will be exhausted within five years and new sources are not immediately obvious. Alternative sources and the performance of their magnetites in coal preparation (including recovery and demagnetisation) are being studied.

CARBONISATION

Pitch added to a Queensland medium–high volatile coal has improved the properties of coke made from the coal. In particular there was marked improvement in reactivity of the coke to carbon dioxide — a property of much significance to Japanese blast furnace operators. An Australian base blend which simulates important aspects of typical blends used in Japanese steel mills has been designed, tested and used to assess the coking potential of individual coals.

ACIRL's pilot coke ovens and coke evaluation procedures have been used by a number of Queensland and New South Wales clients to provide coal/coke quality appraisals for coal marketing assistance.

BRIQUETTING

A briquetting machine (double roll) has been acquired to study Japanese coking practice of partial briquetting particularly as it relates to the use of Australian high volatile coals.

AUTOMATIC IMAGE ANALYSIS

The Quantimet 900 image analyser has been further developed to rapidly characterise coal and coke. Good correlation was found between mean random reflectance of vitrinite (determined by Quantimet) and manually determined values. Important structural parameters of metallurgical coke such as porosity and cell wall thickness can be determined simply and these provide, in conjunction with drum test indices and reactivity, a more complete description of coke quality. The instrument has been developed also for determination of particle size distribution of samples such as clay, fly ash, coal water mixtures, etc.

MINE WATER CLEAN–UP

Practical methods for cleaning up mine waters are being tested and recommended for a number of mine sites. Means of solving corrosion of pumps and piping by acid mine waters and disposal of waste waters containing high dissolved solids to conform to environmental regulations have been studied.

COAL AND COKE PETROGRAPHY

The applied coal and coke petrographic unit has enlarged the range of services available for routine and research related coal evaluation. To complement the maceral analysis and reflectance measurements of bituminous coal the following techniques are available:

- Flourescense microscopy for low rank coal examination.
- Etching to study the origin of vitrinite.
- Qualitative assessment and examination of coke samples.
- Analysis of blends according to ICCP methods.
- Grain count analysis, a method developed by CSIRO and modified by ACIRL.

ACIRL continues to have a role in the ICCP activities which currently include combustion and coal hydrogenation. ACIRL is co-ordinating the Australian editorial group developing an International Classification for Hydrogenated Residues.

COAL-WATER MIXTURE TECHNOLOGY

This project aims to determine the ash liberation and grinding energy costs associated with the fine grinding step of the CWM preparation process, to identify suitable fine coal cleaning techniques and to assess the economics of producing CWM feedstock coals with less than 3% ash. Grinding rates energy requirements of six Australian coals with CWM potential will be determined using a pilot-scale wet ball mill.

The response of these coals to fine coal cleaning techniques such as froth flotation, column flotation, selective flocculation, selective agglomeration, high gradient magnetic separation and chemical cleaning will be evaluated in bench-scale testing.

THE ACA COAL COMBUSTION TEST FACILITY

The test facility is being built at ACIRL Riverview, Queensland, following calibration using a range of Australian thermal coals. It will be able to perform testing for producers and users of thermal coals by late 1985.

The test facility will provide information to predict the performance of coals in pulverised fuel-fired applications. Test results will include combustion behaviour, including ignitability, flame stability and turndown ratios. Test panels will provide measurements of simulated boiler slagging, fouling and erosion.

The requirements to control fly ash emissions using either electrostatic precipitators or fabric collectors will be indicated. NOx levels in single and two stage combustion and other gas emissions will be measured. Trace element emissions will be measured and the suitability of fly ash as a cement admixture will be assessed.

The facility includes a nominal 0.17 MW thermal input combustor with test equipment to provide the above results, with the exception of NOx levels from staged combustion. The rig can be fired directly or indirectly using a pilot scale mill. The firing rate is nominally 23 kg/h of bituminous coal.

A smaller test unit, expected to be completed by mid-1986 will enable staged combustion of coals for NOx levels. Its firing rate will be about 2.5 kg/h.

Funding is being provided jointly by the National Energy Research Development and Demonstration Programme administered by the Department of Resources and Energy, and by the Queensland Government.

SPECTROSCOPY

The spectroscopic facilities available in ACIRL are –

(i) X–ray Flourescence Spectrometer which is used for coal ash analysis and some trace elements.

(ii) Dual Beam Atomic Absorption Spectrometer with a graphite furnace and vapour generation accessory. This equipment is also used in trace element anlaysis.

(iii) Scanning Electron Miscroscope equipped with energy dispersive X–ray analyser. This apparatus is used for studies of the morphology and chemistry of particles including fly ash.

The trace elements most commonly analysed are those which are potentially harmful to the environment or of special interest in coal utilisation.

COAL LIQUEFACTION

All experimental work in 1983/84 was directed to National Energy Research, Development and Demonstration Council (NERD&DC) to Victorian brown coal. It is expected that much of the experience and data obtained with brown coal will be applicable to the liquefaction of Queensland high volatile coals such as Wandoan, Taroom, etc.

Samples of Wandoan coal prepared to different ash contents in the ACIRL Rockhampton preparation pilot plant were test–hydrogenated in a semi–continuous reactor. The results indicate that this coal should be washed to about 10–12% ash content to give maximum liquid yield per tonne of run–of–mine coal. The yield of clean coal at 10–12% ash was about 80%, which means that no middlings are produced for which a market has to be found.

ELECTROSTATIC PRECIPITATION — THE DRIFT VELOCITY PROJECT

The three year project, which commenced in November,1982 seeks a technique to measure the drift velocities of fly ashes in a given electric field. The drift velocity will be related to collection efficiencies achieved in full–scale precipitators when back corona is not occurring.

When perfected, drift velocity will add to existing ACIRL techniques, specifically resistivity and corona characteristics, for a more complete evaluation of the electrostatic precipitability of fly ashes resulting from Australian coals. This project is aimed at extending the existing laboratory scale services which predict electrostatic precipitator emissions from small coal samples.

PULVERISED FUEL MILL CAPACITY AND COMPONENT LIFE WHEN GRINDING AUSTRALIAN COALS

Milling characteristics of Australian coals will be defined through a study of the inter–relationships between coal constitution, mill operating conditions, grinding rate, mill power requirements and wear.

It is envisaged that the fundamental knowledge obtained, together with improved laboratory and pilot scale mill test procedures developed during the project, will enable the better prediction of the milling behaviour of new coals for domestic use and of currently produced coals in new export market applications.

LABORATORY FACILITIES

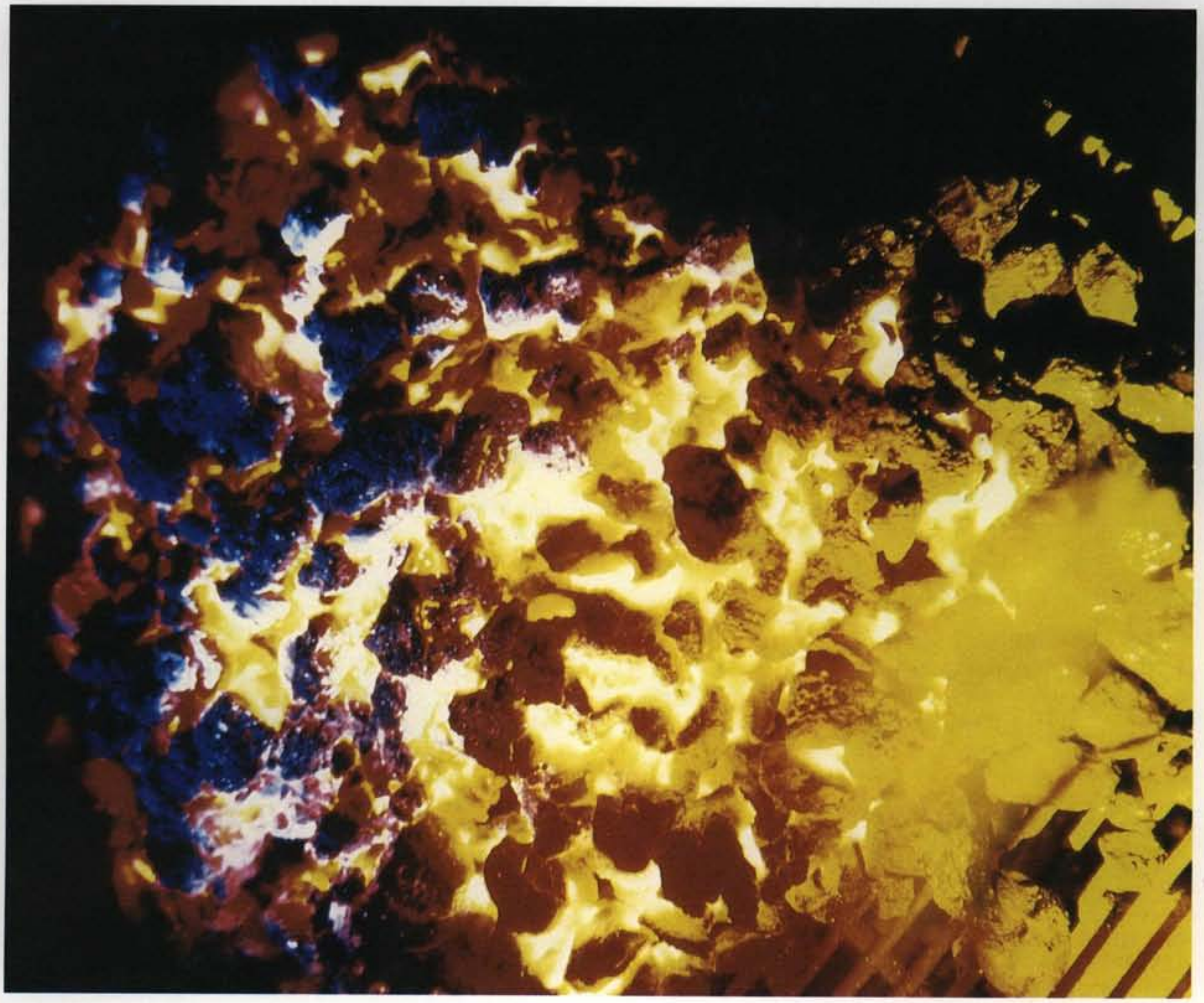
In addition to its involvement in publicly funding coal research, ACIRL also undertakes commissioned work in all the above areas. With laboratories located at Rockhampton and Ipswich in Queensland, Maitland, North Ryde and Bellambi in New South Wales and Perth in Western Australia, it forms the largest coal laboratory network in Australia. The laboratories are equipped and staffed to handle investigatations into problems and opportunities in exploration, mining, coal preparation, handling, marketing and utilisation.

ACIRL RESEARCH (Continued)

With the recent rapid decline in exploration activities, ACIRL laboratories have stepped up mining and marketing related services, especially in production control and environmental analyses. These services, which assist mine management in satisfying statutory regulations, in maintaining product quality control and in improving environmental standards, include:

- Stockpile, truck and wagon sampling
- Stopped belt sampling
- Strip/channel sampling
- Preparation plant sampling (product, refuse, slurries)
- Evaluation of mechanical sampling systems
- Laboratory testing and analysis (comprehensive range)
- Mine gas analysis
- Water analysis
- Spontaneous combustion susceptibility tests
- Diesel engine exhaust gas analysis using a mobile laboratory
- Noise impact assessment
- Atmospheric dust sampling and analysis
- Metallurgical failure analysis

(By Courtesy — Australian Coal Industry Research Laboratories Ltd. (ACIRL), Sydney)



Experimental burn of coke at ACIRL.

SOME REPORTED SHAREHOLDINGS IN CERTAIN COAL MINES AND PROJECTS

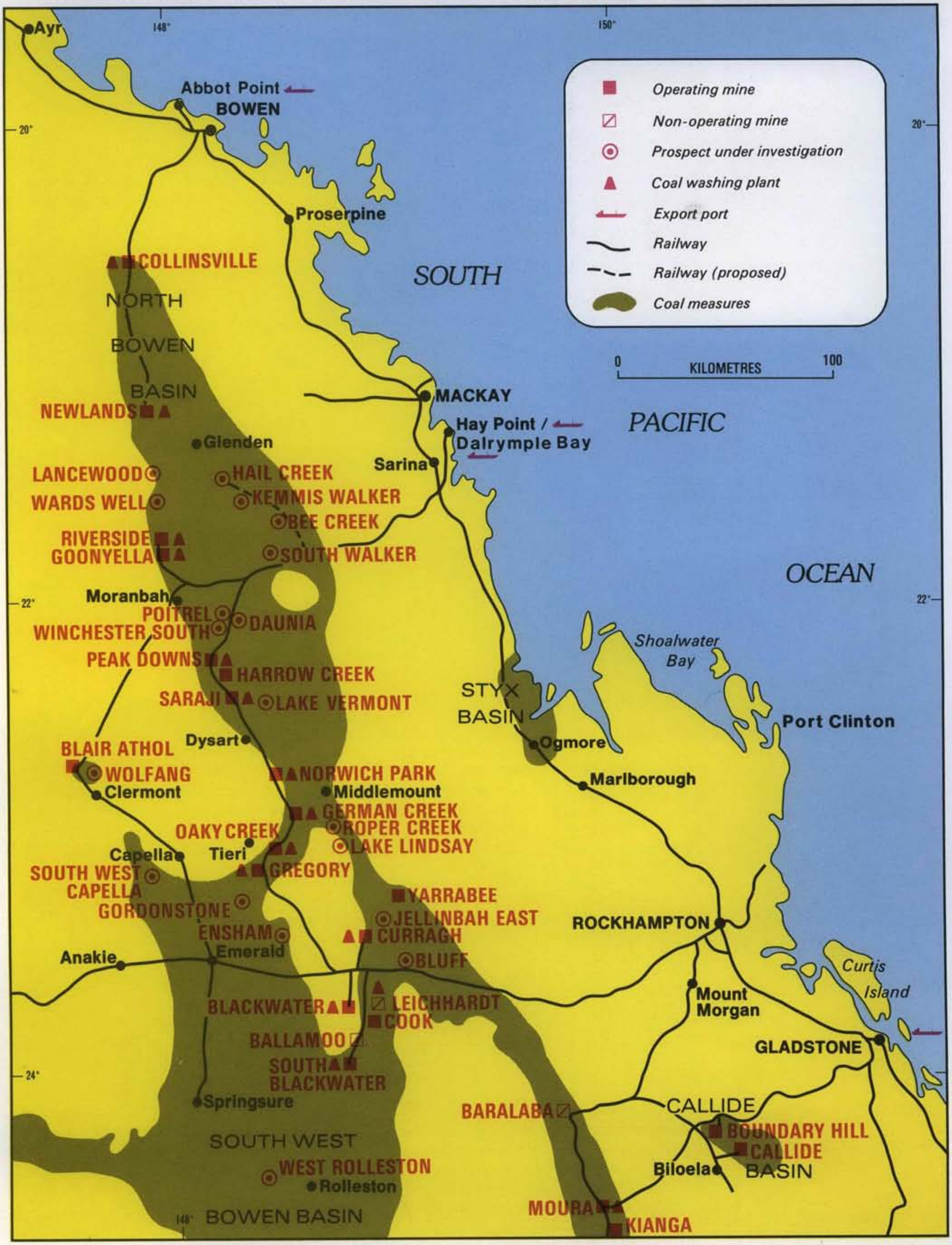
ACI COAL LIMITED	
Curragh	30%
ACI RESOURCES LIMITED	
German Creek	13.03%
Blair Athol	12.195%
AMAX IRON ORE CORPORATION	
Millmerran	70%
AMP SOCIETY	
Boundary Hill, Callide – each	15%
Blackwater, Goonyella, Gregory, Harrow Creek, Norwich Park, Peak Downs, Saraji – each	7.75%
ANACONDA AUSTRALIA INC.	
Curragh	30%
ARCO AUSTRALIA LIMITED	
Blair Athol	15.39%
AUSTEN & BUTTA COLLIERIES	
German Creek	21.4%
BHP MINERALS LIMITED/UTAH DEVELOPMENT COMPANY LIMITED	
Blackwater, Goonyella, Harrow Creek, Norwich Park, Peak Downs, Saraji – each	35%
BHP MINERALS LIMITED	
Gregory	47%
BUNDABERG SUGAR COMPANY	
Box Flat, Rio-Grande, Westfalen – each100%	
Chinchilla	20%
COAL CLIFF COLLIERIES PTY. LIMITED	
Blair Athol	50.22%
CRA LIMITED	
Tarong	100%
Hail Creek	25%
CSR LIMITED	
South Blackwater, Taroom, Yarrabee — each	100%
Theodore	60%
Boundary Hill, Callide – each	55%
Monto, Rolleston, Wandoan, West Moura, Yarrabee South – each 50%	
Hail Creek	44%
Chinchilla	40%
Moura, Nebo, Riverside – each	22%
DAMPIER COAL (QUEENSLAND) PTY. LTD.	
Moura, Nebo, Riverside – each	58%
ESSO EXPLORATION (AUST.)	
Hail Creek	25%
GENERAL ELECTRIC COMPANY	
Blackwater, Goonyella, Gregory, Harrow Creek, Norwich Park, Peak Downs, Saraji – each	15.5%
MARATHON OIL COMPANY	
Macalister	100%
MILLER, R.W. & CO.	
Curragh	30%
MILLMERRAN COAL PTY. LIMITED	
Millmerran	20%
M.I.M. HOLDINGS LTD.	
Collinsville, Newlands – each	100%
Oaky Creek	79%
Monto, Rolleston, Wandoan, West Moura, Yarrabee South – each	50%
Chinchilla	40%
MITSUBISHI DEVELOPMENT PTY. LTD.	
Wolfang	25%
Blackwater, Goonyella, Harrow Creek, Norwich Park, Peak Downs, Saraji – each	12%
MITSUI COAL DEVELOPMENT (AUSTRALIA) PTY. LIMITED	
Millmerran, Curragh – each	10%
MITSUI & CO. (AUST.) LTD.	
Moura, Nebo, Riverside – each	6.7%
MITSUI & CO. LTD. (JAPAN)	
Moura, Nebo, Riverside – each	13.3%
NATIONAL COAL BOARD/COMMERCIAL UNION ASSURANCE	
German Creek	12.06%
NATIONAL MUTUAL LIFE ASSOCIATION OF AUSTRALASIA	
German Creek	13.03%
OILMIN/PETROMIN/TRANSOIL	
Barakula, Bowenville – each	50%
OILMIN/TRANSOIL	
Brigalow Deposit	100%
QUEENSLAND COAL TRUST ASSOCIATION OF AUSTRALASIA	
German Creek	13.03%
OILMIN/PETROMIN/TRANSOIL	
Barakula, Bowenville – each	50%
OILMIN/TRANSOIL	
Brigalow Deposit	100%
QUEENSLAND COAL TRUST	
Blackwater, Goonyella, Gregory, Harrow Creek, Norwich Park, Peak Downs, Saraji – each	21.75%
RUHRKHOLE AUSTRALIA PTY. LIMITED	
(German Creek)	10.77%
SHELL COMPANY OF AUSTRALIA	
Acland, Pentland – each	100%
Barakula, Bowenwille – each	50%
Theodore	40%
Boundary Hill, Callide – each	30%
German Creek	16.68%
SUPERANNUATION FUND INVESTMENT TRUST	
German Creek	13.03%
UTAH DEVELOPMENT COMPANY LIMITED/BHP MINERALS LIMITED	
Blackwater, Goonyella, Harrow Creek, Norwich Park, Peak Downs, Saraji – each	35%
WHITE INDUSTRIES (QLD) PTY. LTD.	
Wolfang	75%

MINING SECTION

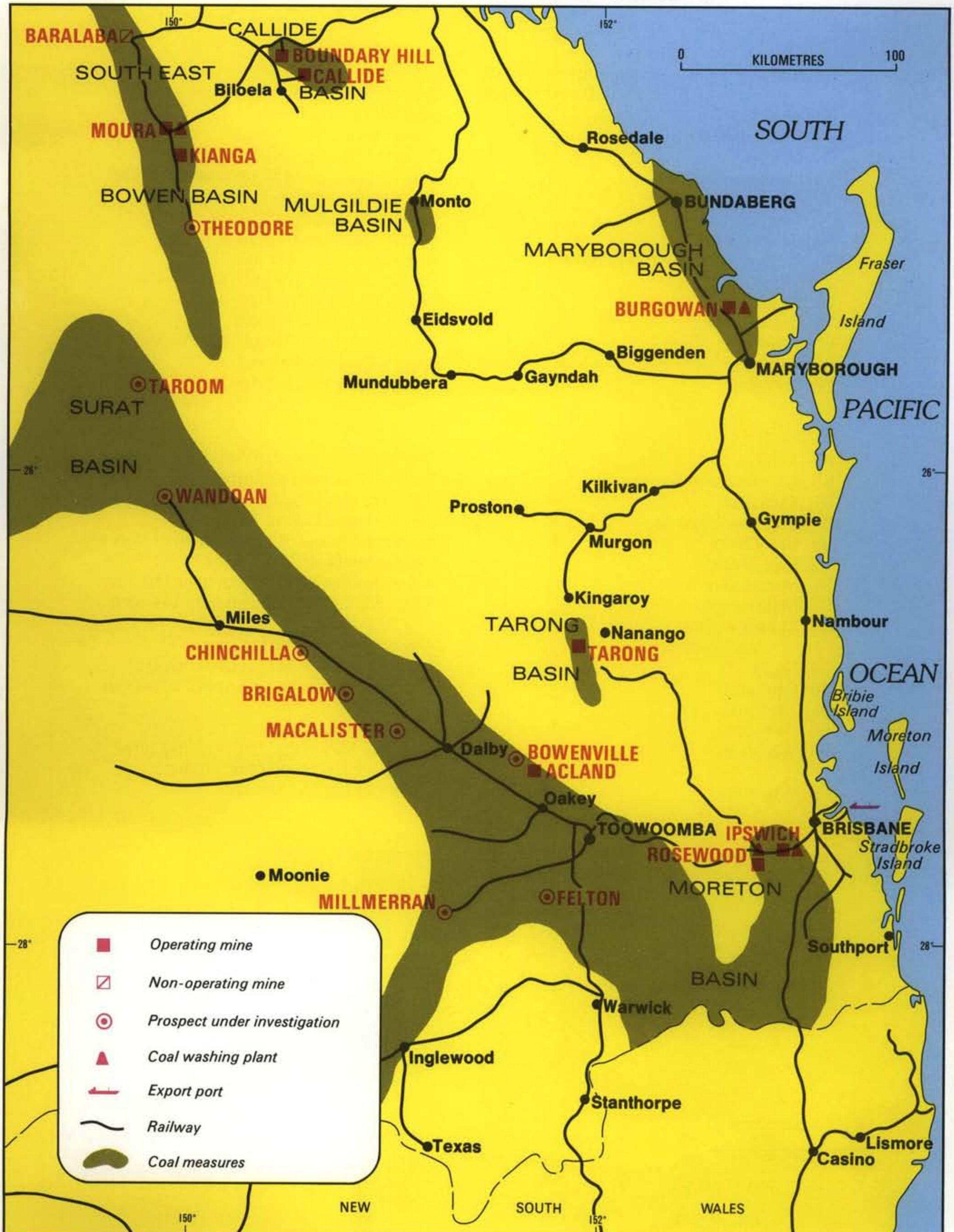
General information on some developed mines and potential coal fields appears in this section.

Similar details have appeared in previous Annual Reports. Where necessary this information has been updated by the mining companies concerned.

NORTHERN AND CENTRAL DIVISIONS



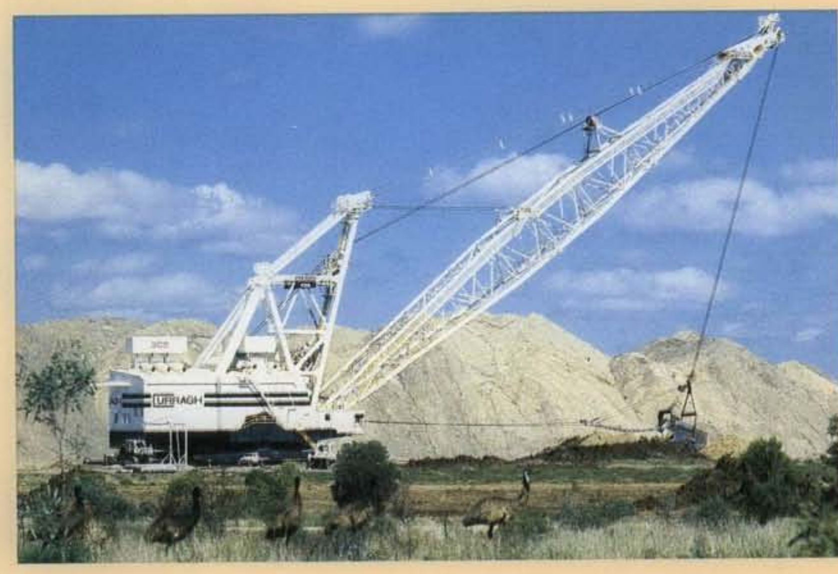
SOUTHERN DIVISION



INDEX

DEVELOPED MINES

POTENTIAL COAL FIELDS



Curragh.

DEVELOPED MINES

BLACKWATER, GOONYELLA, HARROW CREEK, NORWICH PARK, PEAK DOWNS AND SARAJI

CENTRAL QUEENSLAND COAL ASSOCIATES

Information

Central Queensland Coal Associates is a joint venture between the following participants:-

Utah Development Company Limited / BHP Minerals Limited	(35.00 per cent)
Queensland Coal Trust	(21.75 per cent)
General Electric Company	(15.50 per cent)
Mitsubishi Development Pty. Ltd.	(12.00 per cent)
Australian Mutual Provident Society	(7.75 per cent)
Bell Resources Ltd.	(5.00 per cent)
Pancontinental Mining Limited	(3.00 per cent)

As part of a corporate reorganisation in April, 1984 the CQCA Joint Venture was expanded and restructured to include the Blackwater Mine, formerly wholly-owned and operated by Utah, and new equity participants. Australian entities own 72.5 per cent currently, and hold options to buy a further 7 per cent from General Electric Company, U.S.A.

CQCA also owns the coal terminal at Hay Point, 40 km south of Mackay.

Locations Open-cut Mines

Blackwater mine is situated 216 km west of Rockhampton and 315 km by rail from Gladstone.

Goonyella is approximately 225 km south-west of Mackay and 198 km by rail from Hay Point.

Peak Downs, Saraji and Norwich Park are south from Goonyella on another railway line. Norwich Park is the southern most mine and is 256 km from Hay Point.

Operations

The following mines are operated as open-cuts and are designed for the annual production quantities of coking coal as indicated:-

		(Tonnes)
Blackwater	—	4 000 000
Goonyella	—	4 500 000
Peak Downs	—	5 400 000
Saraji	—	4 700 000
Norwich Park	—	4 300 000

The Blackwater mine has a steaming coal production capacity of 2 600 000 tonnes per year.

Employees at the mine totalled 2 898 at June 30, 1984.

DEVELOPED MINES

Coal Quality

Blackwater, Goonyella and Peak Downs coals are medium volatile, while Saraji and Norwich Park are low volatile. The coals are hard coking with International Standard Classifications 434. Typical washed coal analyses are:-

	Black-water	Goon-yella	Peak Downs	Saraji	Norwich Park
Total Moisture (As Received)	10.0%	10.0%	10.0%	10.0%	10.0%
(Air Dried)					
Inherent Moisture	2.0%	1.3%	1.0%	1.2%	1.2%
Volatile Matter	26.5%	25.5%	21.0%	19.5%	17.0%
Fixed Carbon	63.2%	65.4%	68.5%	69.8%	71.5%
Ash	8.3%	7.7%	9.5%	9.5%	9.5%
Total Sulphur	0.50%	0.51%	0.65%	0.53%	0.65%
C.S.N.	$5^1/_2$	8	8-9	8-9	8-9
Specific Energy	32.06 MJ/kg	32.94 MJ/kg	32.69 MJ/kg	32.69 MJ/kg	31.90 MJ/kg

A total of 22 large draglines are used at the open-cuts to strip overburden from above the coal seams. Coal is extracted using electric shovels and/or front end loaders with 110 capacity bottom-dump coal haulers. After crushing in rotary breakers, the coal is processed to customer specifications in mine preparation plants using heavy medium cyclones for the coarse coal fraction and froth flotation for the fine coal product. Both coarse and fine coal are combined and conveyed to a radial stacker for stockpiling prior to railing.

Underground Operation

Harrow Creek Trial Colliery is an underground mine which is situated 6 km south-east of Peak Downs mine industrial area. The fundamental aim of this initial underground venture is to determine the physical and economic mining conditions at depth on CQCA's leases.

Mining Method and Production

Mining is by bord and pillar system using a continuous miner and shuttle cars. Presently the mine is designed to produce 350 000 tonnes per year. The coal is treated at Peak Downs mine. At June 30, 1984, 62 men were employed at the mine.

Coal Quality

Harrow Creek coal is medium volatile, bituminous, medium rank and strongly coking.

Port of Shipment

Coal from five northern mines is shipped from Hay Point. The Hay Point facilities have loaded ships of over 179 000 tonnes capacity. The port is designed for an annual loading in excess of 20 million tonnes. Blackwater coal is shipped through the Clinton loading facility at Gladstone, which is owned and operated by the Gladstone Harbour Board.

Townships

Blackwater mine employees and their families live in the town of Blackwater, which has a population of around 7 500 people. Employees at Goonyella and Peak Downs live in Moranbah, which has a population of approximately 7 000. Dysart is the centre for Saraji, Norwich Park and Harrow Creek employees, and has a population exceeding 4 000.

Stacker Reclaimer — Hay Point

DEVELOPED MINES

General Information

Prior to the April, 1984 reorganisation, CQCA was authorised to export a total of 457.2 million tonnes of coking coal from its Special Coal Mining Lease areas with the provision that should exports exceed 20.3 million tonnes in any one year, the excess will be mined from depths greater than 200 feet (approximately 60 metres). An additional 101.6 million tonnes may be exported provided it is mined from depths greater than 200 feet. CQCA is also authorised to export a total of 101.6 million tonnes of coking coal from its Blackwater leases.

Japanese export contracts from Goonyella and Peak Downs are presently running at 7 million tonnes per year. Peak Downs coal is exported under contract to European and North-East Asian countries. Saraji and Norwich Park coals are exported to Japan as well as Asian and European countries.

BLAIR ATHOL

BLAIR ATHOL COAL PROJECT

Company Information

Current interests in the Project are:–

The Coal Cliff Collieries Pty. Limited	(50.22 per cent)
ARCO Australia Limited	(15.39 per cent)
ACI Resources Limited	(12.195 per cent)
Bundaberg Sugar Company Limited, Millaquin Sugar Company Pty. Limited, Gibson and Howes Pty. Limited	(12.195 per cent)
EPDC (Australia) Pty. Ltd. and J.C.D. Australia Ltd.	(10.00 per cent)

The Manager is Pacific Coal Pty. Limited (a subsidiary of CRA Limited)

Location

The Blair Athol coal field, located 22 km from the township of Clermont, is contained within an isolated sub-basin on the western margin of the Bowen Basin – already well established as a major coal producing area. Blair Athol is about 280 km south-west of Mackay.

Reserves

Recoverable reserves are estimated to 240 million tonnes of good quality steaming coal.

Coal Quality

The typical coal quality is indicated in the table:-

(Air Dried)	
Inherent Moisture	7.5%
Volatile Matter	27.2%
Fixed Carbon	57.3%
Ash	8.0%
Total Sulphur	0.3%
Grindability (Hardgrove Index)	60
Specific Energy (at 7.5% moisture)	27.25 MJ/kg

Previous Mining Operations

Small-scale mining has been undertaken for many years, with an estimated 9 million tonnes of coal being extracted by both open-cut and underground methods.

DEVELOPED MINES

Export Operations

A new open-cut mine has recently been constructed. The initial capacity is 5 million tonnes per annum and the coal will be exported chiefly to several power utilities in Japan. Shipment of coal commenced in February, 1984.

Development of the project involved:-

The construction of a major new mining facility.

Expansion of the rural township of Clermont. The current population of Clermont is 2 000. This will increase to around 3 200.

The upgrading of some facilities, including provision of a new water supply.

Construction of 110 km of high-voltage power line.

Construction of 110 km of railway track, linking with the rail network to Hay Point.

Participation with the Queensland Government and other coal companies in the construction of the Dalrymple Bay coal terminal located at the port of Hay Point.

The township of Clermont has benefitted both economically and socially from the development of the Blair Athol Mine. The project has included the provision of accommodation and facilities for the housing of the mine workforce in Clermont.

At least 250 houses are to be constructed to accommodate married employees. A motel style complex has been constructed to house about 60 single employees.

Manning level for a production of 5 million tonnes per year is expected to build up to in excess of 310. The mine is capable of being expanded eventually to a production rate of 8 million tonnes per annum.

BOUNDARY HILL AND CALLIDE

THIESS BROS. PTY. LIMITED

Company Information

Thiess Bros. Pty. Limited is a wholly owned subsidiary of CSR Limited. Callide coal field is a co-venture between:-

Thiess Bros. Pty. Limited	(55 per cent)
The Shell Company of Australia Limited	(30 per cent)
Australian Mutual Provident Society (AMP)	(15 per cent)

Management of the mines and further development of reserves and marketing is the responsibility of Thiess Bros. Pty. Limited.

Location

The Callide coal field is located 120 km west of Gladstone.

Operation

The current annual production rate from the Callide coal field is approximately 3.5 million tonnes per year from the two open-cut mines. One is based on the Dunn Creek/Trap Gully area in the southern end of the field and the other is located at Boundary Hill at the northern end. The mines are designed to produce 4.5 million tonnes per year. At June 30, 1984, 389 people were employed at the mines.

DEVELOPED MINES

Coal Quality The coal is sub-bituminous with excellent combustion characteristics. A typical analysis is as follows:-

(Air Dried)	Callide	Boundary Hill
Inherent Moisture	9.3%	11.7%
Volatile Matter	24.5%	25.1%
Fixed Carbon	49.7%	50.4%
Ash	16.5%	12.8%
Specific Energy	20.7 MJ/kg	20.4 MJ/kg

Remarks In the Dunn Creek/Trap Gully mine the majority of overburden is removed by using a 1350W (32 cubic metres) dragline on a continuous shift basis while pre-stripping for this dragline and removal of intra-seam partings is accomplished by a front-end loader and rear dump truck fleet.

At the Boundary Hill mine a 24 cubic metre face shovel and a fleet of 154-tonne rear dump trucks are used to remove overburden in a series of benches down to the coal seam.

Markets Steaming coal production is for local markets, the major users being the Queensland Alumina Refinery at Gladstone and the power stations at Callide and Gladstone. Callide coal is also used to bunker the coal-fired ships on the Weipa/Gladstone bauxite run.

COLLINSVILLE

COLLINSVILLE COAL COMPANY PTY. LTD.

Company Information This company is a wholly owned subsidiary of M.I.M. Holdings Limited.

Mines

NO. 2 MINE UNDERGROUND
NO. 3 MINE UNDERGROUND
OPEN-CUT MINES

Location These mines are located at Collinsville, 86 km by rail south-west of the port of Bowen.

Operation Coal is won by both underground and open-cut mining methods. Approximately 690 persons are employed in the operations.

Coal Quality The Blake seam coal is a high ash, low sulphur steaming coal. Coal from the Bowen seam is a medium volatile steaming/coking coal with a sulphur content varying from 0.4 to 3.0 per cent in the underground mines and from 0.5 to 1.2 per cent in the open-cut operations.

Typical analyses (nominal Air Dried) are:-

	Bowen R.O.M.	Blake R.O.M.
Inherent Moisture	1.5%	1.5%
Volatile Matter	20.0%	19.5%
Fixed Carbon	63.5%	58.3%
Ash	15.0%	20.7%
Total Sulphur	2.0%	1.0%
C.S.N.	5	0-1
Specific Energy	29.5 MJ/kg	27.0 MJ/kg

DEVELOPED MINES

The Scott, Denison and Garrick seams are blended and washed to produce coking quality coal. Typical washed product qualities for a 4:1 blend of Scott Denison seam and Garrick seam are:-

Inherent Moisture	1.5%
Volatile Matter	26.0%
Fixed Carbon	63.5%
Ash	9.0%
Total Sulphur	0.9%
C.S.N.	6

Research

Research into the gas/outburst problem mainly concentrated on alleviation through long-hole drilling and gas drainage. A mining block was drilled and gas drained involving a total of 6 900 m of drilling to depths of 300 m.

Rock mechanics research included further development of numerical modelling and pillar design studies.

Remarks

On the domestic market, coal is primarily supplied to Mount Isa Mines Limited, Queensland Electricity Generating Board, Queensland Nickel Pty. Ltd., North Australian Cement Limited and Bowen Coke Works.

The Collinsville mine expansion programme was completed and officially opened in December, 1983. The expansion provides for an additional 1 000 000 tonnes per annum of coking coal to Japanese steel mills. The first coal was delivered to the preparation plant in October, 1983 and exported through the newly completed port of Abbot Point in March, 1984. Upgrading of the rail line from Collinsville to Bowen continued.

An additional twenty-three houses for employees were built bringing to one hundred and sixty the total number constructed. Two additional single accommodation units were built bringing the total number to thirteen.

COOK — COAL RESOURCES OF QUEENSLAND PTY. LTD.

Company Information

This company is a subsidiary of McIlwraith McEacharn Operations Pty. Ltd.

Mine

COOK COLLIERY

Location

The Cook underground mine is located on the Blackwater field 216 km west of Rockhampton and 20 km south of Blackwater. Coal mined at Cook is hauled 11 km to the preparation plant and rail loadout. The product coal is railed 330 km to the port at Gladstone.

Operation

In May, 1983 the leases and operations at Cook and Leichhardt were purchased by McIlwraith McEacharn Operations Pty. Ltd. from BHP Minerals Limited. Since that date, expenditure has been incurred acquiring additional plant and equipment.

Coal Quality

There are two coal products:-

— a high grade coking coal (7% Ash, 0.4% Sulphur, 27% Volatiles, CSN 7 to 8).

— a high energy thermal coal (13% Ash, 0.4% Sulphur, 23 - 25% Volatiles, Specific Energy 29.68 MJ/kg Air Dried)

Sales The bulk of the output of coking coal and thermal coal is being sold to the Korean market.

Activities A contract to supply the Gladstone Power Station was concluded during the year. Contracts for coking and thermal coals to Korea commenced, supplying steel and cement manufacturers in that country.

Extension to and upgrading of the coal preparation plant was concluded at the end of the year.

CURRAGH — CURRAGH QUEENSLAND MINING LIMITED (CQML)

Company Information CQML is constructing the Curragh Mine on behalf of a co-venture comprising:-

ACI Coal Limited	(30 per cent)
Anaconda Australia Inc.	(30 per cent)
R.W. Miller & Company Pty. Limited	(30 per cent)
Mitsui Coal Development (Australia) Pty. Ltd.	(10 per cent)

Location 10 km north of Blackwater.

Coal Both steaming coal and coking coal is produced at Curragh. The steaming coal is for use by The State Electricity Commision at Gladstone Power Station and ultimately the new power station to be built at Stanwell near Rockhampton.

The steaming coal is being sold under a coal supply agreement between the co-venturers, The Queensland Coal Board, The State Electricity Commission of Queensland and the Queensland Electricity Generating Board. This agreement involves the supply of 66 400 000 tonnes of steaming coal over a period of 20 years.

The coking coal is exported on the following specifications:-

Total Moisture (As Received)	10.0% max.
Volatile Matter (Air Dried)	23.0% max.
Ash (Air Dried)	7.0% max.
Total Sulphur	0.60% max.
C.S.N.	$6^1/_2$-9
Size	32 mm x 0
Maximum Fluidity	59-300 dd/min. nominal
Reactive Maceral Content	65% by vol. nominal
R_0 Vitrinite	1.24 - 1.30
Hardgrove Grindability Index	70 min.

In situ measured surface mine coal reserves within the lease area are in the order of 160 million tonnes.


Curragh Industrial Area.

DEVELOPED MINES

Mine Development

Construction work on the Curragh Mine is now complete with current capacity of 2 300 000 tonnes of steaming coal and 2 000 000 tonnes of coking coal per annum. The mine will be expanded in line with The State Electricity Commission's coal supply agreement for 4 000 000 tonnes of steaming coal per year. Coking coal output will rise to 2.8 million tonnes per year. This expansion would entail the purchase of one further Marion 8200 dragline (to a total of three) and coal mining and hauling equipment. An expansion of coal preparation facilities would also be necessary.

The initial coal mining commenced in September, 1983 with the first shipment of steaming coal being made on schedule in October, 1983. Coking coal was first shipped in April, 1984 - on schedule.

Railway

A spur line has been constructed from the central railway some 3 km west of Blackwater to enable railing of coal to Gladstone.

Port

Export coal is shipped through the Gladstone Harbour Board Clinton Estate Facility. CQML has acquired two stockpile areas each of 300 000 tonnes capacity.

Town

CQML has developed housing for the mine workforce and Duaringa Shire Council has expanded water and sewerage services in Blackwater. The Curragh development has resulted in a population increase exceeding 1 200 in Blackwater.

Services

Existing water supply pipe lines from the Bedford Weir on the Mackenzie River were diverted around the mine and the capacity increased to cater for supply to the mine and to the increased population at Blackwater. Power supply to the mine extends from a new 66kV line to the mine from the Blackwater switchyard.

Marketing

A contract has been signed for the supply of 1 500 000 tonnes of coking coal per year to the Japanese steel mills. The balance of production is being sold to markets in Asia, Latin America, Europe and the Middle East.

Capital Expenditure

Capital cost for the development and associated infrastructure was $400 000 000.

GERMAN CREEK M.L. 1306

CAPRICORN COAL MANAGEMENT PTY. LTD.

Company Information

The participants in the joint venture are:-

Austen & Butta Collieries Pty. Limited	(21.40 per cent)
The Shell Company of Australia Limited	(16.68 per cent)
A.C.I. Resources Limited	(13.03 per cent)
Superannuation Fund Investment Trust	(13.03 per cent)
National Mutual Life Association of Australasia Ltd.	(13.03 per cent)

DEVELOPED MINES

Coal Developments (German Creek) Pty. Ltd.- comprising National Coal Board, (U.K.) and Commercial Union Assurance Company	(12.06 per cent)
Ruhrkohle Australia Pty. Limited	(10.77 per cent)

Capricorn Coal Management Pty. Ltd. is managing the $400 million project on behalf of the joint venture.

Location

The mine is located approximately 180 km inland and can be reached from either of the regional coastal centres of Mackay or Rockhampton – 275 km and 302 km by road respectively.

Operation

Coal production commenced at the open-cut mine in October, 1981 and from the underground mine during the latter part of the 1982/83 financial year. Combined production of saleable coal to June 30, 1984 was 5.33 million tonnes.

In its initial stages, the German Creek mine will depend heavily on open-cut mining. However, Stage 2, the development of the underground central colliery, began in August, 1982 and production commenced in January, 1984. Total cost of the central colliery is expected to be about $110 million.

The mine has been designed to produce up to 4 million tonnes of hard coking coal yearly, using both methods. Output at June 30 , 1984 was at the rate of 3.25 mtpa. In August, 1984 the company expanded the washing capacity of its coal preparation plant by installing 216 spiral units especially to treat intermediate size coal fractions. Because of the scale and nature of operations necessary to ensure viability of the project, and its location in a semi-remote part of the State, development has included provision of a major supporting infrastructure.

Reserves

The main coking coal reserves in the leases are contained in the three major seams – German Creek, Tieri and Aquila. These vary in average thickness from 1.7 m to 2.5 m.

Total *in situ* reserves of coking coal available to open-cut production by present mining methods are now estimated at 90 million tonnes. A further 1 110 million tonnes of *in situ* coal are mineable by underground methods.

Coal Quality

Coking coal produced from the project is of the following quality:-

Total Moisture (As Received)	10.0%
(Air Dried)	
Volatile Matter	20-22%
Ash	8.5%
Total Sulphur	0.8%
C.S.N.	8-9
Size	5 mm x 0

Gray King Coke Type	G9-G11
Maximum Fluidity	Greater than 400 ddm
Vitrinite Content	75-85%
Mean Max. Reflectance	1.30-1.50

Railway

Initially, exports of German Creek coal were shipped through the Clinton Estate facility at Gladstone from April, 1982. However, they were diverted to the Dalrymple Bay Coal Terminal at Hay Point, near Mackay, in March, 1984.

Services

Water for the mine and Middlemount township is supplied by pipe-line from the Mackenzie River system, supplemented by a 10 000 megalitre dam built by the company adjacent to the mine.

Township

The company has established the town of Middlemount, 25 km from the mine, to accommodate 780 employees and their families. A total of 605 houses are planned to be built and at June 30, 1984, 490 had been completed and 465 occupied. Town facilities of a high standard and at least comparable to those available in Australian capital cities, have been completed and are in operation. The town has been designed to accommodate a population of 3 400 with provision for future expansion to 7 500. At June 30, 1984 the town population was 2 407.

GREGORY

THE GREGORY JOINT VENTURE

Company Information

The Gregory Joint Venture was formed in April, 1984 to take up equity in the Gregory Mine, formerly owned and operated by BHP Minerals Limited.

The Gregory Joint Venture comprises:-

BHP Minerals Limited	(47.00 per cent)
Queensland Coal Trust	(21.75 per cent)
General Electric Company	(15.50 per cent)
Australian Mutual Provident Society	(7.75 per cent)
Bell Resources Ltd.	(5.00 per cent)
Pancontinental Mining Limited	(3.00 per cent)

As from April 2, 1984 Utah Development Company Limited became responsible for the management of Gregory Mine for the Gregory Joint Venture.

Location

The Gregory open-cut mine is located 60 km north-east of Emerald.

Operation

Gregory Mine became operational in 1979, with the first shipment taking place in May, 1980. It has a production capacity of 4 million tonnes of coking coal a year. A single seam, known as the Lilyvale seam, which forms part of the German Creek coal measures, is mined.

Major infrastructure involved housing at Emerald and Capella, bitumen access roads to the minesite, a railway branch line from west of Blackwater, power and water lines.

DEVELOPED MINES

Coal Quality

Typical washed coal analyses for Gregory Mine are:-

Total Moisture (As Received)	10.0%
(Air Dried)	
Inherent Moisture	2.0%
Volatile Matter	32.0%
Ash	8.5%
Sulphur	0.65%
C.S.N.	8 - 9
Size	50 mm x 0

Exports

The bulk of Gregory coal is exported to Japan. During 1983-84 sales were made to customers in Korea, Taiwan and Spain.

LALEHAM AND SOUTH BLACKWATER

THIESS BROS. PTY. LIMITED

Company Information

The South Blackwater mines are owned by Thiess Bros. Pty. Limited, a wholly owned subsidiary of CSR Limited and are operated as part of CSR's Coal Division.

Location

The mines are located 225 km west of Rockhampton and 343 km by rail from Gladstone.

Operation

At June 30, 1984, 623 employees were engaged at the mines.

The operations have a production capacity currently in excess of 2 million tonnes per year and are capable of major expansion. Coal is produced from the open-cut areas of Terang, Togara, Laleham B and Kenmare using two draglines and a fleet of scrapers for overburden removal. At the Laleham underground mine continuous miners and shuttle cars are used.

Coal Quality

South Blackwater is a multi-seam operation which is worked by both open-cut and underground operations. By selective mining and preparation, coals of the following specifications can be produced:-

(Air Dried)	Coking Coal (Medium Volatile)	Steaming Coal
Inherent Moisture	2.0%	2.0%
Volatile Matter	27-29%	25%
Fixed Carbon	62.3%	60%
Ash	7.3%	12.5%
Sulphur	0.6%	0.75%
C.S.N.	6-7	-
Specific Energy	-	29.68 MJ/kg

Markets

Coking coal is supplied under a long-term contract to the Japanese steel mills. This contract calls for deliveries of up to 1.7 million tonnes per annum. Steaming coal is exported to markets in the Pacific Basin and Europe. Coal is shipped from the three facilities at Gladstone.

MOURA — THIESS DAMPIER MITSUI COAL PTY. LTD.

Company Information

This company is a consortium comprising:-

Dampier Coal (Queensland) Pty. Ltd.	(58.0 per cent)
Thiess Holdings Limited	(22.0 per cent)
Mitsui & Co. Ltd. - Japan	(13.3 per cent)
Mitsui & Co. (Australia) Ltd.	(6.7 per cent)

Mines

MOURA UNDERGROUND NO. 2
MOURA UNDERGROUND NO. 4
OPEN-CUT MINES

Location

The open-cut and underground coal mining operations are located in the south-east flank of the Bowen Basin of Central Queensland. Some 860 people are employed.

Operation

Coal is won by underground and open-cut operations.

OPEN-CUT – Overburden is stripped, after being drilled and blasted, by the use of four walking draglines. The exposed coal seam is also drilled and blasted before being trucked to an overland conveyor belt for transport to the preparation plant (or washplant).

UNDERGROUND – Two underground mines, Moura Nos. 2 and 4, are operating in the northern part of the mining area. Access to underground reserves is by direct entry through portals in exposed coal seams in previously strip-mined areas. All coal is mined by continuous miners and is transported by conveyor belts to the preparation plant.

Coal Preparation

The minus 125 mm raw coal is delivered to the washplant feed stockpile via a 16 km, 2 000 tph overland conveyor system. Four dump stations/stockpiling installations are located along this conveyor to receive and crush run-of-mine coal to a topsize of 125 mm.

Railway

Coal is railed 184 km to the Port of Gladstone. Each train consists of three diesel locomotives and sixty wagons, containing approximately 3 000 tonnes.

Port of Shipment

The Barney Point Coal terminal at Gladstone is a private facility owned by Thiess Dampier Mitsui Coal Pty. Ltd., and operated by Bulk Handling and General Services Pty. Ltd. Existing facilities are designed for an annual throughput of 7 million tonnes, with a stockpile capacity of 500 000 tonnes. The facility handles coal from this consortium's Moura mines as well as coal from Thiess South Blackwater Mine, and other companies by arrangement. Some Moura coking coal is also shipped through the Clinton Coal Loading Facility.

Coal Quality

The Moura operations mine medium volatile and high volatile coals from several locations. These coals are blended in specific proportions to produce a coking coal for the steel industry. The higher coking coal quality from the underground mines is necessary in order to maintain coking coal quality in the final export blend.

DEVELOPED MINES

Open-cut coals of inferior coking properties are blended with washery middlings to produce a steaming coal. A low ash content variant of this blend is also marketed as non-coking coal for use for briquetting or blast furnace pulverised coal injection purposes.

Current export contracts call for the sale of 1.6 million tonnes per annum of coking coal to Japan and 1.0 million tonnes of energy coal to Japan and Asia.

The specification of Moura coal is:-

	Coking Coal	Non-Coking	Energy Coal
Total Moisture (As Received)	10.0%	10.0%	10.0%
(Air Dried)			
Inherent Moisture	-	-	2.5%
Volatile Matter	28-31%	30%	27-30%
Ash	8% with + 0.5% tolerance	8.5%	13.0%
Specific Energy	–	–	28.9 MJ/kg 6 900 Kcal/kg
Total Sulphur	0.55% max	0.6%	0.6%
Hardgrove Grindability Index	–	–	55 min
C.S.N.	6-8	2-3	-
Size	30 mm x 0	30 mm x 0	-

Future Development

Stripping capacity has been increased by an additional dragline which was commissioned in March,1984. This $47m^3$ machine will allow raw coal production to be increased by approximately one million tonnes per annum, and to handle this increased tonnage upgrading of the washery is required. Detailed engineering design work for this upgrade has been completed. However, the project has been deferred pending an upturn in the demand for coal

NEWLANDS

NEWLANDS COAL PTY. LTD.

Company Information

The lease is held by Mount Isa Mines Limited, a member of the M.I.M. Holdings Limited Group.

Location

The field occurs within M.L. 365 and is situated 129 km west of Mackay and 81 km south of Collinsville.

Reserves

The quoted reserves are contained in the Upper Newlands seam of 7.2 m average thickness. *In situ* reserves are:-

	Open-Cut (Million tonnes)	Underground (Million tonnes)
Measured	90	60

DEVELOPED MINES

Coal Quality

Proximate analysis for washed coal product:-

Total Moisture (As Received)	8.0%
(Air Dried)	
Inherent Moisture	2.7%
Volatile Matter	25.8%
Fixed Carbon	57.5%
Ash	14.0%
Total Sulphur	0.5%

Remarks

Production has commenced, and is being built up to the design rate of 4 million tonnes per annum.

A new township named Glenden, located approximately 32 km south of the mine site is being established to accommodate mine personnel and their families.

Construction of a new port facility at Abbot Point, located to the north of Bowen and extension of the railway line south from Collinsville to Newlands has been completed. A new weir has been constructed on the Bowen River and a water pipeline to the Newlands/Glenden area installed.

Shipment of 410 000 tonnes of saleable coal was achieved in 1983-84. The product is being sold to overseas steaming coal markets.

The mine was officially opened in December, 1983 and the Port of Abbot Point in March, 1984.

OAKY CREEK

OAKY CREEK COAL PROJECT - JOINT VENTURE

Ownership

The joint venturers in the Oaky Creek Mine comprise the following:-

Mount Isa Mines Ltd.	(79.0 per cent)
Hoogovens Delfstoffen B.V.	(8.5 per cent)
Nuova Italsider S.p.A.	(7.5 per cent)
Empresa Nacional Siderurgica S.A.	(5.0 per cent)

Mount Isa Mines Limited is the Manager for the joint venture.

Location

Oaky Creek is located 50 km north-east of Capella, which is 366 km by road north-west of Rockhampton.

Coal Quality

The coal is medium volatile coking coal with the following proximate analysis:-

Total moisture (As Received)	10.0%
(Air Dried)	
Volatile Matter	28.9%
Ash	8.0%
Total Sulphur	0.8%
Size	50 mm x 0

Stacker — Oaky Creek.

Gray King Coke Type	G8-G9
Maximum Fluidity	5 500 ddm
C.S.N.	8-8$^{1}/_{2}$
Specific Energy	32.82 MJ/kg

Reserves
Measured reserves of *in situ* coal are in excess of 300 million tonnes.

Development
An open-cut mine to produce 2.5 million tonnes of coal a year was commissioned in 1983. The mine is planned to eventually produce 3 million tonnes a year.

Two Bucyrus Erie draglines of 45 cubic metres bucket capacities are operating initially and a Marion dragline of 57 cubic metres bucket capacity will begin operating in 1985.

Railway
The railway line connection northwards to Norwich Park is complete and duplication of the existing track to the Port of Hay Point is proceeding.

Port of Shipment
All shipments are made from the new Dalrymple Bay Coal Terminal, which was commissioned in December, 1983.

Township
A new township named Tieri located 15 km from the Oaky Creek Mine houses the mining workforce and dependants. A full range of recreational facilities is provided for the township.

Power
Power supply to both the mine and town is drawn from the State grid system via the Lilyvale Substation.

Water Supply
Water is drawn from the Bedford Weir on the Mackenzie River for supply to the permanent township and for mining operations.

Marketing
Long-term contracts for the supply of 1 700 000 tonnes per year of coking coal to consumers in the Netherlands, Italy and Spain remain in operation.

In addition, there is a medium-term contract supply at the rate of 500 000 tonnes per year with the Japanese steel mills. Discussions for the sale of additional tonnage to several other markets are in progress.

Capital Expenditure
The cost of the mine to completion and associated infrastructure is estimated to be in excess of $400 million on present-day prices.

RIVERSIDE — THIESS DAMPIER MITSUI COAL PTY. LTD.

Company Information
See Moura

Mine
RIVERSIDE OPEN-CUT

Development of Mine
Construction of mine infrastructure was commenced early in 1981 with initial preparation plant production scheduled for August, 1983. A long-term contract for an output of 3.3 million tonnes per annum has been signed with the Japanese steel mills. The first shipment under this contract was made in October, 1983.

DEVELOPED MINES

Location	The Riverside area is immediately west of and adjacent to Utah's Goonyella mine. Most of the reserves occur in the Goonyella Lower seam some 8 m thick though nominal tonnages occur in the overlying Goonyella Middle seam which outcrops in three localities in the eastern part of the area.
Reserves	*In situ* mineable reserves total 107.1 million raw tonnes. Estimated recoverable commercial product is 64.7 million tonnes. All reserves are mineable by open-cut methods.
Mining Method	Conventional open-cut strip mining utilising three draglines each with 49 m^3 buckets is used to uncover the coal. After drilling and blasting, the exposed coal is loaded by electric shovel or front-end loader into 136 tonne bottom dump trucks for haulage to the dump station. From there the coal will be crushed to 45 mm by rotary breaker and stacked in one of two 50 000 tonne raw coal stockpiles prior to being fed to the preparation plant.
Coal Preparation	The 1350 raw tph preparation plant will clean 50 x 50 mm coal via 0.71 m diameter heavy medium cyclones and – 0.5 mm material via froth flotation. To optimise recovery of – 0.5 mm material alternative processing via water only cyclones is available. For ease of maintenance the plant is divided into six modules of equal capacity.
Coal Quality	Riverside product coal is medium prime coking with good plastic properties and blendability characteristics.

The Riverside specification is:-

Total Moisture (As Received)	10.0% max.
(Air Dried)	
Volatile Matter	22.5-24.5%
Ash	9.8% max with + 0.5% tolerance
Total Sulphur	0.65% max.
C.S.N.	6-8
Size	50 mm x 0

Railway	A 10 km spur line was constructed from Goonyella to Riverside. The train loading facility at Riverside has a capacity of 2 500 tonnes per hour and the coal is railed to the port in unit trains each carrying 6 600 tonnes.
Port/Coal Loader	Riverside coal is shipped via the new port facility at Dalrymple Bay which is adjacent to the existing Utah facility at Hay Point.

The Government funded the offshore works whilst the onshore facilities were financed by a consortium of companies presently developing coal mines in the North Bowen Basin. The same companies have formed a management company to operate the facility for the Government.

The facility is designed for an initial throughput of 15 million tonnes per year to be loaded into vessels of up to 200 000 d.w.t. and was officially declared an operating port on December 23, 1983.

DEVELOPED MINES

TARONG
M.L. 216

PACIFIC COAL PTY. LIMITED

Company Information Pacific Coal Pty. Limited is a wholly owned subsidiary of CRA Limited.

Mine MEANDU OPEN-CUT

Location South of Kingaroy, about 180 km north-west of Brisbane.

Reverves In excess of 180 million tonnes within usual open-cut depths have been defined within the Meandu lease area. In addition, 190 million tonnes of open-cut potential occur within an Authority to Prospect held by the Company.

Part of the 2 km long coal conveyor — Tarong.

Coal Quality Indicative quality after washing is as follows:-

Total Moisture	14%
Volatile Matter	22% min.
Ash Content	28%
Total Sulphur	0.55% max.
Specific Energy	19.38 MJ/kg
Grindability (Hardgrove Index)	50 min.

DEVELOPED MINES

Development

Development of the Tarong mine was occasioned by the construction of the nearby Tarong Power Station. During 1983-84 production from the mine commenced and in May, 1984 the power station was connected to the State Electricity grid.

Initial projected output of the mine will be 1 million tonnes of steaming coal per year, but this will grow to 5 million tonnes per year when Tarong Power Station reaches full generating capacity in 1987. By 1986, a preparation plant will be installed so that coal produced is to the contract specification of the Queensland Electricity Generating Board.

Coal is transferred to the power station at 1 500 tonnes per hour by an overland conveyor, 2 km long.

During 1984, some 110 people will be working at the mine. This will increase to 300 when full production is reached.

Housing has been established in the nearby towns of Yarraman, Nanango and Kingaroy.

YARRABEE — THIESS BROS. PTY. LIMITED

Company Information

The Yarrabee mine is operated by Thiess Bros. Pty. Limited, a wholly owned subsidiary of CSR Limited, and is operated as part of CSR's Coal Division.

Location

The mine is located approximately 40 km north of Blackwater and 280 km from Gladstone.

Reserves

Measured and Indicated Class 1 reserves of coal within M.L.196 stand at 37 million tonnes. Measured reserves suitable for mining by open-cut operation total 22.9 million tonnes.

Coal Quality

Yarrabee coal ranges from semi-anthracite to anthracite and is suitable for steam raising, briquetting and for use in the carbide, cement and ferro-alloy industries. It is also suitable for blending with high volatile coking coal for use in steel making. The coal is low volatile, sub-hydrous and non-coking.

Several coal qualities can be produced; however, the bulk of current production has the following proximate analysis:-

(Air Dried)	
Inherent Moisture	2.5%
Volatile Matter	9% max.
Fixed Carbon	77%
Ash	11%
Total Sulphur	0.6% max.
C.S.N.	0
Specific Energy	30.97 MJ/kg

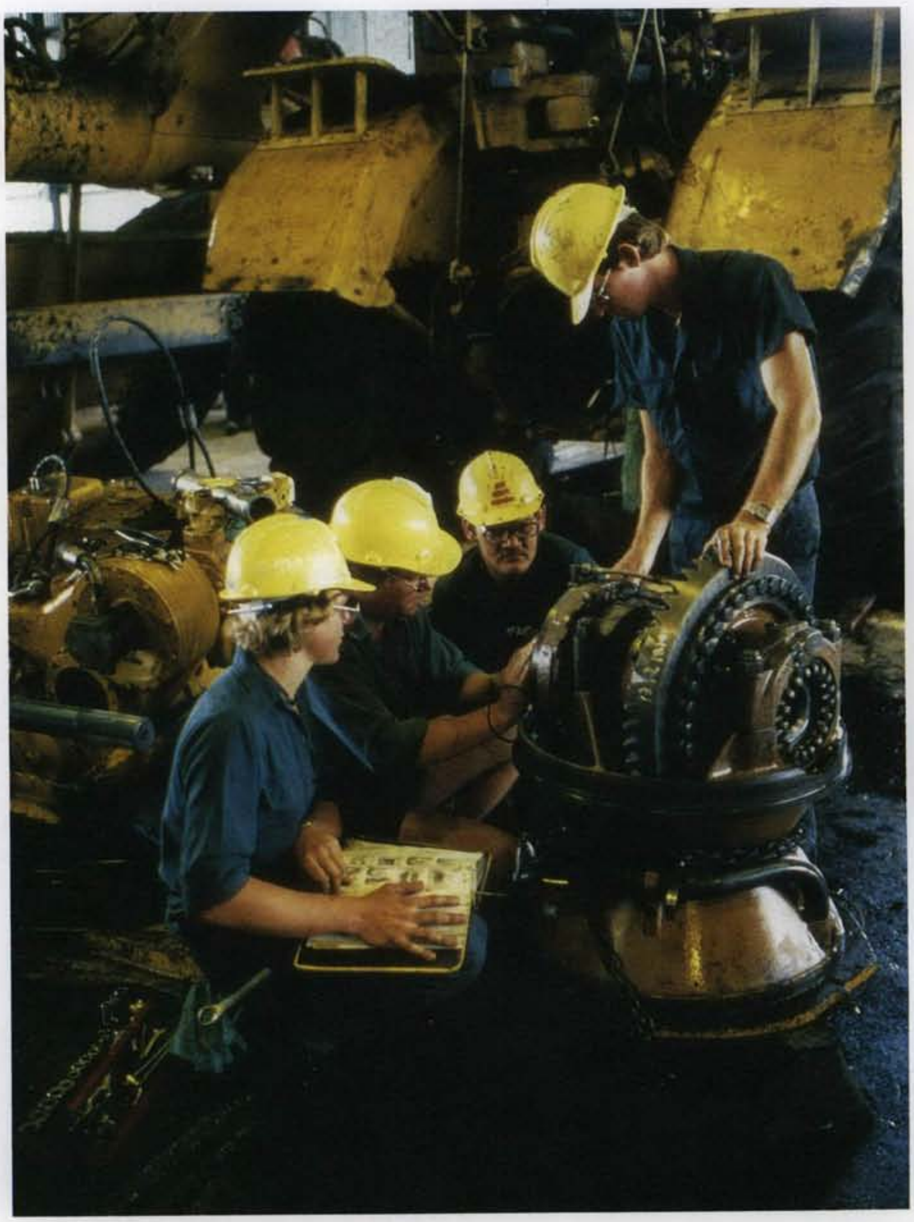
Operation

The mine is an open-cut operation which is designed to produce 300 000 tonnes per year. It is crushed and screened to control sizing and is sold as an unwashed product.

Production can be increased to approximately 1 million tonnes per year if market demand warrants project expansion. If this takes place, an additional open-cut mine will be opened.

Markets

Coal is exported to cement, coke and gas producers in Japan, Korea and Indonesia. Smaller quantities of coal are sold to several companies in Australia for a variety of uses. Export coal is shipped through Auckland Point, Gladstone.



Apprentices working on a scraper differential — Norwich Park

POTENTIAL COAL FIELDS

ACLAND
A. to P. 129C

THE SHELL COMPANY OF AUSTRALIA LIMITED

Location

The Acland Authority to Prospect comprises 47 sub-blocks exclusive to the Acland Coal Company's mining leases, and is located 35 km north-west of Toowoomba.

Geology

The area is situated on the northern side of the Moreton Basin, and near surface lithologies comprise sediments representing the lower interval of the Walloon Coal Measures, which are of mid-Jurassic age.

Reserves

Surface mineable measured and first class indicated *in situ* reserves with overburden to coal ratios better than 5:1 (m^3/tonne) amount to 443 million tonnes distributed amongst three major deposit localities: Glen Roslyn (247 million tonnes), Sabine (104 million tonnes) and Manning Vale (92 million tonnes). The Manning Vale deposit is contiguous with a similar deposit in the adjacent Bowenville area – A. to P. 205C. Additional shallow and deeper second class indicated reserves in A. to P. 139C exceed 360 million tonnes.

Coal Quality

In the principal deposit, Glen Roslyn, the aggregate thickness of workable coal within a 20 m thick seam interval averages 10 m to 12 m. A selectively mined raw coal from this interval would have an ash content of approximately 33% and specific energy of 19.2 MJ/kg. However, washing of selected seams could generate products meeting significantly cleaner market specifications whilst still providing acceptable recovery of the resource.

The quality of Acland coal is similar to other Surat-Moreton Basin coals in that it is per-hydrous, high volatile, bituminous, with a high reactives content and low Hardgrove grindability index. Acland coal is in the upper half of Surat-Moreton coal ash content range, and at the lower end of the moisture range.

Remarks

Mining studies conducted during 1983 have indicated that feasibility of a truck/shovel based mining operation producing up to 2.6 million tonnes per year from a single pit in the northern part of the Glen Roslyn area, with option to double this capacity with an additional operation in a contiguous pit to the south. Product coal would ideally be supplied (as received) at 30% ash, 10% moisture and 19.6 MJ/kg specific energy to an electricity generating facility constructed locally.

Resource development is contingent on the availability of a suitable market. The Acland reserves are large, shallow and strategically located, and offer a relatively low-cost source of energy for power generation or, in the longer term, gasification or conversion.

BARAKULA
A. to P. 312C

SHELL OIL-MIN JOINT VENTURE

Ownership

The A. to P. is held by a joint venture comprising the Shell Company of Australia Limited (50%) and the Oilmin N.L. Petromin N.L. and Transoil N.L. group (50%).

Location

The A. to P. includes 150 sub-blocks in three groups situated on the eastern side of the Leichhardt Highway between Wandoan and Miles.

POTENTIAL COAL FIELDS

Geology

The areas are in the north-eastern part of the Surat Basin and include lithologies of both upper and lower coal intervals of the Walloon Coal Measures, which are of mid to late Jurassic age.

Reserves

Surface mineable *in situ* reserves ocurring at the overburden to coal ratios of up to 5.1 (m^3/tonne) are estimated as follows (millions of tonnes):-

	Group 1 (Collingwood-Pelham)	Group 2 (Kentucky)	Group 3 (Cameby Downs)
Measured	-	-	28
Indicated	196	4	3
	196	4	31

Coal Quality

Substantial additional reserves are available at slightly higher volatiles and inherent moisture, low sulphur, and is strongly per-hydrous. A typical analysis (as received) is 17% ash, 11% moisture, 38% volatile matter, 0.4% sulphur and 23.8 MJ/kg specific energy. The coal could be utilised in the raw state as a power station fuel, or with simple beneficiation as a conversion feedstock.

BOWENVILLE A. to P. 205C

SHELL-OILMIN JOINT VENTURE

Ownership

See Barakula.

Location

The A. to P. includes 56 sub-blocks in two groups, on the northern side of the Warrego Highway between Dalby and Jondaryan.

Geology

The areas are situated on the northern side of the Moreton Basin close to the ridge marking the westerly transition into the Surat Basin. Near surface lithologies comprise sediments representing the lower interval of the Walloon Coal Measures, which are of mid-Jurassic age.

Reserves

Surface mineable *in situ* reserves occurring at overburden to coal ratios of up to 3.5:1 (m^3/tonne) are estimated at 134 million tonnes (western 28 sub-blocks, measured and indicated) and 206 million tonnes (eastern 28 sub-blocks, indicated).

Coal Quality

The raw coal is typically high in ash and volatiles, low in sulphur and strongly per hydrous. However, it is readily washable to lower ash levels at acceptable yields. A typical product coal quality (as received) could be 28% ash, 12% moisture, 37% volatiles, 0.4% sulphur and 19.6 MJ/kg specific energy.

POTENTIAL COAL FIELDS

BARALABA
M.L.'s 54, 70, 77, 107 & 166
A. to P. 257C

BARALABA COAL PTY. LTD.

Company Information

Baralaba Coal Pty. Ltd. is a wholly owned subsidiary of Allied Queensland Coalfields Limited, Brisbane.

Mine

DAWSON VALLEY COLLIERY, BARALABA

Location

At Baralaba in the Dawson River Valley, 157 km by rail south-west of Rockhampton and 257 km by rail west of Gladstone.

Reserves

Detailed drilling has defined the structure in three areas referred to as the Mine Lease Area, Southern Area and North Western Area. The bulk of coal reserves in each of these areas occur in plunging synclines generally separated by thrust faulting. Measured reserves are given only for the Mine Lease Area where the average drill hole spacing is around 250 m.

In situ coal reserves total 439.55 million tonnes of which 176.74 million tonnes are placed in the measured and indicated categories. 21.97 million tonnes of measured and indicated reserves occur at a depth of less than 60 m.

A breakdown of the coal reserves (million tonnes) is:-

	Measured	Indicated	Inferred	Total
Mine Lease Area	77.53	55.90	97.34	230.77
Southern Area (A. to P.)	-	-	109.48	109.48
North Western Area (A. to P.)	-	43.31	55.99	99.30
				439.55

In the remainder of the Authority to Prospect *in situ* reserves of coal are assumed to be in the large inferred category and further exploration of the coal measures will result in an upgrading of these reserves.

Coal Quality

The coal at Baralaba is low volatile, semi-anthracite, ortho-hydrous, feebly caking and non-coking. It is suitable for steam raising, ore smelting, briquette manufacture and blending into coking coals.

Seams of prime importance are Boyd, Cameron, Reid, Doubtful, Dawson, Dunstan and Coolum Seams, for which the following specifications on an air dried basis could be expected.

Proximate Analysis	Raw Coal	Clean Coal
Inherent Moisture	1.50-2.10%	1.40-1.70%
Volatile Matter	10.90-12.90%	10.30-12.70%
Fixed Carbon	70.00-77.30%	76.90-81.00%
Ash	10.10-15.50%	6.90-8.90%
Total Sulphur	0.48-0.57%	0.43-0.46%
Specific Energy		
MJ/kg	28.83-31.57	32.26-33.18
Kcal/kg	6 885-7 540	7 705-7 924
Hardgrove Index		80
Reflectance		1.94-2.12
C.S.N.		0-2
Ash Fusion Temp.		
Deformation		
(Reducing)		1 240°C

Remarks

Mining studies by specialist consultants have concluded that hydraulic mining could be successfully applied to mine underground coal reserves in the Mining Lease.

Confirmed strippable coal reserves are sufficient to support a 300 000 tonne a year open-cut operation for approximately 3 years.

Efforts are currently being made to market the coal to potential consumers in Japan and Korea.

BRIGALOW DEPOSIT

The Brigalow coal deposit is a wholly owned joint venture between Oilmin N.L. and Transoil No Liability. The deposit has been extensively drilled and tested since the initial discovery in 1967.

Location

The deposit is located 19 km east of Chinchilla, 11 km south of the Brigalow rail siding, and 274 km west of Brisbane.

Coal Quality

An Air Dried proximate analysis of the washed coal based on a sizing of 100% minus 38 mm and 30% minus 6 mm minimum is as follows:-

Inherent Moisture	8.8%
Volatile Matter	39.5%
Fixed Carbon	40.5%
Ash	12-13%
Total Sulphur	0.5% max.
Specific Energy	25.96 MJ/kg
Hardgrove Index	35 min.

Mining Plans

The Brigalow coal deposit covers 32 sub-blocks containing in excess of 70 million tonnes of R.O.M. coal at overburden ratios of 2.7:1.

Based on a pre-feasibility study completed in 1981, an opencast operation producing 2.5 million tonnes per year of clean washed coal could be maintained for 20 years with a waste/overburden to product coal ratio of 4:1.

POTENTIAL COAL FIELDS

CHINCHILLA A.'s to P. 102C and 105C

BRIGALOW MINES - RIO GRANDE JOINT VENTURE

Ownership

The Chinchilla coal fields are held by the Brigalow Mines - Rio Grande Joint Venture.

Ownership is:-

Thiess Holdings Limited (100% CSR Limited)	(40 per cent)
M.I.M. Holdings Limited	(40 per cent)
Rio Grande Limited (100% Westfalen Collieries)	(20 per cent)

Location

The Chinchilla coal fields are located in the Surat Basin, South East Queensland, 420 km by rail west of Brisbane.

Reserves

Measured and indicated reserves in two shallow deposits are as follows:-

	Measured (Million Tonnes)	Indicated (Million Tonnes)	Total (Million Tonnes)
A. to P. 102C (Chinchilla)	74	27	101
A. to P. 150C (Condamine)	27	1	28
Total	101	28	129

In addition, inferred reserves are large.

Remarks

Mining studies have been completed for the 28 million tonnes Sefton Park deposit. These studies favoured development for domestic power station supply or small scale export. Production building up from a rate of 0.25 to 0.75 million tonnes per year of washed steaming coal is proposed. Mining of the low overburden Sefton Park deposit by shovel and truck methods has been planned.

Coal Quality

Sefton Park coal is high volatile bituminous, low rank, with a moderate ash and is suitable for power generation and cement manufacture.

A typical analysis of the washed Sefton Park coal is as follows:-

Total Moisture	11.6%
Inherent Moisture	6.0%
Volatile Matter	40.5%
Fixed Carbon	39.5%
Ash	14.0%
Total Sulphur	0.35%
Specific Energy	26.33 MJ/kg
Hardgrove Grindability	37
Fuel Ratio	0.98

POTENTIAL COAL FIELDS

HAIL CREEK M.L. 312

HAIL CREEK COAL PTY. LIMITED

Company Information

The Hail Creek coal project is a joint venture between:-

AAR Limited – (a wholly owned subsidiary of CSR Limited)	(44 per cent)
Esso Exploration and Production Australia Inc. – (a subsidiary of Exxon Corporation)	(25 per cent)
IOL Coal Pty. Limited – (a subsidiary of CRA Limited)	(25 per cent)
Marubeni Coal Pty. Ltd. – (a subsidiary of Marubeni Corporation)	(4 per cent)
Sumisho Coal Development Pty. Ltd. – (a subsidiary of Sumitomo Corporation)	(2 per cent)

Hail Creek Coal Pty. Limited, a wholly owned subsidiary of CSR Limited, has been appointed Operator for the Joint Venture and Sales Representative for each of the Venturers.

Reserves

The Hail Creek coal field contains 740 million tonnes of low volatile, hard coking coal. Measured reserves are 158 million tonnes and indicated Class 1 reserves are 582 million tonnes. Approximately 90% of the *in situ* measured reserves are considered to be amenable to open-cut mining.

Drilling has indicated a further 96 million tonnes of coking coal in the Lake Elphinstone coal field, 15 km west of Hail Creek.

Coal Quality

Processing Hail Creek coal to an ash content of 10.5% gives a 70% yield of low volatile, low sulphur, hard coking coal with the following average properties:-

Inherent Moisture	1.0%
Volatile Matter	19.9%
Fixed Carbon	68.6%
Ash	10.5%
Total Sulphur	0.38%
Phosphorus	0.068%
C.S.N.	6-7
Fluidity	60 dd/m
Mean Max. Reflectance (R_0 (max.))	1.30
Coke Strength J.I.S. 30 revs/ +15 mm	93.5

Development

The planning of the mine, preparation plant, town, railway, water and power supplies and port, for an annual production of up to 4 500 000 tonnes of product coal is being undertaken by Hail Creek Coal Pty. Ltd. A decision to proceed with construction is primarily dependent on securing sales contracts for the project.

POTENTIAL COAL FIELDS

MACALISTER A. to P. 413C

MARATHON PETROLEUM AUSTRALIA, LTD.

Company Information

Marathon Petroleum Australia, Ltd. is a wholly owned subsidiary of the Marathon Oil Company of the U.S.A. Marathon Oil is wholly owned by the United States Steel Corporation.

Location

Macalister is 40 km north-west of Dalby, about 250 km west of Brisbane.

Reserves

The reserves are typically contained in 3 to 6 seams up to 12 metres thick. The average thickness of coal over the deposits is in excess of 8 metres.

Over 440 million tonnes of reserves with less than 60 metres overburden have been delineated.

The status of the reserves:-

	Million Tonnes
Measured	265
Indicated Class I	157
Indicated Class II	18
	440

Coal Quality

The Macalister coal is a typical per-hydrous Walloon coal suitable for steam raising or as a feedstock for coal conversion.

An indicative specification for a washed coal product is:-

Proximate Analysis (Air Dried)	
Inherent Moisture	8%
Volatile Matter	39%
Fixed Carbon	39%
Ash	14%
Total Sulphur	0.4% max.
Specific Energy	25.1 MJ/kg
Hardgrove Grindability Index	32
Ash Fusion Deformation Temperature	1 350°C

Remarks

Detailed engineering studies have been completed of projects for both export and domestic markets.

An open-cut trial pit has been excavated at Macalister to provide bulk samples for further evaluation.

Mine Planning

The coal will be mined by open-cut methods using compact bucketwheel excavators to remove the relatively soft overburden.

Regional Infrastructure

The mine workforce will be housed at Dalby which will be expanded to provide for the additional population.

It is proposed to develop a flood harvesting scheme on the Condamine River to provide water for the mine.

Transport

Detailed evaluations of both railway and slurry pipeline transport systems to port sites in southern Queensland have been completed.

MILLMERRAN (A. to P. 203C)

AMAX-MITSUI-MILLMERRAN JOINT VENTURE

Company Information

Amax Iron Ore Corporation	(70 per cent)
Mitsui Coal Development (Australia) Pty. Limited	(10 per cent)
Millmerran Coal Pty. Limited	(20 per cent)

Location

A. to P. 203C (1) and (2) are situated south of Pittsworth and Millmerran, 160 km and 230 km respectively west of Brisbane. The A. to P. portions cover 121 sub-blocks (367 sq.km) and 115 sub-blocks (348 sq.km).

Resource

Exploration within the Walloon Coal Measures has delineated five deposits containing 1 950 million tonnes of *in situ* measured plus indicated coal reserves to 80 m depth, a minimum of 0.5 m seam thickness and maximum 10:1 volume waste:tonnes of coal overburden ratio.

These reserves are distributed as:-

	Measured (Million Tonnes)	Indicated (Million Tonnes)
Felton East	420	150
Felton West	240	530
A. to P. 203C (1)	660	680
Commodore	185	45
Lochbar	50	-
Bringalily *	190	140
A. to P. 203C (2)	425	185

*Formerly referred to as Commodore II

Reserves are typically contained in two to six seams up to 12 m in cumulative thickness and at less than 7:1 cumulative mine areas overburden ratio.

Coal Quality

The coal is per hydrous and is particularly suitable for use as a steaming coal. It could be beneficiated to a variety of specifications, such as:-

(Air Dried)	
Inherent Moisture	5%
Volatile Matter	38-42%
Ash	30-20%
Total Sulphur	0.5%
Specific Energy	21.5 - 25.0 MJ/kg
Hardgrove Grindability Index	35
Ash Fusion Temperature	
Deformation (Red Atm)	1 500°C
Flow (Red Atm)	+ 1 600°C

Remarks

A trial box-cut has been established on the Commodore deposit and numerous samples, the largest being 2 000 tonnes, have been taken for test work. Detailed mining plans and feasibility studies have been prepared at various production levels up to 8 Mtpa. As part of these studies, successful revegetation of the box-cut spoil has been achieved. Mining studies on the remaining deposits are in progress.

A.'s to P. 53C, 57C, 123C and 303C

BRIGALOW MINES PTY. LTD.

Company Information

Brigalow Mines is a joint venture between:-

Thiess Bros.Pty. Limited (CSR Limited 100%)	(50 per cent)
Mount Isa Mines Limited (M.I.M. Holdings Ltd. 100%)	(50 per cent)

MONTO
A. to P. 303C

The Monto coal field, 120 km south of Gladstone contains measured plus indicated reserves of in situ open-cut coal currently totalling 180 million tonnes.

Quality of coal is suitable for steam raising.

ROLLESTON
A. to P. 57C

Rolleston is located in Central Queensland 350 km due west of the port of Gladstone.

Reserves

The Meteor Park deposit within A. to P. 57C near Rolleston has *in situ* measured reserves of 274 million tonnes contained at a depth of less than 80 m.

Measured and indicated *in situ* reserves of non-coking coal within A. to P. 57C total 422 million tonnes.

Coal Quality

Rolleston coal is a uniform, high volatile, non-coking coal with excellent steaming characteristics. It has a low ash content and will not require beneficiation to produce an export quality product.

The coal will be marketed with the following typical analysis:-

Total Moisture	15.0%
(Air Dried)	
Inherent Moisture	11.0%
Volatile Matter	28.7%
Fixed Carbon	50.2%
Ash	10.1%
Total Sulphur	0.5%
Specific Energy	
- Gross Air Dried	25.29 MJ/kg
- Gross As Received	24.12 MJ/kg
Nitrogen (Dry Basis)	1.8%
Hardgrove Grindability	53
Fuel Ratio	1.75

Remarks

The joint venture is proposing to develop an open-cut export project with scheduled production of 2 million tonnes in Year 1, 4 million tonnes in Year 2, and 5 million tonnes in Years 3 to 20.

WEST MOURA
A. to P.53C Area (1)

Investigations are aimed at establishing a small semi-anthracite export mine based on the West Moura Area 1 (Baralaba) deposit, where 20 million tonnes of shallow semi-anthracite suitable for surface mining are inferred.

YARRABEE SOUTH
A. to P. 123C

Semi-anthracite (16 million tonnes indicated) also occurs at shallow depth on A. to P. 123C Yarrabee South, adjacent to and as an extension of the CSR Yarrabee Mine deposit. Drilling indicates potential for development of a small-scale operation.

NEBO RESOURCE AREA — THIESS DAMPIER MITSUI COAL PTY. LTD.

Company Information

See Moura

Location

Six mineable coal deposits (Nebo Resource Area) have been delineated on both limbs of the North Bowen Basin some 140 km to 210 km by road west of the coastal city of Mackay.

These areas designated Wards Well, Poitrell, Kemmis Walker, South Walker, Bee Creek and Suttor Creek are collectively known as the Nebo Resource Area, the name being derived from the adjacent Nebo township. All deposits except Wards Well, may be mined by open-cut methods, and all except Suttor Creek are held under Mining Leases. Suttor Creek being a Mining Lease Application, has been recommended for grant by the Mining Warden's Court.

POTENTIAL COAL FIELDS

Coal Quality

The virgin deposits of the Nebo Resource Area are able to be geared to meet changing consumer demands in the future due to large reserves and the vast range of coal quality from one field to another. Coal quality and rank include medium volatile metallurgical blend coals, high medium and low volatile energy coals and high rank semi-anthracites.

The first step in the current strategy for the development of the Nebo Resource Area is based on the establishment of an open-cut mine to exploit the hard coking coal reserves at Riverside. This mine commenced operation in 1983 and is now producing as scheduled. This will be followed by successive developments of the other coal fields for the extraction of both energy coal and metallurgical blend coal.

Reserves

Raw coal reserves amount to 1 242 million tonnes of which 334 million tonnes are mineable by open-cut methods and 908 million tonnes by underground methods.

PENTLAND A. to P. 249C

THE SHELL COMPANY OF AUSTRALIA LIMITED

Location

The Pentland Authority to Prospect comprises 105 sub-blocks in two groups, which are some 25 km apart and located 250 km to the south-west of Townsville. The northern area is crossed by the Flinders Highway and the Townsville-Mount Isa railway.

Geology

The areas are underlain by Late Permian coal measures deposited near the north-eastern margin of the Galilee Basin. Triassic and Tertiary sediments overlie the coal measure sequence, the Betts Creek Beds, which contain two groups of coal seams. The Pentland Upper group of seams is 10 m to 20 m thick, but is characteristically shaley and is of limited economic significance. The Lower Pentland group of seams has a thickness range of 20 m to 80 m, including up top 30 m of coal.

Reserves

The northern part of the A. to P. contains the Ellimeek and Lauderdale deposits, where drilling has so far established measured and indicated *in situ* reserves of 389 million tonnes and 225 million tonnes respectively, at stripping ratios of up to 6:1 (m^3/tonne). Lauderdale reserves are presently under review. The southern part contains the Milray deposit, where indicated *in situ* reserves total 187 million tonnes at stripping ratios of up to 5:1 (m^3/tonne). Alternatively underground mineable *in situ* reserves of 208 million tonnes are available from a single seam at depths less than 200 m.

Coal Quality

The coal is high volatile bituminous, of low rank and with a high inherent ash. Typical raw coal quality (Air Dried) for the reserves is:-

	Surface Mineable	Underground Mineable
Moisture	8%	9%
Volatile Matter	22%	24%
Fixed Carbon	39%	50%
Ash	31%	17%
Total Sulphur	0.3%	0.3%
Specific Energy	18.4 MJ/kg	23.8 MJ/kg

Remarks

The coal reserves in the Pentland A. to P. represent a very large energy resource suitable for power generation and industrial use in the region.

POTENTIAL COAL FIELDS

TAROOM
A. to P. 189C
M.L. 52 ROMA

CSR LIMITED

Company Information

The Taroom coal deposit is held by Mines Administration Pty. Limited, a subsidiary of AAR Limited (100% CSR Limited).

Location

The deposit is situated approximately 7 km south-east of the town of Taroom in South Central Queensland. Taroom is 250 km by rail from the Port of Gladstone and is 400 km north-west of Brisbane.

Reserves

Measured and indicated reserves presently stand at 230 million tonnes, of which 195 million tonnes are available at depths of less than 60 m.

Coal Quality

Taroom coal has good combustion properties and thus represents a premium coal for power generation in Queensland or overseas. A typical analysis is as follows:-

(Air Dried)	Raw Coal	Washed Coal
Inherent Moisture	8.0%	7.6%
Volatile Matter	38.0%	43.1%
Fixed Carbon	33.0%	36.7%
Ash	21.0%	12.6%
Total Sulphur	0.31%	0.33%
Specific Energy	28.83 MJ/kg	25.92 MJ/kg
Ash Fusion Temperature (Reducing) °C		
Initial Deformation	1 400	1 450
Spherical	1 500	1 500
Hemispherical	1 510	1 510
Flow	1 520	1 520

Remarks

Coal from Taroom has been tendered for domestic power supply contracts and preliminary export market studies have been completed. An open-cut operation is envisaged producing some 4 000 000 tonnes of coal each year.

THEODORE
A. to P. 202C

THEODORE COAL PTY. LTD.

Company Information

The Theodore Coal Project is a joint venture between:-

Thiess Holdings Ltd.	(60 per cent)
The Shell Company of Australia	(40 per cent)

Reserves

This area contains 1 340 million tonnes of measured and indicated Class 1 bituminous coal, of which 250 million tonnes are capable of being won by open-cut mining. The coal is low in ash and sulphur and ideally suited for steam raising.

POTENTIAL COAL FIELDS

Coal Quality

In situ analysis is as follows:-

	Theodore North	Theodore South
(Air Dried)		
Inherent Moisture	4.6%	6.5%
Volatile Matter	30.9%	32.0%
Fixed Carbon	50.6%	52.0%
Ash	13.9%	9.5%
Total Sulphur	0.5%	0.4%
CSN	1	$^{1}/_{2}$
Specific Energy	27.3 MJ/kg	27.5 MJ/kg
Calorific Value Kcal/kg	6 520	6 550
Hardgrove Grindability Index	53	53
Ash Fusion Temperature (Reducing) °C		
Initial Deformation	1 230	1 230
Spherical	1 350	1 320
Hemispherical	1 370	1 350
Flow	1 430	1 400

Box-Cut Theodore

Development

Planning for the development of a 4 500 000 tonnes a year open-cut mining operation at Theodore North is being undertaken by Theodore Coal Pty. Ltd., a CSR Limited subsidiary that has been appointed manager of the project. The opening of mines at Theodore South could increase total production from Theodore to 9 000 000 tonnes a year. A decision to proceed with construction of the Theodore North mine is primarily dependent on securing sales contracts.

WANDOAN
A's to P. 157C, 138C, 182C and others

BRIGALOW MINES PTY. LTD. AND BRIGALOW MINES – RIO GRANDE JOINT VENTURE

The ownership of the Wandoan coal fields is as follows:-

Brigalow Mines Pty. Ltd.	(80 - 100 per cent)*
Rio Grande Group	(20 per cent)*

* Participation varies between Authorities to Prospect

(Shareholding Brigalow Mines:- - CSR Limited 50 per cent; M.I.M. Holdings 50 per cent

Rio Grande Group: - Bundaberg Sugar Co. Ltd. 100 per cent)

Location

In the Surat Basin, 373 km by rail south-west of Gladstone.

Reserves

Measured and indicated *in situ* reserves in the Wandoan-Taroom vicinity total 1 000 million tonnes of low overburden coal.

Coal Quality

Wandoan coal is eminently suitable for domestic electricity generation, export steaming coal and domestic coal conversion.

Proximate analyses are as follows:-

(Air Dried)	Raw Coal	Washed Coal
Inherent Moisture	8.9%	7.9%
Volatile Matter	35.0%	40.5%
Fixed Carbon	32.5%	40.9%
Ash	23.6%	10.7%
Total Sulphur	0.32%	0.28%
Specific Energy	21.23 MJ/kg	26.17 MJ/kg
Hardgrove Grindability Index	41	

Remarks

Feasibility studies have been completed for supply to both domestic and export markets. Production of raw coal with 20GJ/tonne and 25% ash delivered quality for a domestic power station has been proposed. Nominal initial production of 5 million tonnes per year of washed steaming quality coal for export is planned.

The Wandoan coal field was nominated by the Queensland Government for feasibility evaluation under the Imhausen Coal Conversion Study. The high quality and low cost of the very large resource is the basis for a number of feasibility studies by several coal conversion technology groups overseas.

Japan has entered a new phase in coal liquefaction research and development with the decision by NEDO's (New Energy Development Organisation) Sunshine Project to establish a 250 tpd pilot plant in Japan at a cost of $A400 million.

Brigalow Mines Pty. Ltd. has to date supplied over 600 tonnes of Wandoan coal for coal liquefaction testing purposes to the Sunshine Project.

Last year a trial of 224 tonnes of washed Wandoan coal was sent to Japan.

WOLFANG M.L's 1874 and 1980

THE CLERMONT PROJECT - CLERMONT COAL MINES LTD.

Company Information

Clermont Coal Mines Ltd. is a joint venture between White Industries Ltd. (75%) and Mitsubishi Development Pty. Ltd. (25%).

Exploration

In May, 1980 the Queensland Government, after calling open tenders, awarded the Authority to Prospect No. 294C at Clermont to White Industries (Qld.) Pty. Limited.

The prospect area covers 614 square kilometres within which 5 sedimentary basins were delineated, all of which showed varying degrees of coal deposition.

Major economic reserves have been shown to exist in the Wolfang Basin and it is in this area that exploration was concentrated.

An accelerated programme of drilling and logging was undertaken using, for the most part, drilling equipment owned and operated by White Industries Limited.

Since the granting of the Authority, total exploration drilling has been:-

	Open Hole (metres)	Cored (metres)
Exploratory	29 044	9 065
Large Diameter (200 mm)	570	157
Geotechnical	138	999
Groundwater Studies	3 019	
	32 771	10 221

Total cost of exploration to June, 1983 was in excess of $9 000 000.

Wolfang Basin Reserves

The drilling and core logging programme has defined six seams within the basin, with total reserves in excess of 260 million tonnes.

Most of the coal is readily accessible to open-cut mining operations and within the proposed mine area *in situ* reserves have been calculated at 241 million tonnes. Overburden to coal ratios average 3.2BCM overburden:1 tonne coal.

Of the reserves nominated in the open-cut area, 229 million tonnes are contained in the main Wolfang Seam.

This is a massive seam having an average thickness of 29.8 m. In certain areas it is greater than 50m thick and is of a remarkably consistent quality throughout the deposit.

POTENTIAL COAL FIELDS

Coal Quality The indicated product coal specification is:-

(Air Dried)	
Inherent Moisture	5.5-6.5%
Ash	9-10%
Volatile Matter	27-28%
Fixed Carbon	58.5-55.5
Total Sulphur	0.2-0.4%
Hardgrove Grindability Index	56
Specific Energy	28.26-27.64 MJ/kg

Testing and analysis has been carried out on core samples from 50 mm and 200 mm diameter drill holes.

Because of the depth of overburden and the consequent cost of obtaining bulk samples use was made of core recovery from the thick seam to obtain sufficient coal for testing and analysis.

Early indications are that the product specification can be achieved without washing.

Mine Planning Feasibility studies for the development of an open-cut mine operation, employing trucks and shovels, have been completed and planning for detailed design is well advanced.

Initial minimum production is 3.5 million tonnes per year. Planning and design of the mine will allow for expansion to 10 million tonnes per year.

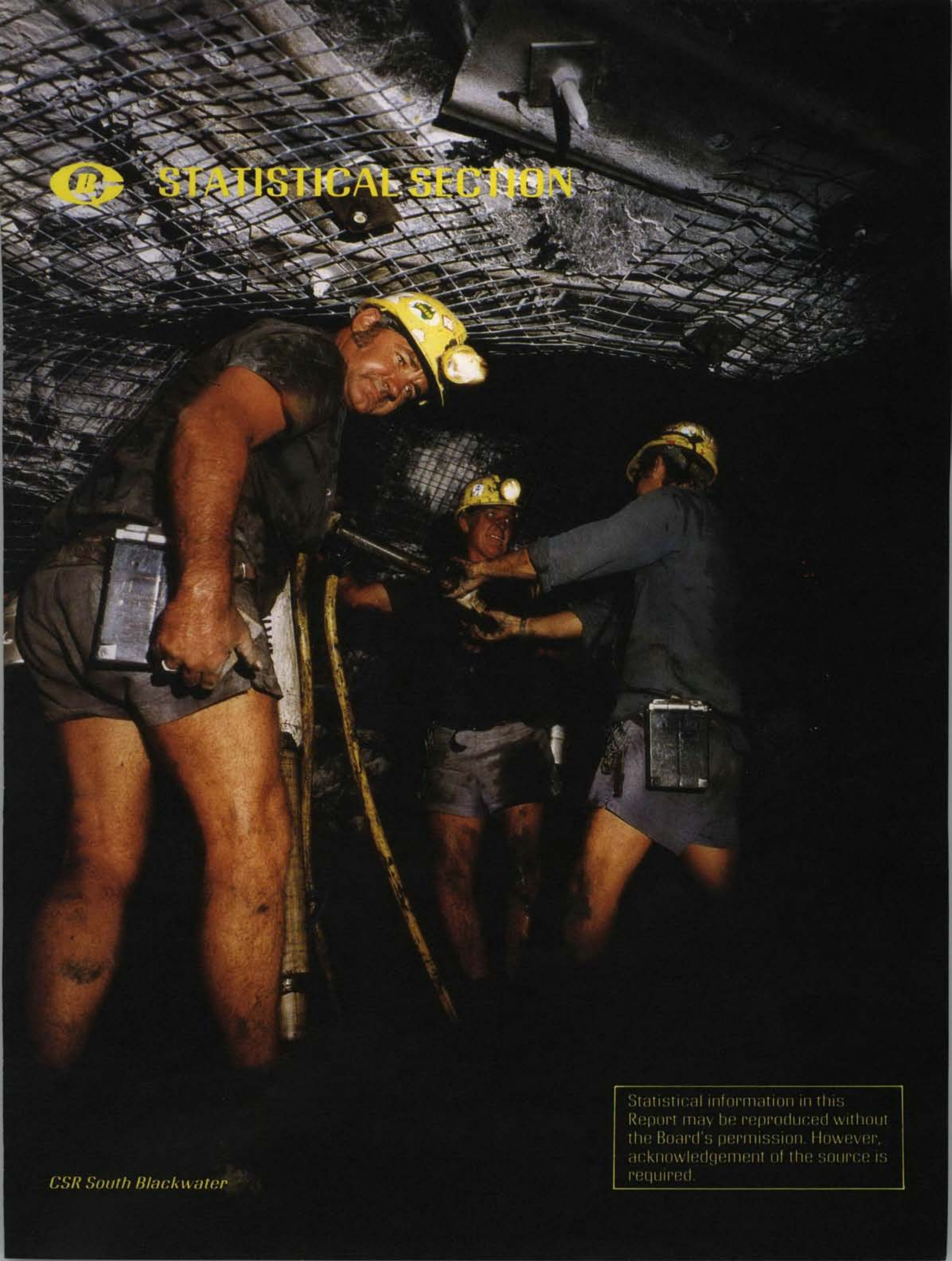
Railway An 11.5 km spur line will connect the Wolfang Mine rail loop to the recently completed Blair Athol/Dalrymple Bay rail link.

Where necessary, duplication and upgrading of the existing track will be carried out to handle the additional traffic.

Port It is proposed that product coal from Clermont Coal Project will be loaded through the Dalrymple Bay Coal Terminal.

Township The projected initial workforce is 470 persons. Housing and accommodation will be provided in the existing town of Clermont where a subdivision of 400 allotments is planned.

STATISTICAL SECTION



CSR South Blackwater

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TABLE 1
QUEENSLAND'S COAL INDUSTRY — 10 YEARS SUMMARY
Years Ended June 30, 1975-1984.

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
MINES OPERATING — As at June 30	41	43	48	45	40	45	46	48	50	54
EMPLOYEES IN COAL INDUSTRY -- As at June 30	5 383	5 777	5 955	6 180	6 424	7 374	7 965	8 664	8 773	9 674
MANSHIFTS WORKED AS PERCENTAGE OF MANSHIFTS POSSIBLE	90.22	88.87	90.02	90.19	90.69	86.06	85.27	87.39	93.15	93.05
NET PRODUCTION—'000 TONNES BY DISTRICTS										
(i) UNDERGROUND MINES										
West Moreton	1 481	1 393	1 565	1 511	1 443	1 252	1 611	1 555	1 727	1 701
Darling Downs	11	10	9	8	7	9	9	10	12	10
Maryborough	67	67	58	41	43	21	18	13	16	17
Kiang-Moura	646	425	573	531	404	430	423	512	507	395
Blackwater	606	511	658	678	581	762	681	883	927	852
Mackay	..	..	..	..	202	245	258	125	218	196
Bowen	638	536	457	435	414	271	350	329	418	446
	3 449	**2 942**	**3 320**	**3 204**	**3 094**	**2 990**	**3 350**	**3 427**	**3 825**	**3 617**
(ii) OPEN-CUT MINES										
West Moreton	1 000	1 065	1 229	1 130	779	715	1 065	1 210	1 354	1 236
Nanango	..	..	..	..	..	..	..	..	..	603
Kianga-Moura	2 171	2 017	1 959	1 739	2 082	1 742	1 838	2 094	1 396	1 856
Callide	1 005	1 330	1 254	1 530	1 906	2 086	2 444	2 313	3 542	3 737
Blackwater	4 342	4 186	4 048	4 066	5 401	5 626	7 416	8 918	10 309	14 547
Blair Athol	216	209	144	147	113	111	100	96	132	934
Mackay	11 438	11 877	13 401	12 658	13 148	13 850	15 968	15 425	14 288	16 761
Bowen	281	296	316	479	416	390	668	793	966	745
	20 453	**20 980**	**22 351**	**21 749**	**23 845**	**24 520**	**29 499**	**30 849**	**31 987**	**40 419**
STATE TOTAL	23 902	23 922	25 671	24 953	26 939	27 510	32 849	34 276	35 812	44 036

NET SALEABLE OUTPUT—TONNES										
(a) State—Per Employee	4 440	4 141	4 311	4 038	4 194	3 731	4 124	3 956	4 082	4 552
(b) State—Per Working Day Possible	103 923	104 007	109 240	108 491	117 127	119 607	142 204	144 015	147 983	184 251
(c) Per Manshift Worked										
Underground Mines										
Face	23.20	22.79	23.41	23.82	20.96	21.66	22.71	21.95	22.70	24.45
Overall	6.96	6.58	6.49	6.33	6.15	6.11	6.01	6.06	6.53	7.05
Open-cut Mines										
Overall	23.86	22.56	21.35	20.12	20.76	20.69	22.69	21.14	18.99	21.27
STATE OVERALL	17.77	17.47	16.54	15.76	16.36	16.43	17.66	16.93	15.78	18.25
COAL CONSUMPTION—'000 TONNES										
AREAS										
Brisbane Metropolitan	460	467	551	635	422	468	462	490	473	503
Southern Queensland	2 270	2 341	2 407	1 917	1 587	1 856	1 703	1 539	1 441	1 943
Central Queensland	1 674	1 716	2 063	2 573	3 318	3 652	4 218	4 600	5 649	6 315
North Queensland	840	799	863	905	826	653	735	869	1 053	1 070
STATE TOTAL	5 244	5 323	5 884	6 030	6 153	6 629	7 118	7 498	8 616	9 831
INDUSTRY										
Electricity	3 796	3 848	4 315	4 540	4 520	4 882	5 346	5 653	6 709	7 636
Metal Processing	942	1 004	1 107	1 043	1 179	1 256	1 261	1 201	1 224	1 437
Building Materials	302	280	284	272	277	283	266	362	357	274
Paper Pulp and Board	52	60	61	55	56	61	61	77	80	81
Coke Works	66	49	40	54	56	53	66	53	66	67
Food Processing	50	48	43	33	31	51	74	103	102	107
Miscellaneous	36	34	34	33	34	43	44	49	78	229
STATE TOTAL	5 244	5 323	5 884	6 030	6 153	6 629	7 118	7 498	8 616	9 831
EXPORTS—'000 TONNES										
Interstate Sales	197	435	499	383	383	579	497	128	91	15
Overseas Countries	17 591	16 388	18 965	20 118	18 836	21 296	23 727	24 862	26 405	33 095
STATE TOTAL	17 788	16 823	19 464	20 501	19 219	21 875	24 224	24 990	26 496	33 110

TABLE 2

NET COAL PRODUCTION (SALEABLE) BY DISTRICTS

Years Ended June 30, 1965-1984 ('000 Tonnes)

YEAR	DISTRICT											
	WEST MORETON			DARLING DOWNS	NANANGO	MARY-BORO	ROCK-H'TON		KIANGA-MOURA		CALLIDE	BLAIR ATHOL
	U/ground	Open-Cut	Total	U/ground	Open-Cut	U/ground	U/ground	U/ground	Open-Cut	Total	Open-Cut	Open-Cut
1965	1 927	..	1 927	74	..	179	70	381	847	1 228	126	113
1966	2 158	..	2 158	71	..	174	56	452	1 186	1 638	151	79
1967	2 101	48	2 149	60	..	141	38	505	1 258	1 763	204	83
1968	1 917	155	2 072	41	..	134	34	492	1 624	2 116	316	74
1969	1 936	234	2 170	20	..	116	23	531	2 435	2 966	356	52
1970	1 859	274	2 133	14	..	107	..	581	2 831	3 412	396	48
1971	1 921	337	2 258	12	..	110	..	736	2 795	3 531	443	82
1972	1 900	505	2 405	13	..	96	..	812	2 606	3 418	485	122
1973	1 720	574	2 294	13	..	72	..	859	2 803	3 662	587	118
1974	1 559	658	2 217	12	..	64	..	625	2 599	3 224	729	127
1975	1 481	1 000	2 481	11	..	67	..	646	2 171	2 817	1 005	216
1976	1 393	1 065	2 458	10	..	67	..	425	2 017	2 442	1 330	209
1977	1 565	1 229	2 794	9	..	58	..	573	1 959	2 532	1 254	144
1978	1 511	1 130	2 641	8	..	41	..	531	1 739	2 270	1 530	147
1979	1 443	779	2 222	7	..	43	..	404	2 082	2 486	1 906	113
1980	1 252	715	1 967	9	..	21	..	430	1 742	2 172	2 086	111
1981	1 611	1 065	2 676	9	..	18	..	423	1 838	2 261	2 444	100
1982	1 555	1 210	2 765	10	..	13	..	512	2 094	2 606	2 313	96
1983	1 727	1 354	3 081	12	..	16	..	507	1 396	1 903	3 542	132
1984	1 701	1 236	2 937	10	603	17	..	395	1 856	2 251	3 737	934

DISTRICT									TOTAL			YEAR
BLACKWATER			MACKAY			BOWEN						
U/ground	Open-Cut	Total	U/ground	Open-Cut	Total	U/ground	Open-Cut	Total	UNDER-GROUND	OPEN-CUT	STATE TOTAL	
..	..	..	..	..	..	229	12	241	2 860	1 098	3 958	1965
..	..	..	..	..	..	326	..	326	3 237	1 416	4 653	1966
..	..	..	..	..	..	374	..	374	3 219	1 593	4 812	1967
..	502	502	..	..	..	316	..	316	2 934	2 671	5 605	1968
5	1 358	1 363	..	..	..	436	..	436	3 067	4 435	7 502	1969
2	2 841	2 843	..	..	..	492	..	492	3 055	6 390	9 445	1970
208	3 747	3 955	..	214	214	517	..	517	3 504	7 618	11 122	1971
480	3 506	3 986	..	3 150	3 150	575	122	697	3 876	10 496	14 372	1972
502	3 910	4 412	..	6 856	6 856	633	170	803	3 799	15 018	18 817	1973
608	4 090	4 698	..	8 174	8 174	615	164	779	3 483	16 541	20 024	1974
606	4 342	4 948	..	11 438	11 438	638	281	919	3 449	20 453	23 902	1975
511	4 186	4 697	..	11 877	11 877	536	296	832	2 942	20 980	23 922	1976
658	4 048	4 706	..	13 401	13 401	457	316	773	3 320	22 351	25 671	1977
678	4 066	4 744	..	12 658	12 658	435	479	914	3 204	21 749	24 953	1978
581	5 401	5 982	202	13 148	13 350	414	416	830	3 094	23 845	26 939	1979
762	5 626	6 388	245	13 850	14 095	271	390	661	2 990	24 520	27 510	1980
681	7 416	8 097	258	15 968	16 226	350	668	1 018	3 350	29 499	32 849	1981
883	8 918	9 801	125	15 425	15 550	329	793	1 122	3 427	30 849	34 276	1982
927	10 309	11 236	218	14 288	14 506	418	966	1 384	3 825	31 987	35 812	1983
852	14 547	15 399	196	16 761	16 957	446	745	1 191	3 617	40 419	44 036	1984

TABLE 3

PRODUCTION OF NET SALEABLE COAL BY INDIVIDUAL MINES

Years Ended June 30, 1980-1984 (Tonnes)

DISTRICT AND MINES	1980	1981	1982	1983	1984
WEST MORETON					
UNDERGROUND					
Box Flat No. 8	116 520	121 827	117 881	74 253	81 280
Box Flat No. 9	137 032	211 897	212 210	250 655	179 872
M.W. Haenke No. 1	242 422	264 504	216 219	189 112	182 737
M.W. Haenke No. 2	..	..	1 963	87 869	144 601
New Hope	169 647	204 635	232 907	315 782	366 766
Oakleigh No. 3 and 5	65 095	123 565	116 247	125 268	114 327
Rhondda No. 1	85 186	119 988	86 197	79 970	105 085
Rhondda No. 5	68 640	154 948	172 021	150 052	137 692
Southern Cross No. 9	54 207	51 074	69 010	103 663	11 375
Southern Cross No. 11	69 854	76 736	54 449	..	..
Southern Cross No. 12	40 158	74 303	64 795	73 338	70 536
Southern Cross No. 14	..	..	40	33 427	45 579
Southern Cross No. 15	..	..	..	..	5 210
Westfalen No. 3	203 416	207 081	210 843	243 645	255 534
	1 252 177	**1 610 558**	**1 554 782**	**1 727 034**	**1 700 594**
OPEN-CUT					
Amberley	34 754	95 184	114 017	228 908	329 176
Blackheath	54 301	23 290	21 260	5 969	..
Box Flat No. 2	..	48 380	58 625	62 623	85 132
Box Flat Harris	15 201	..	..	..	..
New Hope	177 068	258 186	153 085	136 224	31 652
New Whitwood	12 130	201 165	366 150	392 320	454 788
Oakleigh	50 620	30 570	44 430	78 874	60 926
Rhondda	26 750	..	..	..	..
Rylance No. 3	123 366	114 705	108 309	57 263	..
Southern Cross No. 2	1 527	..	..	..	..
Southern Cross No. 3	217 387	184 158	209 278	264 442	179 686
Wattle Glen	1 581	109 662	135 327	127 753	91 193
Wattle Glen Extd.	..	..	..	..	3 524
	714 685	**1 065 300**	**1 210 481**	**1 354 376**	**1 236 077**
DISTRICT TOTAL	**1 966 862**	**2 675 858**	**2 765 263**	**3 081 410**	**2 936 671**

Table 3 (Continued)

DISTRICT AND MINES	1980	1981	1982	1983	1984
DARLING DOWNS					
UNDERGROUND					
Acland No. 3	8 964	9 322	9 792	12 202	9 833
NANANGO					
OPEN-CUT					
Meandu	..	..	..	..	602 980
MARYBOROUGH					
UNDERGROUND					
Burgowan No. 12	20 884	17 438	13 133	16 389	17 013
KIANGA-MOURA					
UNDERGROUND					
Moura No. 2	234 430	246 361	302 027	239 319	246 619
Moura No. 4	195 470	177 039	209 673	267 711	148 156
	429 900	**423 400**	**511 700**	**507 030**	**394 775**
OPEN-CUT					
Kianga	384 736	602 215	..	..	..
Moura	1 356 885	1 235 561	2 093 929	1 396 422	1 856 431
	1 741 621	**1 837 776**	**2 093 929**	**1 396 422**	**1 856 431**
DISTRICT TOTAL	2 171 521	2 261 176	2 605 629	1 903 452	2 251 206
CALLIDE					
OPEN-CUT	2 085 338	2 444 261	2 312 680	3 541 673	3 736 661
BLAIR ATHOL					
OPEN-CUT	111 432	99 758	95 688	132 437	934 174

Table 3 (Continued)

DISTRICT AND MINES	1980	1981	1982	1983	1984
BLACKWATER					
UNDERGROUND					
Ballamoo	..	..	..	12 192	..
Cook	389 310	325 254	436 091	361 691	519 452
*German Creek Central	..	..	..	1 400	54 820
Leichhardt	10 174	13 630	8 617	..	..
South Blackwater No. 1	362 571	342 542	437 965	551 176	277 913
	762 055	**681 426**	**882 673**	**926 459**	**852 185**
OPEN-CUT					
Blackwater	4 395 972	4 741 326	4 724 642	4 150 399	4 021 103
Curragh	..	..	..	..	2 173 099
German Creek	..	..	510 642	2 302 609	2 462 158
Gregory	280 958	1 438 618	2 341 711	2 001 807	2 012 348
Oaky Creek	..	..	..	535 343	2 457 598
South Blackwater	949 302	1 236 445	1 199 180	1 117 433	1 200 498
Yarrabee	..	..	142 002	201 175	219 898
	5 626 232	**7 416 389**	**8 918 177**	**10 308 766**	**14 546 702**
DISTRICT TOTAL	**6 388 287**	**8 097 815**	**9 800 850**	**11 235 225**	**15 398 887**
MACKAY					
UNDERGROUND					
Harrow Creek	**245 207**	**257 751**	**125 299**	**217 647**	**196 407**
OPEN-CUT					
Goonyella	4 017 274	4 300 878	4 325 597	4 248 587	4 451 347
Newlands	..	..	..	..	515 021
Norwich Park	1 827 243	3 952 624	4 389 813	2 527 094	2 497 902
Peak Downs	3 948 274	4 035 768	3 608 190	3 872 258	3 276 366
Riverside	..	..	..	..	2 021 047
Saraji	4 057 582	3 678 338	3 101 525	3 640 113	3 998 855
	13 850 373	**15 967 608**	**15 425 125**	**14 288 052**	**16 760 538**
DISTRICT TOTAL	**14 095 580**	**16 225 359**	**15 550 424**	**14 505 699**	**16 956 945**
BOWEN					
UNDERGROUND					
Bowen No. 2	195 747	233 025	215 689	299 038	309 182
Bowen No. 3	74 919	117 126	113 497	118 832	137 358
	270 666	**350 151**	**329 186**	**417 870**	**446 540**
OPEN-CUT					
Bowen Central No. 3	270 469	95 815	485 628	915 171	396 854
Dacon East No. 4	119 558	572 231	307 240	50 428	..
Garrick West S/D	..	..	..	..	348 327
	390 027	**668 046**	**792 868**	**965 599**	**745 181**
DISTRICT TOTAL	**660 693**	**1 018 197**	**1 122 054**	**1 383 469**	**1 191 721**

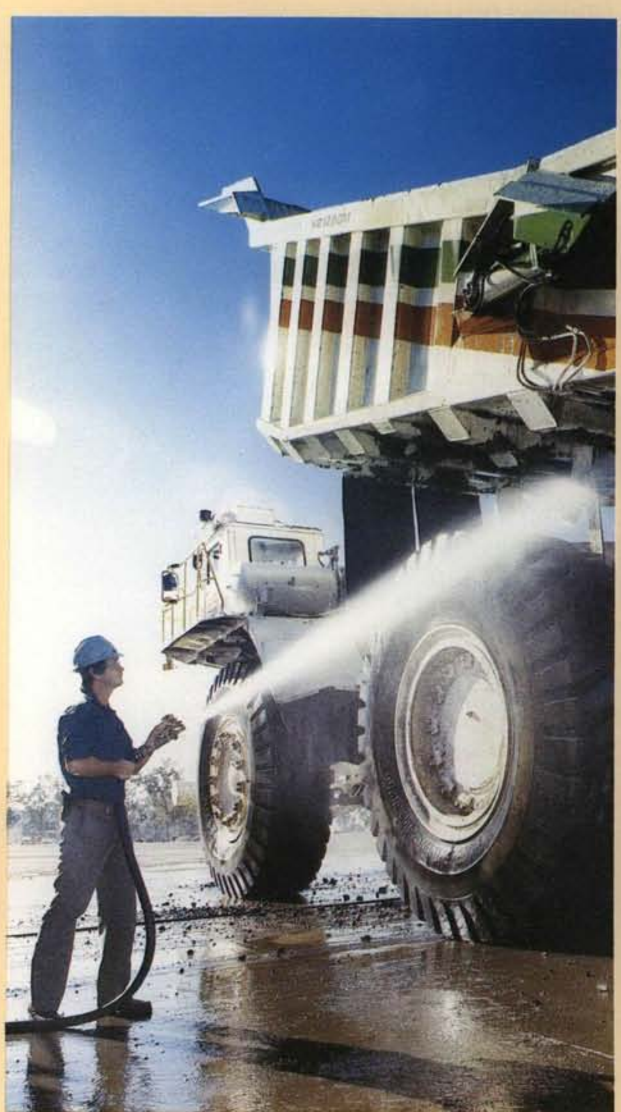
* Developing mines

TABLE 4

SOME EQUIPMENT INSTALLED AT QUEENSLAND MINES*

Number of Installed Units and Megawatt power—June 30, 1984

UNDERGROUND MINES	
Air Compressors	41
megawatts	2.9
Belt Conveyors	210
megawatts	19.9
Coal Loaders	13
megawatts	0.5
Continuous Miners	60
megawatts	23.1
Haulages and Winders	15
megawatts	1.5
Locomotives	6
Man and Supply Vehicles	73
Preparation Plants	12
megawatts	6.2
Roofbolters	17
megawatts	0.3
Shuttle Cars	108
megawatts	10.6
Ventilating Fans	37
megawatts	4.6
Water Pumps	187
megawatts	4.2
OPEN-CUT MINES	
Air Compressors	55
megawatts	4.84
Coal Haulers	186
megawatts	104.66
Dozers	194
megawatts	68.43
Draglines	46
megawatts	256.8
Front-end Loaders	113
megawatts	35.96
Preparation Plants	16
megawatts	86.63
Pumps	243
megawatts	15.24
Rotary Drills	64
megawatts	18.96
Scrapers	86
megawatts	43.97
Shovels	21
megawatts	16.68



Equipment on wash-down pad — Blair Athol.

** By courtesy of the Department of Mines*

TABLE 5

AVERAGE DAILY OUTPUT SALEABLE COAL

— (239 WORKING DAYS POSSIBLE)

Years Ended June 30, 1983 and 1984 (Tonnes)

DISTRICT AND MINES	1983	1984
WEST MORETON		
UNDERGROUND		
Box Flat No. 8	* 307	340
Box Flat No. 9	1 036	752
New Hope	1 305	1 535
Oakleigh	518	478
Rhondda No. 1	330	440
Rhondda No. 5	620	576
M.W. Haenke Nos. 1 & 2	1 145	1 370
Southern Cross No. 9	428	* 47
Southern Cross No. 12	..	295
Southern Cross No. 14	441	191
Southern Cross No. 15	..	* 22
Westfalen No. 3	1 007	1 069
OPEN-CUT		
Amberley	946	1 377
Blackheath	* 25	..
Box Flat No. 2	259	356
New Hope	563	132
New Whitwood	1 621	1 903
Oakleigh	326	255
Rylance No. 3	* 236	..
Southern Cross No. 3	1 093	752
Wattle Glen	528	* 382
Wattle Glen Extd.	..	* 15
DARLING DOWNS		
UNDERGROUND		
Acland No. 3	50	41
MARYBOROUGH		
UNDERGROUND		
Burgowan No. 12	68	71
NANANGO		
OPEN-CUT		
Meandu	..	*2 523
KIANGA-MOURA		
UNDERGROUND		
Moura No. 2	989	1 032
Moura No. 4	1 106	620
OPEN-CUT		
Moura	5 770	7 767

** Not producing for full year*

DISTRICT AND MINES	1983	1984
CALLIDE		
OPEN-CUT		
Boundary Hill	*3 612	6 124
Callide	11 023	9 510
BLACKWATER		
UNDERGROUND		
Ballamoo	* 50	..
Cook	1 494	2 173
German Creek Central	* 6	230
South Blackwater No. 1	2 278	1 163
OPEN-CUT		
Blackwater	17 151	16 825
Curragh	..	*9 092
German Creek	9 515	10 302
Gregory	8 272	8 420
Oaky Creek	*2 212	10 283
South Blackwater	4 617	5 023
Yarrabee	831	920
BLAIR ATHOL		
OPEN-CUT		
Blair Athol	547	3 909
MACKAY		
UNDERGROUND		
Harrow Creek	899	822
OPEN-CUT		
Goonyella	17 556	18 625
Newlands	..	*2 155
Norwich Park	10 443	10 451
Peak Downs	16 001	13 709
Riverside	..	*8 456
Saraji	15 042	16 732
BOWEN		
UNDERGROUND		
Bowen No. 2	1 236	1 293
Bowen No. 3	491	575
OPEN-CUT		
Bowen Central No. 3	3 782	1 661
Dacon No. 4	* 208	..
Garrick West S/D	..	1 457
TOTAL — UNDERGROUND	**15 804**	**15 135**
— OPEN-CUT	**132 179**	**169 116**
— STATE	**147 983**	**184 251**

TABLE 6

OUTPUT OF SALEABLE COAL PER MANSHIFT WORKED

Six Monthly Periods—Years Ended June 30, 1980-1984

DISTRICT	TONNES—SIX MONTHS 1979-1980		1980-1981		1981-1982	
	July-Dec	Jan-June	July-Dec	Jan-June	July-Dec	Jan-June
UNDERGROUND MINES						
West Moreton						
Face	20.02	20.82	22.41	21.12	18.50	19.32
Overall	6.01	5.99	6.63	6.24	5.95	6.15
Darling Downs						
Face	18.72	18.71	14.66	12.44	13.44	14.66
Overall	3.83	3.70	3.54	3.15	3.60	3.82
Maryborough						
Face	12.15	10.82	12.38	12.11	10.85	11.44
Overall	5.98	5.50	6.21	5.32	4.40	4.74
Kianga-Moura						
Face	14.81	16.23	17.57	14.26	20.86	18.71
Overall	6.19	6.69	7.28	5.94	8.75	7.67
Blackwater						
Face	27.01	23.07	22.40	22.59	24.19	26.80
Overall	5.58	4.62	4.09	4.50	5.03	5.45
Mackay						
Face	28.43	27.78	78.70	69.17	27.08	32.15
Overall	16.43	15.64	18.45	16.42	6.31	8.83
Bowen						
Face	29.02	31.96	32.49	33.78	34.12	34.23
Overall	4.98	4.29	5.48	5.23	5.33	5.12
Face	**21.67**	**23.07**	**23.52**	**22.00**	**21.19**	**21.95**
Overall	**6.08**	**5.79**	**6.20**	**5.81**	**5.94**	**6.06**
OPEN-CUT MINES						
West Moreton						
Overall	23.31	24.80	21.20	17.82	18.96	19.84
Nanango						
Overall	..	..	..	..	..	..
Kianga-Moura						
Overall	9.03	8.18	10.11	9.47	9.31	10.52
Callide						
Overall	38.04	40.39	43.16	39.11	39.08	38.15
Blackwater						
Overall	21.23	23.36	21.86	27.73	20.79	21.78
Blair Athol						
Overall	13.84	13.72	12.37	7.48	7.42	9.37
Mackay						
Overall	22.91	23.54	25.55	25.16	24.89	23.72
Bowen						
Overall	9.58	8.66	12.02	8.99	10.75	11.52
Overall	**20.27**	**21.40**	**22.34**	**22.92**	**22.02**	**21.14**
STATE						
Face—Underground	**21.67**	**23.07**	**23.52**	**22.00**	**21.19**	**21.95**
Overall—All Mines	**15.96**	**16.68**	**17.31**	**17.94**	**16.70**	**16.93**

NOTE: Developing mines excluded

DISTRICT	1982-1983 July-Dec.	1982-1983 Jan-June	1983-1984 July-Dec.	1983-1984 Jan-June
	TONNES—SIX MONTHS			
UNDERGROUND MINES				
West Moreton				
Face	21.29	18.16	20.34	20.43
Overall	6.46	5.97	6.55	6.93
Darling Downs				
Face	15.83	14.82	14.69	15.06
Overall	4.79	4.43	3.70	4.19
Maryborough				
Face	11.47	11.66	12.47	12.61
Overall	5.11	5.10	5.94	6.03
Kianga-Moura				
Face	17.80	19.10	18.67	17.65
Overall	7.36	7.80	8.46	7.59
Blackwater				
Face	27.52	24.66	34.16	29.43
Overall	6.91	5.46	6.26	7.26
Mackay				
Face	44.36	47.18	39.64	73.26
Overall	12.45	14.03	10.49	14.35
Bowen				
Face	34.60	39.69	48.23	53.19
Overall	5.39	6.26	6.33	7.53
Face	**23.62**	**21.69**	**24.00**	**24.87**
Overall	**6.70**	**6.33**	**6.73**	**7.37**
OPEN-CUT MINES				
West Moreton				
Overall	21.91	23.96	26.91	21.67
Nanango				
Overall	..	..	..	39.71
Kianga-Moura				
Overall	7.49	7.03	12.46	11.00
Callide				
Overall	33.38	35.54	35.62	35.04
Blackwater				
Overall	20.73	18.85	21.62	24.56
Blair Athol				
Overall	13.15	9.48	10.73	38.37
Mackay				
Overall	21.24	20.14	19.62	22.59
Bowen				
Overall	13.30	10.53	6.89	7.91
Overall	**19.80**	**18.65**	**19.79**	**22.68**
STATE				
Face — Underground	23.62	21.69	24.00	24.87
Overall—All Mines	16.28	15.54	16.96	19.48

NOTE: Developing mines excluded

TABLE 7

EMPLOYMENT QUEENSLAND COAL INDUSTRY

Years Ended June 30, 1980-1984

YEAR	DISTRICT											YEAR
	West Moreton	Darling Downs	Mary-borough	Nanango	Kianga/ Moura	Callide	Black-water	Blair Athol	Mackay	Bowen	TOTAL	
					UNDERGROUND AND OPEN-CUT MINES TOTAL							
1980	1 043	11	19	..	1 139	214	1 834	38	2 570	506	7 374	1980
1981	1 194	12	12	..	1 109	225	2 073	40	2 723	577	7 965	1981
1982	1 300	11	13	..	1 087	282	2 547	42	2 775	607	8 664	1982
1983	1 233	12	12	90	913	379	2 526	65	2 855	688	8 773	1983
1984	1 069	12	12	103	872	393	3 076	175	3 272	690	9 674	1984
					UNDERGROUND MINES							
					Below Ground — Coal Face							
1980	298	2	6	..	126	..	159	..	34	41	666	1980
1981	335	3	6	..	127	..	156	..	17	53	697	1981
1982	378	4	6	..	115	..	155	..	20	48	726	1982
1983	383	4	6	..	98	..	95	..	20	40	646	1983
1984	357	4	6	..	78	..	175	..	13	39	672	1984
					Below Ground — Elsewhere							
1980	309	4	8	..	84	..	272	..	14	117	808	1980
1981	342	3	1	..	83	..	288	..	34	111	862	1981
1982	332	1	2	..	83	..	290	..	32	116	856	1982
1983	320	1	2	..	76	..	151	..	32	122	704	1983
1984	209	1	2	..	61	..	200	..	36	110	619	1984

					Above Ground — General							
1980	156	4	3	..	48	..	98	..	3	52	364	1980
1981	180	5	3	..	51	..	108	..	3	48	398	1981
1982	192	5	3	..	54	..	90	..	3	55	402	1982
1983	205	6	2	..	43	..	62	..	3	55	376	1983
1984	184	6	2	..	45	..	56	..	3	52	348	1984
					Above Ground — Administrative and Clerical							
1980	130	1	2	..	32	..	138	..	14	61	378	1980
1981	145	1	2	..	30	..	156	..	14	63	411	1981
1982	160	1	2	..	31	..	143	..	14	72	423	1982
1983	152	1	2	..	25	..	109	..	13	63	365	1983
1984	137	1	2	..	20	..	113	..	14	56	343	1984
					UNDERGROUND MINES — ALL CATEGORIES							
1980	893	11	19	..	290	..	667	..	65	271	2 216	1980
1981	1 002	12	12	..	291	..	708	..	68	275	2 368	1981
1982	1 062	11	13	..	283	..	678	..	69	291	2 407	1982
1983	1 060	12	12	..	242	..	417	..	68	280	2 091	1983
1984	887	12	12	..	204	..	544	..	66	257	1 982	1984

TABLE 7—Continued

YEAR	DISTRICT West Moreton	Nanango	Kianga/ Moura	Callide	Blackwater	Blair Athol	Mackay	Bowen	TOTAL	YEAR
					OPEN-CUT MINES General					
1980	139	..	628	148	831	30	1 904	185	3 865	1980
1981	179	..	597	156	943	30	1 964	234	4 103	1981
1982	227	..	601	202	1 329	31	2 073	239	4 702	1982
1983	166	47	522	281	1 493	51	2 100	294	4 954	1983
1984	170	52	518	292	1 838	115	2 328	316	5 629	1984
					Administrative and Clerical					
1980	11	..	221	66	336	8	601	50	1 293	1980
1981	13	..	221	69	422	10	691	68	1 494	1981
1982	11	..	203	80	540	11	633	77	1 555	1982
1983	7	43	149	98	616	14	687	114	1 728	1983
1984	12	51	150	101	694	60	878	117	2 063	1984
					OPEN-CUT MINES — ALL CATEGORIES					
1980	150	..	849	214	1 167	38	2 505	235	5 158	1980
1981	192	..	818	225	1 365	40	2 655	302	5 597	1981
1982	238	.	804	282	1 869	42	2 706	316	6 257	1982
1983	173	90	671	379	2 109	65	2 787	408	6 682	1983
1984	182	103	668	393	2 532	175	3 206	433	7 692	1984

TABLE 8

SUMMARY OF MANSHIFTS WORKED AND LOST AT QUEENSLAND MINES

Years Ended June 30, 1979-1984

YEAR	MANSHIFTS POSSIBLE	NUMBER WORKED		NUMBER LOST THROUGH Industrial Disputes		Sickness		Compensation		Absenteeism		Other Causes	
		Number	% of Possible	Number	% of Possible	Number	% of Possible	Number	% of Possible	Number	%of Possible	Number	%of Possible
1979	1 849 298	1 677 214	90.69	74 571	4.03	47 665	2.58	25 502	1.38	24 190	1.31	156	0.01
1980	1 959 466	1 686 323	86.06	152 135	7.76	42 955	2.19	26 366	1.35	51 301	2.62	386	0.02
1981	2 181 674	1 860 336	85.27	211 615	9.70	49 745	2.28	27 093	1.24	32 558	1.49	327	0.02
1982	2 316 773	2 024 705	87.39	160 133	6.91	55 366	2.39	30 305	1.31	45 921	1.98	343	0.02
1983	2 437 162	2 270 241	93.15	28 190	1.16	68 162	2.79	27 788	1.14	40 654	1.67	2 127	0.09
1984	2 593 687	2 413 495	93.05	51 153	1.97	65 785	2.54	26 040	1.00	37 061	1.43	153	0.01

TABLE 9
MANSHIFTS WORKED AND LOST AND REASONS FOR LOSS

Years Ended June 30, 1982-1984

DISTRICT	MAN-SHIFTS POSSIBLE	MANSHIFTS WORKED		MANSHIFTS LOST		INDUSTRIAL DISPUTES	
		Number	% of Possible	Number	% of Possible	Number	% of Possible
UNDERGROUND MINES							
West Moreton							
1982	294 621	252 802	85.81	41 819	14.19	20 346	6.91
1983	302 381	277 700	91.84	24 681	8.16	2 671	0.88
1984	274 751	252 612	91.94	22 139	8.06	2 223	0.81
Darling Downs							
1982	2 768	2 565	92.67	203	7.33	24	0.87
1983	2 869	2 637	91.91	232	8.09	10	0.35
1984	2 669	2 495	93.48	174	6.52	8	0.30
Maryborough							
1982	2 973	2 768	93.10	205	6.90	128	4.31
1983	3 435	3 209	93.42	226	6.58	10	0.29
1984	2 933	2 839	96.79	94	3.21	..	..
Kianga-Moura							
1982	76 457	66 740	87.29	9 717	12.71	4 456	5.83
1983	73 506	66 939	91.07	6 567	8.93	868	1.18
1984	54 677	49 296	90.16	5 381	9.84	974	1.78
Blackwater							
1982	201 292	161 826	80.39	39 466	19.61	21 239	10.55
1983	166 208	147 158	88.54	19 050	11.46	3 442	2.07
1984	140 657	125 458	89.19	15 199	10.81	5 257	3.74
Mackay							
1982	17 962	14 197	79.04	3 765	20.96	1 488	8.28
1983	18 084	16 461	91.03	1 623	8.97	153	0.85
1984	17 164	15 783	91.95	1 381	8.05	144	0.84
Bowen							
1982	73 180	64 357	87.94	8 823	12.06	3 470	4.74
1983	78 984	71 878	91.00	7 106	9.00	1 509	1.91
1984	71 172	64 580	90.74	6 592	9.26	842	1.18
TOTAL UNDERGROUND MINES							
1982	669 253	565 255	84.46	103 998	15.54	51 151	7.64
1983	645 467	585 982	90.78	59 485	9.22	8 663	1.34
1984	564 023	513 063	90.96	50 960	9.04	9 448	1.68

REASONS FOR LOSS								
SICKNESS		COMPENSATION		ABSENTEEISM		OTHER CAUSES		YEAR
Number	% of Possible	Number	% of Possible	Number	% of Possible	Number	% of Possible	
8 606	2.92	9 231	3.13	3 636	1.23	..	..	1982
10 427	3.45	7 774	2.57	3 785	1.25	24	0.01	1983
8 723	3.18	7 671	2.79	3 512	1.28	10	..	1984
92	3.32	55	1.98	32	1.16	..	..	1982
111	3.87	68	2.37	43	1.50	..	..	1983
80	3.00	60	2.25	26	0.97	..	..	1984
12	0.40	44	1.48	21	0.71	..	..	1982
144	4.19	41	1.19	19	0.56	12	0.35	1983
26	0.89	36	1.23	32	1.09	..	..	1984
2 394	3.13	1 115	1.46	1 752	2.29	..	..	1982
3 092	4.21	894	1.21	1 713	2.33	..	..	1983
2 303	4.21	732	1.34	1 372	2.51	..	..	1984
5 889	2.93	5 636	2.80	6 591	3.27	111	0.06	1982
5 676	3.41	4 453	2.68	5 022	3.02	457	0.28	1983
4 477	3.18	3 458	2.46	2 007	1.43	..	..	1984
258	1.44	576	3.21	1 443	8.03	..	..	1982
406	2.24	818	4.52	246	1.36	..	..	1983
311	1.81	580	3.38	346	2.02	..	..	1984
2 963	4.05	836	1.14	1 554	2.13	..	..	1982
2 892	3.66	959	1.22	1 746	2.21	..	..	1983
3 205	4.50	1 007	1.42	1 538	2.16	..	..	1984
20 214	3.02	17 493	2.61	15 029	2.25	111	0.02	1982
22 748	3.52	15 007	2.33	12 574	1.95	493	0.08	1983
19 125	3.39	13 544	2.40	8 833	1.57	10	..	1984

DISTRICT	MAN-SHIFTS POSSIBLE	MANSHIFTS WORKED		MANSHIFTS LOST		INDUSTRIAL DISPUTES	
		Number	% of Possible	Number	% of Possible	Number	% of Possible
OPEN-CUT MINES							
West Moreton							
1982	64 537	60 996	94.51	3 541	5.49	2 278	3.53
1983	61 594	59 475	95.56	2 119	3.44	260	0.42
1984	52 628	51 135	97.16	1 493	2.84	288	0.55
Nanango							
1982	..	..	..	..	..	..	..
1983	4 256	4 166	97.89	90	2.11	..	..
1984	27 093	26 686	98.50	407	1.50	..	..
Kianga-Moura							
1982	222 265	199 078	89.57	23 187	10.43	9 473	4.26
1983	209 108	192 131	91.88	16 977	8.12	1 537	0.74
1984	175 298	158 628	90.49	16 670	9.51	3 896	2.22
Callide							
1982	65 748	60 626	92.21	5 122	7.79	2 388	3.63
1983	108 299	102 737	94.86	5 562	5.14	1 308	1.21
1984	111 846	105 763	94.56	6 083	5.44	728	0.65
Blackwater							
1982	465 186	409 484	88.03	55 702	11.97	33 291	7.16
1983	555 727	521 394	93.82	34 333	6.18	4 215	0.76
1984	672 238	629 590	93.66	42 648	6.34	15 471	2.30
Blair Athol							
1982	11 046	10 213	92.46	833	7.54	458	4.15
1983	12 234	11 776	96.26	458	3.74	89	0.73
1984	38 015	35 539	93.49	2 476	6.51	306	0.80
Mackay							
1982	740 763	650 252	87.78	90 511	12.22	57 101	7.71
1983	750 984	710 991	94.67	39 993	5.33	10 417	1.39
1984	843 709	792 643	93.95	51 066	6.05	19 690	2.33
Bowen							
1982	77 975	68 801	88.23	9 174	11.77	3 993	5.12
1983	89 493	81 589	91.17	7 904	8.83	1 701	1.90
1984	108 837	100 448	92.29	8 389	7.71	1 326	1.22
TOTAL OPEN-CUT MINES							
1982	1 647 520	1 459 450	88.58	188 070	11.42	108 982	6.62
1983	1 791 695	1 684 259	94.00	107 436	6.00	19 527	1.09
1984	2 029 664	1 900 432	93.63	129 232	6.37	41 705	2.05
STATE							
1982	2 316 773	2 024 705	87.39	292 068	12.61	160 133	6.91
1983	2 437 162	2 270 241	93.15	166 921	6.85	28 190	1.16
1984	2 593 687	2 413 495	93.05	180 192	6.95	51 153	1.97

REASONS FOR LOSS								
SICKNESS		COMPENSATION		ABSENTEEISM		OTHER CAUSES		YEAR
Number	% of Possible	Number	% of Possible	Number	% of Possible	Number	% of Possible	
529	0.82	359	0.56	241	0.37	134	0.21	1982
546	0.89	837	1.36	293	0.47	183	0.30	1983
393	0.75	463	0.88	211	0.40	138	0.26	1984
..	..	..	..	..	..	..	..	1982
10	0.23	..	..	3	0.07	77	1.81	1983
242	0.89	63	0.23	102	0.38	..	..	1984
6 318	2.84	3 118	1.40	4 278	1.93	..	..	1982
7 709	3.69	2 410	1.15	5 321	2.54	..	..	1983
6 262	3.57	1 541	0.88	4 971	2.84	..	..	1984
1 596	2.43	605	0.92	533	0.81	..	..	1982
2 755	2.54	246	0.23	1 253	1.16	..	..	1983
3 182	2.85	961	0.86	1 212	1.08	..	..	1984
9 637	2.07	4 044	0.87	8 632	1.85	98	0.02	1982
13 394	2.41	5 379	0.97	10 024	1.80	1 321	0.24	1983
14 861	2.21	5 123	0.76	7 188	1.07	5	..	1984
242	2.19	11	0.10	122	1.10	..	..	1982
206	1.68	25	0.20	138	1.13	..	..	1983
679	1.79	20	0.05	1 471	3.87	..	..	1984
13 556	1.83	4 238	0.57	15 616	2.11	..	..	1982
17 343	2.31	3 123	0.41	9 057	1.21	53	0.01	1983
17 176	2.04	3 482	0.41	10 718	1.27	..	..	1984
3 274	4.20	437	0.56	1 470	1.89	..	..	1982
3 451	3.86	761	0.85	1 991	2.22	..	..	1983
3 865	3.55	843	0.78	2 355	2.16	..	..	1984
35 152	2.14	12 812	0.78	30 892	1.87	232	0.01	1982
45 414	2.54	12 781	0.71	28 080	1.57	1 634	0.09	1983
46 660	2.30	12 496	0.62	28 228	1.39	143	0.01	1984
55 366	2.39	30 305	1.31	45 921	1.98	343	0.02	1982
68 162	2.79	27 788	1.14	40 654	1.67	2 127	0.09	1983
65 785	2.54	26 040	1.00	37 061	1.43	153	0.01	1984

TABLE 10

QUEENSLAND COAL CONSUMPTION BY CONSUMER GROUPS

Years Ended June 30, 1980-1984 ('000 Tonnes)

CONSUMER GROUP	1980	1981	1982	1983	1984
ELECTRICITY					
°Steam Power Stations	4 882	5 346	5 653	6 709	7 636
METAL PROCESSING					
Alumina Refining	1 174	1 177	1 025	916	1 174
Lead Smelting	82	84	89	89	85
Nickel Refining	..	..	87	219	178
BUILDING MATERIALS					
Cement Works	270	244	332	332*	251*
Bricks and Pottery	14	22	30	25	23
PAPER PULP AND BOARD					
Paper and Hardboard Mills	61	61	77	80	81
FOOD PROCESSING					
Meat and Bacon	17	21	30	33	34
Sugar Mills	24	30	30	23	26
Dairy Products	3	3	4	6	6
Fruit Canneries	2	5	9	10	12
Breweries	6	15	16	16	16
Margarine & Edible Oils	..	..	14	14	13
COKE MAKING					
Coke Works	53	66	53	66	67
MISCELLANEOUS					
Hospitals	30	31	35	37	35
Ships' Bunkers	..	..	..	28	184
Sundry	12	13	14	13	10
STATE TOTAL	**6 630**	**7 118**	**7 498**	**8 616**	**9 831**

* Includes clinker plant, The Queensland Cement & Lime Co. Ltd., Gladstone. ° Includes Mica Creek.

TABLE 11

BRISBANE METROPOLITAN COAL CONSUMPTION

Years Ended June 30, 1980-1984 ('000 Tonnes)

CONSUMER GROUP	1980	1981	1982	1983	1984
Electricity	211	232	184	212	327
Cement Works	195	155	202	157	76
Hospitals	23	23	27	29	28
Sugar Refinery	11	10	12	11	11
Breweries	6	15	16	16	16
Meat and Bacon	9	8	8	15	14
Margarine and Edible Oils	. .	. .	12	11	10
Bricks and Pottery	7	11	15	9	6
Fruit Canneries	2	5	9	10	12
Miscellaneous	4	3	5	3	3
TOTAL	**468**	**462**	**490**	**473**	**503**

TABLE 12

SOUTHERN QUEENSLAND COAL CONSUMPTION

(Excluding Brisbane)

Years Ended June 30, 1980-1984 ('000 Tonnes)

CONSUMER GROUP	1980	1981	1982	1983	1984
Electricity	1 759	1 595	1 416	1 311	1 809
Paper and Hardboard Mills	61	61	77	80	81
Hospitals	7	8	8	8	7
Bricks and Pottery	7	9	9	10	12
Sugar Mills	12	12	8	8	10
Meat and Bacon	5	9	10	9	12
Dairy Products	3	3	4	6	6
Margarine and Edible Oils	. .	. .	2	3	3
Miscellaneous	2	6	5	6	3
TOTAL	**1 856**	**1 703**	**1 539**	**1 441**	**1 943**

TABLE 13

CENTRAL QUEENSLAND COAL CONSUMPTION

Years Ended June 30, 1980-1984 ('000 Tonnes)

CONSUMER GROUP	1980	1981	1982	1983	1984
Electricity	2 446	2 992	3 483	4 570	4 822
Alumina Refining	1 174	1 177	1 025	916	1 174
Cement Works	30	40	73	122*	121*
Meat and Bacon	. .	1	7	4	6
Sugar Mills	. .	2	3	1	1
Bricks and Pottery	. .	2	6	5	4
Ships' Bunkers	. .	. .	. .	28	184
Miscellaneous	3	4	3	3	3
TOTAL	**3 653**	**4 218**	**4 600**	**5 649**	**6 315**

* Includes clinker plant, The Queensland Cement & Lime Co. Ltd., Gladstone.

TABLE 14

NORTH QUEENSLAND COAL CONSUMPTION

Years Ended June 30, 1980-1984 ('000 Tonnes)

CONSUMER GROUP	1980	1981	1982	1983	1984
*Electricity	466	527	570	616	678
Lead Smelting	82	84	89	89	85
Nickel Refining	. .	. .	87	219	178
Cement Works	45	49	57	53	54
Coke Works	53	66	53	66	67
Meat and Bacon	3	3	5	5	2
Sugar Mills	1	6	7	3	4
Bricks and Pottery	. .	. .	. .	1	1
Miscellaneous	3	. .	1	1	1
TOTAL	**653**	**735**	**869**	**1 053**	**1 070**

* Includes Mica Creek

TABLE 15

INTERSTATE SALES AND OVERSEAS EXPORTS

Years Ended June 30, 1965-1984 ('000 Tonnes)

YEAR	Interstate Sales	Overseas Exports	TOTAL
1965	..	1 186	1 186
1966	..	1 741	1 741
1967	..	1 741	1 741
1968	..	2 369	2 369
1969	3	4 103	4 106
1970	7	5 742	5 749
1971	177	6 975	7 152
1972	91	9 200	9 291
1973	214	14 679	14 893
1974	207	15 642	15 849
1975	197	17 591	17 788
1976	435	16 388	16 823
1977	499	18 965	19 464
1978	383	20 118	20 501
1979	383	18 836	19 219
1980	579	21 296	21 875
1981	497	23 727	24 224
1982	128	24 862	24 990
1983	91	26 405	26 496
1984	15	33 095	33 110

TABLE 16

EXPORTS TO OVERSEAS COUNTRIES

Years Ended June 30, 1965-1984 ('000 Tonnes)

YEAR	Japan	Italy	United Kingdom	Brazil	Spain	*Belgium	*Nether-lands	France	Taiwan	Romania	Korea	Egypt	Iran	Turkey	Hong Kong	Other Countries	TOTAL	
1965	1 186	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1 186	1965
1966	1 731	..	..	..	..	..	..	..	..	..	..	..	..	..	..	10	1 741	1966
1967	1 736	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5	1 741	1967
1968	2 366	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	2 369	1968
1969	4 103	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4 103	1969
1970	5 706	26	..	..	..	..	..	..	..	..	..	..	..	..	..	10	5 742	1970
1971	6 937	..	22	16	..	..	..	..	..	..	..	..	..	..	..	..	6 975	1971
1972	8 328	326	..	..	98	68	284	..	..	..	..	..	..	..	..	96	9 200	1972
1973	12 446	656	127	..	75	362	467	119	..	..	..	..	..	..	..	427	14 679	1973
1974	13 083	1 027	133	..	..	286	561	232	..	..	..	..	..	..	..	320	15 642	1974
1975	14 179	1 408	217	..	..	312	626	516	..	..	..	..	..	..	..	333	17 591	1975
1976	13 426	828	451	..	324	145	348	739	16	..	..	..	..	..	..	111	16 388	1976
1977	14 895	1 109	385	..	332	316	652	832	62	52	60	..	..	..	..	270	18 965	1977
1978	14 297	1 253	432	41	521	224	945	1 384	188	577	135	..	..	..	..	121	20 118	1978
1979	12 909	1 030	750	123	559	276	631	1 073	307	251	469	..	..	..	..	458	18 836	1979
1980	15 157	1 265	781	52	527	268	480	1 048	381	234	550	116	..	..	..	436	21 295	1980
1981	17 066	1 524	566	97	571	269	395	906	346	405	835	296	..	..	..	451	23 727	1981
1982	17 226	1 197	863	..	624	155	466	1 100	630	246	1 224	387	..	..	..	744	24 862	1982
1983	17 776	1 336	921	322	594	221	477	1 151	1 009	152	1 466	433	33	40	..	474	26 405	1983
1984	19 872	2 187	761	483	1 135	263	1 050	1 821	1 372	588	1 532	260	398	240	705	*428	33 095	1984

* Often transhipped from these destinations to other countries.

* Summary—Other Countries

F.R. Germany	160
Yugoslavia	81
Algeria	55
India	50
Chile	27
Malaysia	20
Fiji	20
Burma	9
Indonesia	6
	428

TABLE 17
OVERSEAS EXPORTS BY MINES
Years Ended June 30, 1965-1984 ('000 Tonnes)

YEAR	Kianga-Moura	Black-water	Collins-ville	South Black-water	Blair Athol	Goonyella	Peak Downs	Saraji	Harrow Creek	Gregory
1965	1 158	..	..	..	..	..	..	..	..	..
1966	1 721	2	..	..	..	..	..	..	..	..
1967	1 719	..	13	..	..	..	..	..	..	..
1968	1 897	430	20	..	..	..	..	..	..	..
1969	2 708	1 315	47	12	..	..	..	..	..	..
1970	3 037	2 652	38	..	10	..	..	..	..	..
1971	3 184	3 240	..	547	..	..	..	..	..	..
1972	2 740	2 670	100	1 091	24	2 574	..	..	..	
1973	3 216	3 287	101	1 109	7	4 642	2 317	..	..	..
1974	2 998	3 336	60	1 010	5	3 887	4 346	..	..	..
1975	2 244	3 478	57	967	..	4 023	4 994	1 822	..	..
1976	1 979	2 815	33	621	5	3 279	4 356	3 300	..	..
1977	2 370	3 102	16	691	..	3 862	4 183	4 741	..	..
1978	2 099	2 953	20	898	..	4 308	5 144	4 696	..	..
1979	2 246	3 043	10	1 056	6	3 804	4 028	4 465	162	..
1980	2 146	3 111	6	1 234	..	4 370	4 263	4 484	254	148
1981	2 200	2 799	308	1 613	19	3 914	3 923	3 491	248	1 453
1982	2 381	2 593	161	1 467	23	4 283	3 435	2 765	147	1 967
1983	2 182	2 350	23	1 536	53	4 338	3 543	3 702	174	2 186
1984	2 233	3 081	68	1 629	504	4 436	3 830	3 973	236	1 959

Norwich Park	New Whitwood	German Creek	Oaky Creek	Curragh	Newlands	Riverside	Other	TOTAL	YEAR
..	..	..	..	..	..	..	28	1 186	1965
..	..	..	..	..	..	..	18	1 741	1966
..	..	..	..	..	..	..	9	1 741	1967
..	..	..	..	..	..	..	22	1 369	1968
..	..	..	..	..	..	..	21	4 103	1969
..	..	..	..	..	..	..	5	2 369	1970
..	..	..	..	..	..	..	4	6 975	1971
..	..	..	..	..	..	..	..	9 199	1972
..	..	..	..	..	..	..	..	14 679	1973
..	..	..	..	..	..	..	..	15 642	1974
..	..	..	..	..	..	..	6	17 591	1975
..	..	..	..	..	..	..	..	16 388	1976
..	..	..	..	..	..	..	..	18 965	1977
..	..	..	..	..	..	..	..	20 118	1978
..	..	..	..	..	..	..	16	18 836	1979
1 131	9	..	..	..	..	..	140	21 296	1980
3 376	167	..	..	..	..	..	216	23 727	1981
4 453	256	349	..	..	..	..	582	24 862	1982
2 751	429	2 015	278	..	..	..	845	26 405	1983
2 854	304	2 525	2 106	361	412	1 673	*911	33 095	1984

* Summary — Other

Amberley	215
Cook	211
Yarrabee	200
Westfalen Group	127
New Hope Group	125
Rhondda	33
	911

TABLE 18

OVERSEAS EXPORTS — COKING AND STEAMING COAL

Years Ended June 30, 1970-1984 ('000 Tonnes)

YEAR	Coking	Steaming	TOTAL
1970	5 727	15	5 742
1971	6 971	4	6 975
1972	9 175	25	9 200
1973	14 672	7	14 679
1974	15 637	5	15 642
1975	17 582	9	17 591
1976	16 380	8	16 388
1977	18 963	2	18 965
1978	20 098	20	20 118
1979	18 634	202	18 836
1980	20 954	341	21 295
1981	22 586	1 141	23 727
1982	23 559	1 303	24 862
1983	24 829	1 576	26 405
1984	29 622	3 473	33 095

TABLE 19

OVERSEAS AND INTERSTATE SHIPMENTS — PORTS

Years Ended June 30, 1970-1984 ('000 Tonnes)

YEAR	Brisbane	Gladstone	Hay Point	Dalrymple Bay	Bowen	Abbot Point
1970	..	5 705	..	..	37	..
1971	4	7 138	..	..	..	..
1972	..	6 600	2 574	..	100	..
1973	..	7 677	7 098	..	101	..
1974	..	7 502	8 265	..	60	..
1975	..	6 871	10 838	..	57	..
1976	..	5 682	11 084	..	33	..
1977	..	6 489	12 941	..	16	..
1978	..	6 314	14 147	..	20	..
1979	16	6 716	12 460	..	10	..
1980	33	7 064	14 751	..	6	..
1981	383	8 438	15 077	..	308	..
1982	510	9 109	15 082	..	161	..
1983	787	11 087	14 508	..	23	..
1984	804	11 982	15 655	4 174	..	480

TABLE 20

INTERSTATE SALES BY MINES

Years Ended June 30, 1970-1984 ('000 Tonnes)

YEAR	Oakleigh	Black-water	South Black-water	Moura	Leich-hardt	Goon-yella	Cook	Saraji	Gregory	Norwich Park	Other	TOTAL	YEAR
1970	7	..	..	..	..	..	..	..	..	..	..	7	1970
1971	10	126	41	..	..	..	..	..	..	..	..	177	1971
1972	16	23	..	25	27	..	..	..	..	..	..	91	1972
1973	16	59	..	..	..	138	..	..	..	..	1	214	1973
1974	21	83	..	..	64	32	5	..	..	..	1	206	1974
1975	20	100	..	..	45	..	30	..	..	..	2	197	1975
1976	20	30	25	..	55	..	153	148	..	..	4	435	1976
1977	18	..	..	..	48	73	279	81	..	..	..	499	1977
1978	17	..	..	..	39	..	324	..	..	..	3	383	1978
1979	17	..	..	..	13	..	353	..	..	..	1	384	1979
1980	17	..	..	..	6	78	278	..	26	171	3	579	1980
1981	17	55	..	..	12	..	286	..	..	125	2	497	1981
1982	27	..	..	..	4	..	95	..	..	..	2	128	1982
1983	21	..	..	..	..	..	..	..	69	..	1	91	1983
1984	12	..	..	..	..	..	..	..	..	..	3	15	1984

Loading export coal in bulk carrier

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THE QUEENSLAND COAL BOARD

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QUEENSLAND, 4001
AUSTRALIA

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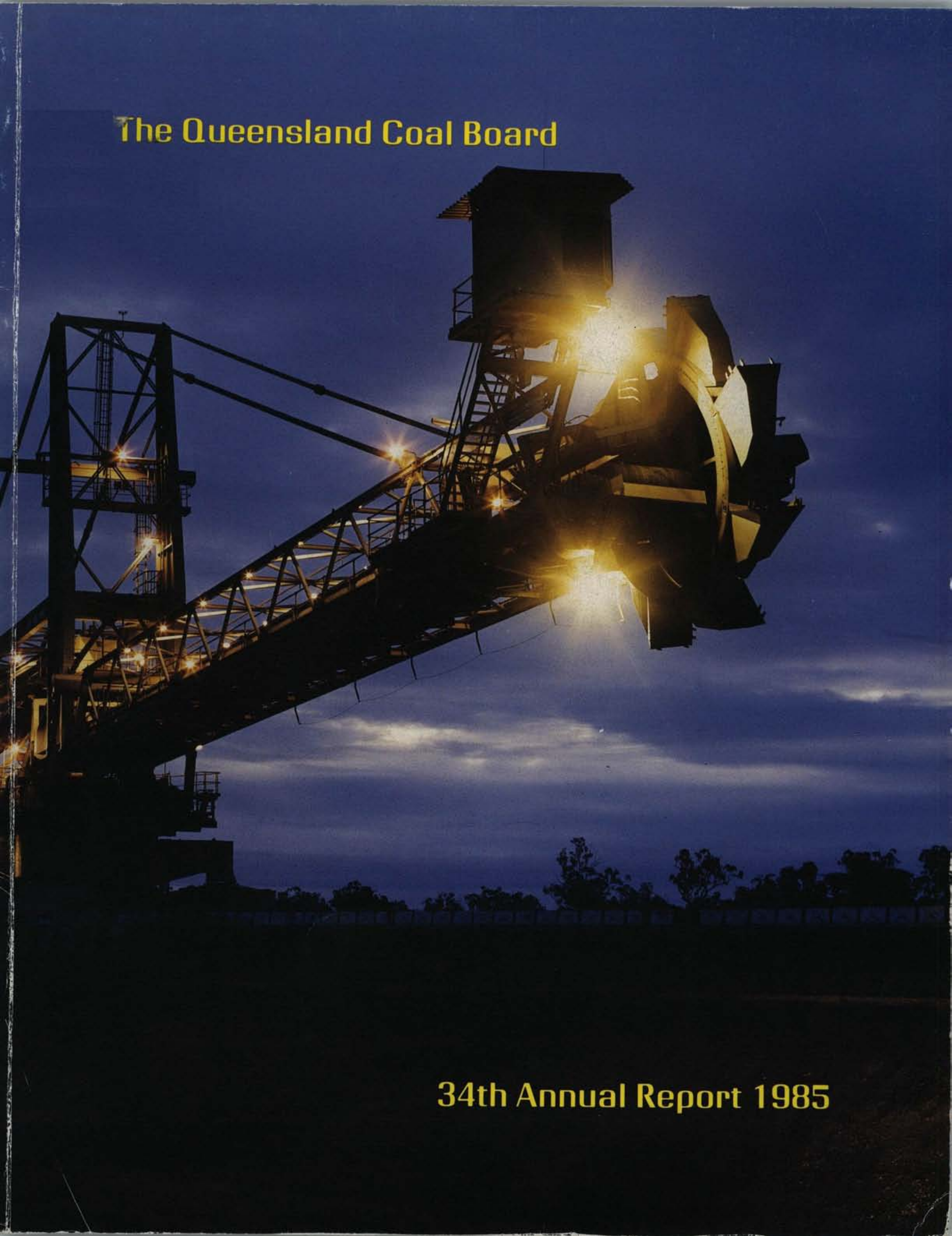
The Queensland Coal Board



34th Annual Report 1985

~~B A Coxhead~~

[signature]

THE QUEENSLAND COAL BOARD

288 EDWARD STREET,
BRISBANE. QLD. 4000.
AUSTRALIA.

October 12, 1985

The Hon. IVAN J. GIBBS, M.L.A.,
Minister for Mines and Energy,
BRISBANE.

Sir,

The Queensland Coal Board herewith presents its Thirty-fourth Annual Report which covers the financial year ended June 30, 1985.

The Board extends appreciation to you for your continuing co-operation and assistance and it desires to thank the Chief Government Geologist and officers of the Department of Mines, other Government Departments, mining companies, coal consumers, the Queensland Coal Association, coal mining unions and the Joint Coal Board for their co-operation.

J. T. WOODS, Chairman
M. L. NOUME, Member
W. J. PLATT, Member

P. J. CRANITCH, Secretary

CONTENTS

STATISTICAL SECTION

THE COAL INDUSTRY 1985.

The Board is proud to report on the continuing growth of the Queensland coal mining industry. The year ended June 30, 1985, reflects major expansion in coal trade, despite some difficulties on the international market.

Production of saleable coal has grown to 54.3 million tonnes, the highest in any year. The export mines in the Blackwater, Mackay, Blair Athol and Bowen Districts have contributed to this record figure, together with the Meandu mine at Tarong which provides coal to the adjacent Power Station. Production from several major mines which were developing last year has boosted the figures for this year's total output.

Employment increased to 10,393 despite 59 workers being retrenched from mines in the southern area.

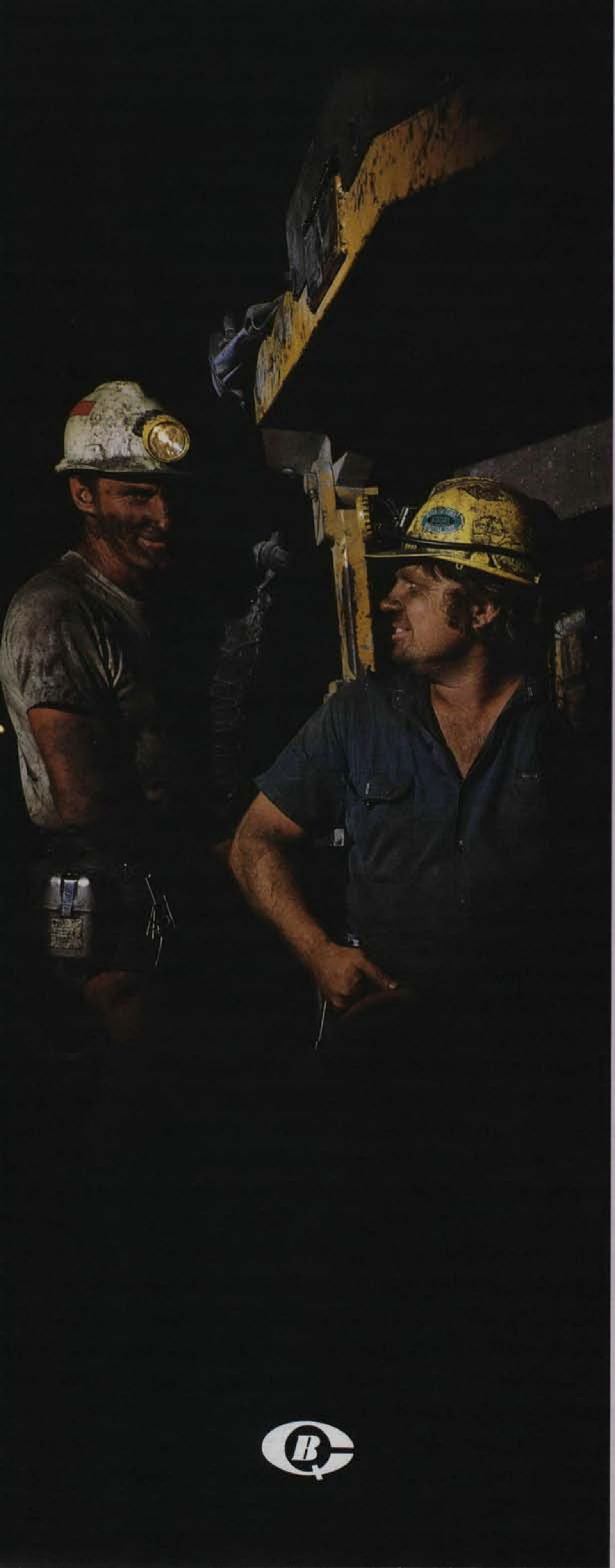
The number of manshifts possible to work rose to 2.8 million, although the actual number worked — 2.5 million — was a drop percentage wise from last year. However, productivity per employee throughout the State has risen.

Coal usage in Queensland has grown by 6.3% to a total of 10.4 million tonnes. The electricity generating industry used 8.2 million tonnes of this quantity at the coal fired power stations.

Exports of both coking and steaming coal are the highest in a 12 months period. Coking coal sales totalled 34.8 million tonnes and steaming coal 11.1 million tonnes, the latter being a rise of 7.3 million tonnes above last year. Exports were made to 31 countries and some companies previously engaged in coking coal markets have expanded their activities into the thermal coal area. Trade to Japan, the major destination of the State's export coal, has increased with additional coking and steaming coal being consigned to that country.

The two newer coal ports Abbot Point and Dalrymple Bay, were each utilised for a full 12 months period. Throughput at Dalrymple Bay increased by 7 million tonnes.

It is anticipated that the coal industry will continue to grow to meet increases in overseas trade and usage of coal within the State. Extra manpower will be required for the still developing projects in the central area.



1985 IN BRIEF

EMPLOYMENT Total

DISTRICT	
West Moreton	1 065
Maryborough	13
Nanango	135
Kianga-Moura	873
Callide	389
Blackwater	3 530
Blair Athol	257
Mackay	3 460
Bowen	671

NET PRODUCTION Tonnes

DISTRICT	
West Moreton	2 990 312
Darling Downs	3 104
Maryborough	11 767
Nanango	1 153 474
Kianga-Moura	2 019 379
Callide	3 001 642
Blackwater	18 041 222
Blair Athol	3 667 935
Mackay	21 560 984
Bowen	1 838 443

OUTPUT PER MANSHIFT State

OVERALL Tonnes	
Underground Mines	7.59
Open-cut Mines	24.76

COAL VALUE

The mine site value of coal produced is estimated at Australian $2 195 000 000

10 393

COAL CONSUMPTION Tonnes

Electricity Generation	8 239 987
Metal Processing	1 438 761
Building Materials	314 377
Ships' Bunkers	158 496
Food Processing	101 854
Paper and Board Mills	80 188
Coke Works	62 433
Miscellaneous	50 803

10.4 MILLION

COAL EXPORT Tonnes

45.5 MILLION

54.3 MILLION

Japan	24 594 975
Netherlands	3 131 714
France	2 635 701
Italy	2 308 724
Korea	1 905 381
Taiwan	1 772 626
Spain	1 159 570
Romania	1 039 603
Brazil	997 316
Denmark	840 957
United Kingdom	733 441
Hong Kong	640 646
India	550 644
Turkey	430 351
Philippines	406 970
Algeria	340 235
Iran	336 101
Greece	299 184
Indonesia	279 929
Egypt	263 844
China	193 522
Belgium	190 449
Chile	97 527
F.R. Germany	85 820
Sweden	70 633
Austria	63 631
Malaysia	61 650
Switzerland	26 930
U.S.A. (Hawaii)	21 720
Fiji	16 669
Burma	4 500

21.43

$2.2 BILLION

OPERATING COAL MINES

JUNE 30, 1985

DISTRICT	COMPANY	MINES	OPERATION
WEST MORETON	Allied Queensland Coalfields, G.P.O. Box 1692, BRISBANE. QLD. 4001.	New Whitwood No. 3 New Whitwood No. 8/2	Open-cut Open-cut
	Jeebropilly Collieries Pty. Ltd., P.O. Box 47, IPSWICH. QLD. 4305.	Amberley	Open-cut
	New Hope Collieries Pty. Ltd., P.O. Box 47, IPSWICH. QLD. 4305.	New Hope Nos. 4A, 6, 7 & Western Leases Nos. 1 & 2 New Hope Swanbank Area New Hope Area No. 2	U/ground Open-cut Open-cut
	Oakleigh Colliery Pty. Ltd., P.O. Box 25, ROSEWOOD. QLD. 4340.	Oakleigh No. 3 Oakleigh	U/ground Open-cut
	Rhondda Collieries Pty. Ltd., P.O. Box 109, IPSWICH. QLD. 4305.	Rhondda No. 1 Rhondda No. 5 M.W. Haenke M.W. Haenke No. 2 Bogside Extnd. Wattle Glen Extnd.	U/ground U/ground U/ground U/ground Open-cut Open-cut
	Westfalen Colliery Pty. Ltd., P.O. Box 215, BOOVAL. QLD. 4304.	Westfalen No. 3 Box Flat No. 8 Box Flat No. 9 Box Flat Extnd. No. 2	U/ground U/ground U/ground Open-cut
NANANGO	Pacific Coal Pty. Limited, G.P.O. Box 391, BRISBANE. QLD. 4001.	Meandu	Open-cut
MARYBOROUGH	Burgowan Collieries Pty. Ltd., 386 Albert Street, MARYBOROUGH. QLD. 4650.	Burgowan No. 12	U/ground
MOURA	Thiess Dampier Mitsui Coal Pty. Ltd., G.P.O. Box 2206, BRISBANE. QLD. 4001.	Moura No. 2 Moura No. 4 Moura	U/ground U/ground Open-cut

OPERATING COAL MINES (Continued)

JUNE 30, 1985

DISTRICT	COMPANY	MINES	OPERATION
CALLIDE	Thiess Bros. Pty. Limited, G.P.O. Box 18, BRISBANE. QLD. 4001.	Boundary Hill Callide	Open-cut Open-cut
BLACKWATER	Capricorn Coal Management Pty. Limited, G.P.O. Box 1410, BRISBANE. QLD. 4001.	German Creek Central German Creek	U/ground Open-cut
	Central Queensland Coal Associates, G.P.O. Box 1389, BRISBANE. QLD. 4001.	Blackwater	Open-cut
	Coal Resources of Queensland Pty. Ltd., G.P.O. Box 2692, SYDNEY. NSW. 2001.	Cook	U/ground
	Curragh Queensland Mining Limited, G.P.O. Box 807, BRISBANE. QLD. 4001.	Curragh	Open-cut
	Gregory Joint Venture, G.P.O. Box 1389, BRISBANE. QLD. 4001.	Gregory	Open-cut
	Oaky Creek Coal Pty. Ltd., G.P.O. Box 856, BRISBANE. QLD. 4001.	Oaky Creek	Open-cut
	Thiess Bros. Pty. Limited, G.P.O. Box 18, BRISBANE. QLD. 4001.	South Blackwater No. 1 South Blackwater Yarrabee	U/ground Open-cut Open-cut
MACKAY	Central Queensland Coal Associates, G.P.O. Box 1389, BRISBANE. QLD. 4001.	Harrow Creek Goonyella Norwich Park Peak Downs Saraji	U/ground Open-cut Open-cut Open-cut Open-cut
	Newlands Coal Pty. Ltd., G.P.O. Box 1042, BRISBANE. QLD. 4001.	Newlands	Open-cut
	Thiess Dampier Mitsui Coal Pty. Ltd., G.P.O. Box 2206, BRISBANE. QLD. 4001.	Riverside	Open-cut

OPERATING COAL MINES (Continued)

JUNE 30, 1985

DISTRICT	COMPANY	MINES	OPERATION
BLAIR ATHOL	Blair Athol Coal Project, G.P.O. Box 391, BRISBANE. QLD. 4001.	Blair Athol	Open-cut
BOWEN	Collinsville Coal Company Pty. Ltd., G.P.O. Box 1433, BRISBANE. QLD. 4001.	Bowen No. 2 Bowen No. 3 Bowen Central No. 3 Garrick West & Scott Denison Bocum	U/ground U/ground Open-cut Open-cut U/ground

Coal Face – Blair Athol.

COAL PRODUCTION

Tonnes—Year Ended June 30, 1985

ALL DISTRICTS

	RAW	DISCARD	NET SALEABLE
UNDERGROUND MINES	5 268 696	1 536 447	3 732 249
OPEN-CUT MINES	63 944 750	13 388 737	50 556 013
	69 213 446	14 925 184	54 288 262

NET PRODUCTION

District	Underground Mines	Open-Cut Mines	Total
West Moreton	1 399 707	1 590 605	2 990 312
Darling Downs	3 104	..	3 104
Maryborough	11 767	..	11 767
Nanango	..	1 153 474	1 153 474
Kianga-Moura	461 213	1 558 166	2 019 379
Callide	..	3 001 642	3 001 642
Blackwater	1 208 574	16 832 648	18 041 222
Blair Athol	..	3 667 935	3 667 935
Mackay	176 652	21 384 332	21 560 984
Bowen	471 232	1 367 211	1 838 443
	3 732 249	50 556 013	54 288 262

DISTRICT NET PRODUCTION 1983-84 and 1984-85—TONNES

District	1983-84	1984-85	1985 Increase + or Decrease –	%
West Moreton	2 936 671	2 990 312	+ 53 641	+ 1.83
Darling Downs	9 833	3 104	– 6 729	–
Maryborough	17 013	11 767	– 5 246	– 30.84
Nanango	602 980	1 153 474	+ 550 494	+ 91.30
Kianga-Moura	2 251 206	2 019 379	– 231 827	– 10.30
Callide	3 736 661	3 001 642	– 735 019	– 19.67
Blackwater	15 398 887	18 041 222	+ 2 642 335	+ 17.16
Blair Athol	934 174	3 667 935	+ 2 733 761	+292.64
Mackay	16 956 945	21 560 984	+ 4 604 039	+ 27.15
Bowen	1 191 721	1 838 443	+ 646 722	+ 54.27
	44 036 091	54 288 262	+ 10 252 171	+ 23.28

PRODUCTION OF SALEABLE COAL

INCREASE

Saleable coal production during the fiscal year rose to an all time high of 54.29 million tonnes compared with 44.04 million in 1984, an increase 23.28%. Over the last two years the progressive gains were 8.22 million tonnes in 1983-84 and 10.25 million tonnes in 1984-85.

Mines which were established in the period 1983 to 1984 have contributed towards this growth of production. The other factor was increased overall efficiency within the industry. This is highlighted by the larger output per employee per year from 4 552 tonnes to 5 224 tonnes, and the corresponding output per manshift figure for the State from 18.25 to 21.43

VALUE

The mine site value of coal produced within the State is estimated at $A2 195 million.

STATISTICAL INFORMATION

Statistical information and data for the year covers 52 weeks or 238 working days. The 1985 statistical year commenced on July 1, 1984 and closed on June 29, 1985.

EMPLOYMENT

Employment in underground mines in 1985 increased by 30 to 2 012. The number of persons employed in open-cut operations throughout the State rose by 689 or 8.96%. Total employment in the industry grew from 9 674 in 1984 to 10 393 in 1985, an overall gain of 7.43%.

The increased overall industry productivity reflected in the record production without a corresponding percentage rise in employee numbers.

MANSHIFTS LOST THROUGH INDUSTRIAL PROBLEMS

Shifts lost due to industrial disputes rose appreciably from 51 153 shifts in 1983-84, or 1.97% of manshifts possible to 128 210 manshifts or 4.56%. However, the E.T.U. dispute, not directly related to the industry that occurred in the early part of 1985, caused the loss of 70 291 manshifts or 2.5%. The number of manshifts lost due to industry orientated problems accounted for 57 919 manshifts or 2.06% of manshifts possible. This figure does not take into account the bonus negotiations between Utah/BHP and its employees. The ensuing dispute acccounted for a loss of 20 706 manshifts.

The bonus negotiations take place every two years, and generally result in some lost time before agreement covering the following two years is reached.

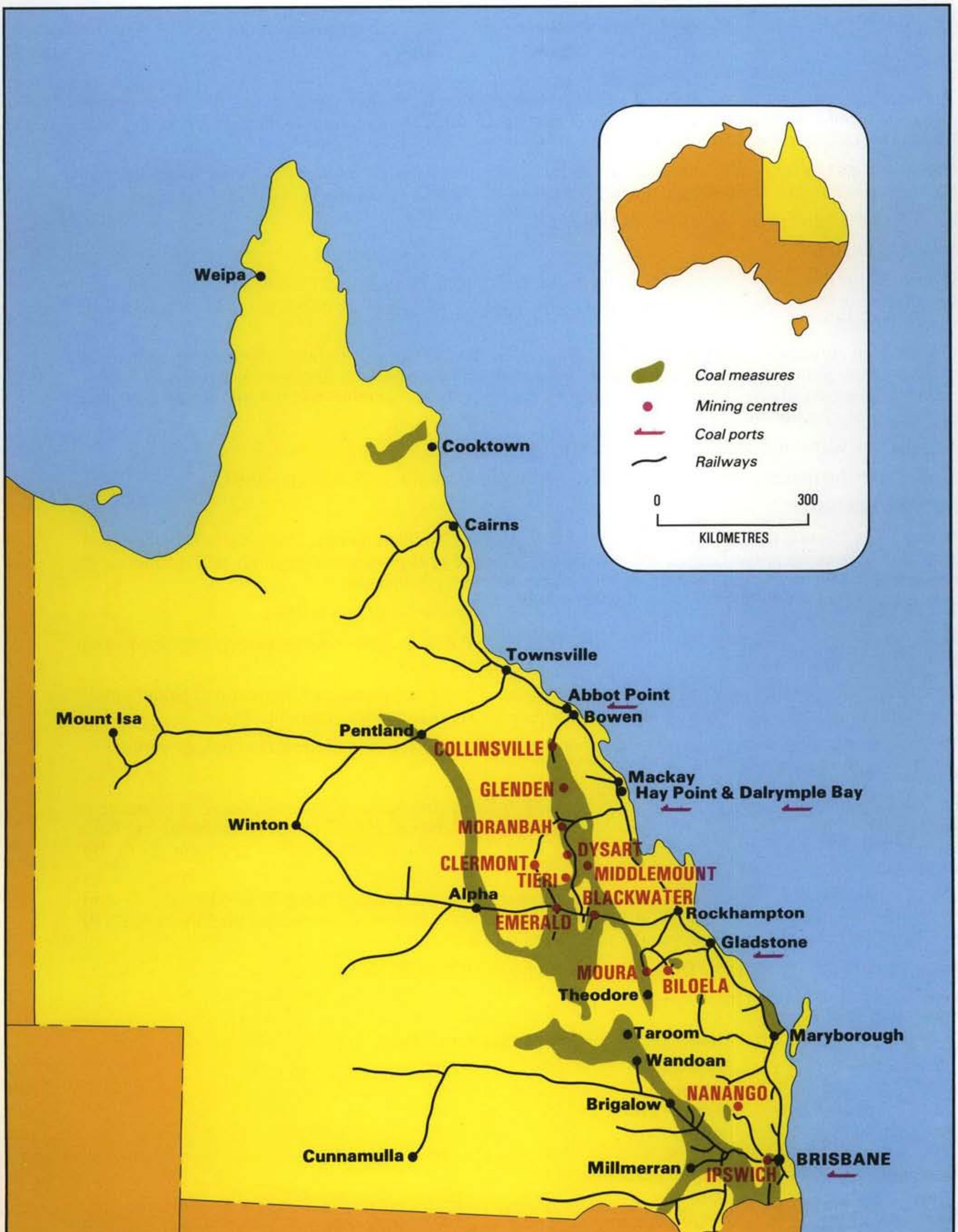
WEST MORETON DISTRICT

Saleable coal production from the West Moreton District increased slightly during 1985 from 2.94 to 2.99 million tonnes. The rise occurred despite the closure of the Southern Cross mines, a reduction in orders for the power stations serviced, and that requirements of some other consumers were curtailed slightly. However, by expansion of open-cut production these losses were compensated by increased exports which grew from 0.80 to 1.38 million tonnes in 1985. It is anticipated that export trade from West Moreton will continue to increase.

Employment numbers in West Moreton fell by only 4 to 1 065, even though the Southern Cross mines closed. While employment in underground mines fell from 887 to 831 comparing June 30 numbers for 1984-1985, increased activity by open-cut mines resulted in employment at these mines rising from 182 to 234. The total workforce engaged in the District industry therefore remained static.
The increase in the overseas market has played a considerable part in the rearrangement of employment in the District. The nature of these new markets has required greater emphasis on open-cut mining for the District to be price competitive.

Industrial disputes in the underground mines accounted for a loss of 8 944 shifts or 3.69% and 1 573 or 2.64% in the open-cuts. This is well below the total State loss due to industrial disputes and reflects a more co-operative attitude between management and labour in this District.

QUEENSLAND



Coal measures
Mining centres
Coal ports
Railways
0
300
KILOMETRES
Weipa
Cooktown
Cairns
Townsville
Abbot Point
Bowen
Mount Isa
Pentland
COLLINSVILLE
GLENDEN
Mackay
Hay Point & Dalrymple Bay
Winton
MORANBAH
DYSART
CLERMONT
TIERI
MIDDLEMOUNT
Alpha
BLACKWATER
EMERALD
Rockhampton
Gladstone
MOURA
BILOELA
Theodore
Taroom
Maryborough
Wandoan
NANANGO
Brigalow
Cunnamulla
Millmerran
IPSWICH
BRISBANE

PRODUCTION OF SALEABLE COAL (Continued)

NANANGO DISTRICT

The Meandu mine at Tarong showed increased production from 0.6 million tonnes to 1.15 million in 1985. This will continue in parallel with the growth of the Tarong Power Station which is the sole market for coal from Meandu.

Manshifts lost in total accounted for a loss of 1 135 manshifts or 3.90%. This is much lower than most open-cut mines in Queensland which returned 9.28% of lost manshifts.

As at June 30, 135 people were in employment.

MOURA DISTRICT

Production in the Moura District declined from 2.25 million tonnes to 2.02 million. Output from the open-cuts fell by 0.3 million tonnes while underground production increased from 0.39 million to 0.46 million tonnes.

Contributing towards lower production from the Moura group during 1985 were extensive maintenance programmes on equipment and, prior to this, major equipment breakdowns which reduced stripping capabilities. These problems have now been rectified and the mines are currently producing at a higher rate.

Employment within the group was virtually static at 873.

Export from the mines totalled 1.74 million tonnes compared with 2.23 million in 1984.

CALLIDE DISTRICT

Output from the two Callide mines fell from 3.74 million to 3 million tonnes. This was occasioned by a slackening in demand for coal to the Queensland Electricity Commission together with a decline in requirements by the Queensland Cement and Lime Works at Gladstone.

The number of employees fell slightly to a total of 389 from a peak of 393 in 1984.

Manshifts lost for all reasons increased from 5.44% to 8.24% in 1985. Industrial disputes accounted for 3.52% of these losses.

Callide coal is sold to Power Stations at Gladstone and Callide, Queensland Cement and Lime clinker works at Gladstone, and sundry small consumers covering meatworks, hospitals, etc.

The District has an estimated production potential of 4.5 million tonnes of saleable coal per year.

BLACKWATER DISTRICT

Blackwater District has 10 producing mines of which 3 are underground. Saleable coal produced rose appreciably from 15.4 million to 18.04 million tonnes. The Curragh mine established in 1984 contributed 1.24 million to the total increase. Both coking and thermal coal is produced from the mines and most of the coal is marketed overseas.

The overall O.M.S. from the Blackwater underground mines increased from 6.79 in 1984 to 8.23, and the output per man year from 1 567 to 1 897. O.M.S. from the open-cuts increased slightly from 23.10 to 23.82 and the output per man year from 5 745 to 5 818.

Employment in the Blackwater District increased from 3 076 to 3 530.

Exports from the various mines were:–

Mine	Million Tonnes
Blackwater	2.94
Gregory	2.86
German Creek	2.83
Oaky Creek	2.71
Curragh	1.86
South Blackwater	1.72
Cook	0.61
Yarrabee	0.25
	15.78

PRODUCTION OF SALEABLE COAL (Continued)

Thermal coal accounted for 1.91 million tonnes of the exports and coking coal 13.87 million tonnes. The principal market for Blackwater coal was Japan. In 1984 - 85 exports of thermal product from both Curragh and Oaky Creek commenced. It is anticipated that this market will continue to expand at an appreciable rate.

BLAIR ATHOL DISTRICT

Completion of project development at Blair Athol enabled production of 3.67 million tonnes for the year compared to 0.93 million tonnes in 1984. The company exported 3.44 million tonnes of thermal coal mainly to Japanese buyers with other shipments to Europe, Asia and South America.

Employment rose from 175 to 257, a growth of 46.86%. However, productivity at the Blair Athol mine increased at a much higher rate with the overall O.M.S. rising from 26.29 to 67.79 tonnes, and the output per man year from 5 338 to 14 272 tonnes.

Manshifts lost for all reasons were consistent with those lost throughout the State. Industrial disputes accounted for the loss of 4.44% of manshifts possible. In common with other mines a number of the shifts lost were related to an ex industry dispute.

With the growth of the export market in the thermal area, it is considered the Blair Athol company will continue to gain overseas markets and increase export trade.

MACKAY DISTRICT

There are seven mines in the Mackay District, one underground and the balance open-cut operations. Coal sales from this area are primarily related to the export trade. Production benefited from overseas trade and rose from 16.96 million to 21.56 million tonnes in 1985.

Expansion of the Newlands and Riverside mines during 1985 contributed a considerable tonnage to the Mackay District total. Newlands production rose from 0.52 million to 3.75 million tonnes, and Riverside from 2.02 to 3.05 million.

Riverside produces thermal coal for the export market. To date other Mackay District mines have produced export quality coking coal only. However, the upsurge in demand for thermal coal on the international market will encourage the companies to enter the market through an ability to produce this coal as a second product.

Employment in this District grew from 3 272 to 3 460, an increase of 188 or 5.75%. Productivity in the underground mines fell from 2 976 tonnes per man year to 2 677 and the O.M.S. overall from 12.44 to 11.39. The open-cut mines increased from 5 288 tonnes per man year to 6 301 and the overall O.M.S. from 21.15 to 25.72. However, in 1984 the Newlands and Riverside mines were still developing production capacity.

The Mackay mines were affected by the ex industry dispute in February, 1985, and by a strike over the production bonus issue which started on February 6, 1985 and was not finally resolved until March. The bonus dispute involved only those mines owned by Utah/BHP.

The majority of exports from Mackay were sent to Japan; however, diversification of markets has occurred and a number of new countries including Sweden, Austria, Switzerland and the Peoples Republic of China received coal from this District.

Exports from the Mackay District mines are listed below:–

Mine	Million Tonnes
Saraji	4.48
Goonyella	4.08
Peak Downs	3.97
Newlands	3.58
Riverside	3.13
Norwich Park	2.97
Harrow Creek	0.18
	22.39

PRODUCTION OF SALEABLE COAL (Continued)

BOWEN DISTRICT

The Bowen District comprises two open-cut mines and three underground. Combined production was 1.84 million tonnes compared with 1.19 million in 1984. The additional output went to servicing an export contract of coking coal to Japan.

Total exports from the Bowen District to Japan in the fiscal year were 0.78 million tonnes compared with 0.07 million in 1984.

Although production increased appreciably, employment declined from 690 to 671. Productivity, as a result of an upsurge in output and lower employment, increased in the underground mines from 1 738 tonnes per man year to 1 939 with the overall O.M.S. growing from 6.91 to 8.10 tonnes. In the open-cut operations the output per man year rose from 1 721 tonnes to 3 194 and the overall O.M.S. from 7.42 to 13.36.

The Bowen mines supply coal to Queensland Electricity Commission, Mount Isa Mines, Bowen Coke Works, Queensland Nickel, meatworks, cement works and other sundry consumers. The metal processing and cement industries used a larger quantity of coal.

Blasting Norwich Park

PRODUCTION OF SALEABLE COAL (Continued)

PRODUCTION TREND

The Board is of the opinion that the strong growth of the industry underlying this report will continue. In the short term a nett saleable production of between 59 and 62 million tonnes in calendar year 1985 is indicated from advance advice in sales expectations which approach the estimated total available capacity.

Existing mines have the potential to provide additional tonnage to bring the annual total to approximately 83.5 million tonnes. However, to achieve this, some extra equipment and upgrading of washery facilities would be necessary, together with increase in mine workforce. Under present conditions such an expansion should be attainable with a 12 months lead time. The extent to which this will be utilised depends on market demands for the various grades of coal produced by the mines included in the assessment. In addition developed planning of several new major projects capable of producing substantial tonnages of both thermal and coking coal have been finalised. Such projects could be brought on stream with a lead time of about three years to meet an upsurge in demand.

Estimated production of metallurgical and thermal coal by operating mines is shown in the table below:–

ESTIMATED PRODUCTION CAPACITY (Million Tonnes)

	Metallurgical		Thermal		
	Export	Domestic	Export	Domestic	Total
Underground	1.8	–	0.5	1.3	3.6
Open-Cut	48.6	–	16.2	15.1	79.9
	50.4	–	16.7	16.4	83.5

OUTPUT PER MANSHIFT AND MANSHIFTS WORKED AND LOST

State figures for the financial years 1983-84 and 1984-85 are as follows:–

OUTPUT PER MANSHIFT

	1983-1984 Tonnes	1984-1985 Tonnes
Underground		
Coal Face	24.45	25.18
Overall	7.05	7.59
Open-cut		
Overall	21.27	24.76
STATE		
Overall	18.25	21.43

MANSHIFTS WORKED AND LOST

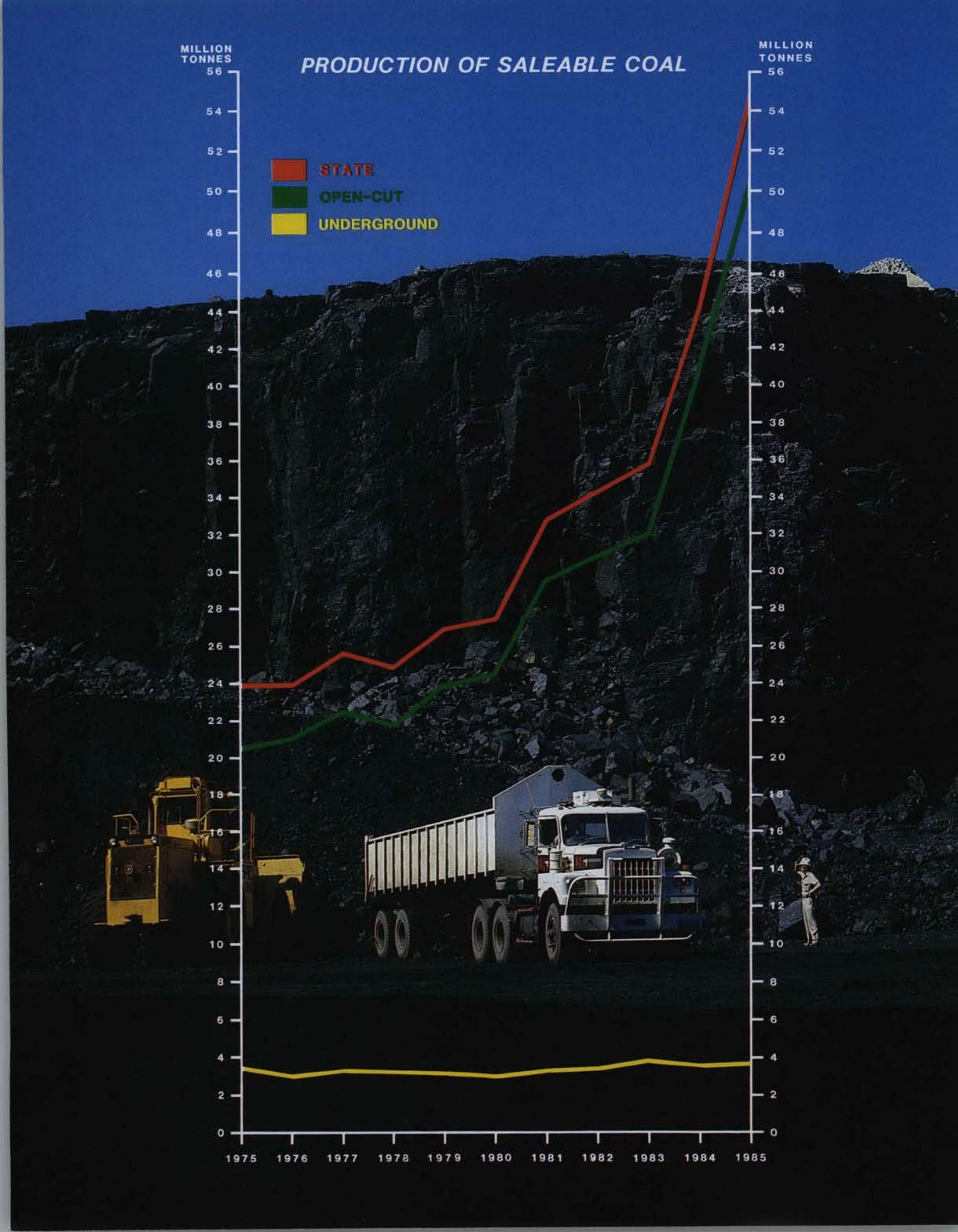
	1983-1984	1984-1985
Manshifts Possible	2 593 687	2 809 876
Number Worked	2 413 495	2 533 403
Number Lost	180 192	276 473
— Disputes	51 153	128 210
— Sickness	65 785	76 242
— Compensation	26 040	31 590
— Absenteeism	37 061	39 863
— Other	153	568

RAW COAL PRODUCED AND DISCARD

Year Ended June 30, 1985—Tonnes

DISTRICT AND MINE	RAW	DISCARD	SALEABLE	% DISCARD
WEST MORETON				
UNDERGROUND				
Box Flat No. 8	142 577	39 882	102 695	27.97
Box Flat No. 9	259 330	72 557	186 773	27.98
New Hope	707 247	344 878	362 369	48.76
Oakleigh	210 872	94 892	115 980	45.00
Rhondda No. 1	83 071	41 887	41 184	50.42
Rhondda No. 5	199 277	73 404	125 873	36.84
M.W. Haenke No. 1	242 037	119 632	122 405	49.43
M.W. Haenke No. 2	288 835	145 607	143 228	50.41
Southern Cross No. 12	2 534	1 013	1 521	39.98
Southern Cross No. 15	58 964	30 467	28 497	51.67
Westfalen No. 3	260 056	90 874	169 182	34.94
OPEN-CUT				
Amberley	978 817	453 651	525 166	46.35
Box Flat	239 961	100 844	139 117	42.03
New Hope	346 302	199 738	146 564	57.68
New Whitwood	1 150 160	653 224	496 936	56.79
Oakleigh	106 833	35 044	71 789	32.80
Rhondda	26 202	12 396	13 806	47.31
Southern Cross No. 3	117 264	57 821	59 443	49.31
Wattle Glen	274 287	136 503	137 784	49.77
DARLING DOWNS				
UNDERGROUND				
Acland No. 3	3 403	299	3 104	8.79
MARYBOROUGH				
UNDERGROUND				
Burgowan No. 12	13 412	1 645	11 767	12.27
NANANGO				
OPEN-CUT				
Meandu	1 153 474	—	1 153 474	—
KIANGA-MOURA				
Underground				
Moura No. 2	420 683	110 971	309 712	26.38
Moura No. 4	219 238	67 737	151 501	30.90
OPEN-CUT				
Moura	2 120 404	562 238	1 558 166	26.52
CALLIDE				
OPEN-CUT				
Boundary Hill	1 342 344	657	1 341 687	0.05
Callide	1 659 955	—	1 659 955	—

DISTRICT AND MINE	RAW	DISCARD	SALEABLE	% DISCARD
BLACKWATER				
UNDERGROUND				
Cook	756 109	87 267	668 842	11.54
German Creek Central	225 471	61 909	163 562	27.46
South Blackwater No. 1	463 357	87 187	376 170	18.82
OPEN-CUT				
Blackwater	4 360 873	569 016	3 791 857	13.05
Curragh	3 405 797	—	3 405 797	—
German Creek	3 466 502	864 863	2 601 639	24.95
Gregory	3 457 007	562 910	2 894 097	16.28
Oaky Creek	3 237 757	702 854	2 534 903	21.71
South Blackwater	1 580 979	207 997	1 372 982	13.16
Yarrabee	231 373	—	231 373	—
BLAIR ATHOL				
OPEN-CUT				
Blair Athol	3 667 935	—	3 667 935	—
MACKAY				
UNDERGROUND				
Harrow Creek	240 991	64 339	176 652	26.70
OPEN-CUT				
Goonyella	4 688 765	945 025	3 743 740	20.16
Newlands	4 615 317	869 636	3 745 681	18.84
Norwich Park	3 424 564	704 361	2 720 203	20.57
Peak Downs	5 980 022	1 993 058	3 986 964	33.33
Riverside	5 032 454	1 978 601	3 053 853	39.32
Saraji	5 383 272	1 249 381	4 133 891	23.21
BOWEN				
UNDERGROUND				
B.O.C.U.M.	2 648	—	2 648	—
Collinsville	468 584	—	468 584	—
OPEN-CUT				
Bowen Central No. 3	532 519	55 480	477 039	10.42
Garrick West S/D	1 363 611	473 439	890 172	34.72
TOTAL — UNDERGROUND	**5 268 696**	**1 536 447**	**3 732 249**	**29.16**
OPEN-CUT	**63 944 750**	**13 388 737**	**50 556 013**	**20.94**
STATE	**69 213 446**	**14 925 184**	**54 288 262**	**21.56**


PRODUCTION OF SALEABLE COAL
MILLION TONNES
STATE
OPEN-CUT
UNDERGROUND
56
54
52
50
48
46
44
42
40
38
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985

CAPITAL EXPENDITURE BY SOME COMPANIES

Year Ended June 30, 1985

COMPANY	MINES Including Plant, Equipment & Development $	POWER & WATER $	ROAD, RAIL AND PORT FACILITIES $	TOWNS $	OTHER CAPITAL EXPENDITURE $
Central Queensland Coal Associates	10 443 000	—	620 000	590 000	13 000
Thiess Dampier Mitsui Coal Pty. Ltd.					
— Moura	14 069 000	857 000	97 000	354 000	—
— Riverside	8 537 000	—	56 330 000	1 307 000	—
Thiess Bros. Pty. Limited	5 608 000	—	—	96 000	—
— Callide Joint Venture	2 958 000	—	—	—	—
Capricorn Coal Management Pty. Ltd.	180 376 000	24 398 000	95 320 000	52 821 000	2 084 000
Oaky Creek Coal Pty. Ltd.	10 392 000	256 000	10 219 000	6 291 000	3 638 000
Curragh Queensland Mining Limited	37 983 000	205 000	1 695 000	3 680 000	602 000
Tarong Coal	17 102 000	—	—	—	—
Blair Athol Coal Project	5 852 000	—	15 177 000	1 229 000	214 000
Collinsville Coal Company Pty. Ltd.	8 438 000	588 000	47 000	206 000	—
Newlands Coal Pty. Ltd.	9 854 000	—	28 797 000	—	2 431 000
Gregory Joint Venture	3 430 000	—	—	97 000	—
Coal Resources of Queensland Pty. Ltd.	1 818 000	—	—	152 000	32 000

German Creek

COAL CONSUMPTION

Tonnes—Year Ended June 30, 1985

STATE TOTAL 10 446 899

CONSUMER INDUSTRIES	Brisbane Metropolitan	Southern Queensland	Central Queensland	North Queensland
Electricity	197 539	2 547 190	4 788 712	706 546
Metal Processing	..	..	1 126 628	312 133
Building Materials	119 217	12 188	123 156	59 816
Food Processing	59 353	31 312	8 014	3 175
Paper and Board Mills	..	80 188	..	..
Coke Works	..	..	..	62 433
Ships' Bunkers	..	..	158 496	..
Miscellaneous	32 708	9 743	6 327	2 025
	408 817	2 680 621	6 211 333	1 146 128

COAL CONSUMPTION 1983-84 AND 1984-85 — TONNES

CONSUMER INDUSTRIES	1983-84	1984-85	1985 Increase + or Decrease –	%
Electricity	7 635 636	8 239 987	+ 604 351	+ 7.91
Metal Processing	1 436 994	1 438 761	+ 1 767	+ 0.12
Building Materials	273 744	314 377	+ 40 633	+14.84
Food Processing	107 362	101 854	– 5 508	– 5.13
Paper and Board Mills	80 998	80 188	– 810	– 1.00
Coke Works	66 742	62 433	– 4 309	– 6.46
Ships' Bunkers	183 827	158 496	– 25 331	–13.78
Miscellaneous	45 515	50 803	+ 5 288	+11.62
	9 830 818	10 446 899	+ 616 081	+ 6.27

COAL CONSUMPTION

Usage of Coal in Queensland slowed down when compared with 1984 and showed an increase of only 0.62 million tonnes or 6.27%, whereas in 1984 consumption increasd by 1.21 million or 14.1%.

Electricity generation contributed to most of the rise in consumption which accounted for 0.60 million tonnes or 7.91%. Actual electricity generation increased in 1985 to 17 860 GWh compared with 16 503 GWh in 1984, an increase of 8.22%. It is estimated that 215 GWh were lost due to an electricity industry strike that occurred in February. At the Tarong Power Station electricity generation increased which occasioned quite a considerable rise in coal burned.

Metal processing usage of coal rose slightly during the year which is a reflection of the problems involved in world metal markets at this point of time.

In the area of coal for ships' bunkers, one of the vessels on the Weipa to Gladstone run is now under contract to carry coal overseas. This has effected the reduced consumption figure for this activity.

The following table shows the burn by the State's Power Stations during 1984 and 1985 fiscal years:–

	1984 Tonnes	1985 Tonnes
Brisbane	327 008	197 539
Swanbank	1 513 814	1 445 145
Tarong	294 634	1 102 045
Gladstone	4 314 350	4 223 977
Caldlide	508 219	564 735
Mica Creek	323 029	325 909
Collinsville	354 582	380 637
	7 635 636	8 239 987

FUTURE POWER STATIONS

Construction of three new power stations continued during 1984-1985. The second of four 350 MW units at Tarong Power Station went into commercial service in May 1985. The third is due to go into service in February 1986 and the fourth in November 1986 by which time the station will burn up to 4.8 million tonnes of coal a year, supplied from the adjacent Meandu mine.

Callide B Power Station is also on schedule to begin commercial operation in March 1988 drawing coal from South Callide mine 1.7 km away.

Stanwell Power Station, 24 km west of Rockhampton, has maintained its flexible construction programme, allowing for first generation as soon as the early 1990s. Coal will be railed to that station from the Curragh mine.

Following extensive investigations, a further four coastal sites are being acquired on which sea water-cooled power stations will be developed over the next 40 or so years. These sites are Abbot Point (near Bowen), Dudgeon Point (near Mackay), Broadmount (near Rockhampton) and Raglan (between Rockhampton and Gladstone). Coal will be supplied from mines in the central area.

EMPLOYMENT—Queensland Coal Industry

June 30, 1985 **STATE TOTAL 10 393**

	Below Ground		Above Ground		
	Coal Face	Elsewhere	General	Admin. & Clerical	TOTAL
UNDERGROUND MINES					
DISTRICT:					
West Moreton	332	195	177	127	831
Maryborough	6	2	3	2	13
Kianga-Moura	40	96	64	22	222
Blackwater	201	228	79	129	637
Mackay	18	31	4	13	66
Bowen	39	102	49	53	243
	636	654	376	346	2 012
OPEN-CUT MINES					
DISTRICT:					
West Moreton	..	..	221	13	234
Nanango	..	..	77	58	135
Kianga-Moura	..	..	476	175	651
Callide	..	..	294	95	389
Blackwater	..	..	2 122	771	2 893
Blair Athol	..	..	185	72	257
Mackay	..	..	2 530	864	3 394
Bowen	..	..	320	108	428
			6 225	2 156	8 381

FATAL ACCIDENTS

On June 25, 1985 a shuttle car driver died of asphyxiation after the car was partially buried when a section of a seven metre high rib fell. The accident occurred at Moura No. 4 mine.

The Board extends sympathy to the family of the deceased miner.

During the past five years ended June 30, the number of fatal accidents was as follows:-

1981	1982	1983	1984	1985
2	3	nil	1	1

EMPLOYMENT

During 1985 employment within the industry increased by 719 or 7.4% to a total of 10 393. The largest increase in numbers was in the Blackwater District where mines which were developed in the previous year came closer to achieving designed production potential. The Blackwater District mines now employ 3 530 people, an increase of 454 or 14.76% over the preceding year.

On a percentage basis the Blair Athol mine showed the largest gain in staff from 175 to 257, a rise of 46.86%. This increase is due to the development of the new mine which has specifically been designed for the production of export thermal coal.

With further expansion at Riverside and Newlands, the Mackay District work force rose from 3 272 to 3 460, an increase of 188 or 5.75%.

Staff levels at underground mines showed an overall increase of 30 with additional employees being engaged in the Blackwater and Moura Districts. Manpower declined in West Moreton and Bowen Districts.

Some mines were closed in the West Moreton District and the Acland mine on the Darling Downs ceased to operate due to lack of reserves coupled with insufficient trade. A total of 56 men were retrenched during the year from these mines.

EXPORT COAL PRICES

The following table shows variations in prices for coking coal exports to Japan during the past few years. The list of such movements is not complete.

All prices are expressed in United States of America dollars per tonne F.O.B. (Note: CQCA, Gregory, Collinsville, Oaky Creek and Riverside prices are expressed at a nominal US/AUST exchange rate of $1.10.)

CENTRAL QUEENSLAND COAL ASSOCIATES (CQCA)

Date	Black-water $	Goonyella $	Norwich Park $	Peak Downs $	Saraji $
1.7.82	66.00	59.09	66.48	59.49	58.33
1.7.83	54.00	62.04	69.25	61.72	60.69
1.7.84	51.00	62.75	61.29	62.60	62.29
1.7.85	51.00	61.27	62.56	60.57	60.39

THIESS DAMPIER MITSUI COAL PTY. LTD.

Date	Moura $	River-side $	Date	Moura $	River-side $
1.4.82	66.00	—	1.4.84	51.50	69.47
1.4.83	54.00	—	1.5.85	51.50	70.89

THIESS BROS. PTY. LIMITED

Date	South Black-water $	Date	South Black-water $
1.4.82	66.00	1.4.84	51.50
1.4.83	54.00	1.4.85	51.50

GREGORY JOINT VENTURE

Date	Gregory $	Date	Gregory $
1.4.82	66.46	1.4.84	54.50
1.4.83	71.22	1.4.85	53.85

CAPRICORN COAL MANAGEMENT PTY. LTD.

Date	German Creek $	Date	German Creek $
1.4.82	64.56	1.4.84	70.31
1.4.83	67.92	1.4.85	65.26

M.I.M. HOLDINGS LIMITED

Date	Collins-ville $	Oaky Creek $	Date	Collins-ville $	Oaky Creek $
1.4.82	57.04	64.56	1.4.84	63.06	70.32
1.4.83	60.76	68.24	1.4.85	64.35	71.78

CURRAGH CO-VENTURE

Date	Curragh $	Date	Curragh $
1.4.82	64.56	1.4.85	61.60
1.4.84	60.97		

CURRENT EXPORT CONTRACTS

COMPANY	COUNTRY	TONNES	PERIOD (YEARS)	EXPIRY DATE
Central Queensland Coal Associates	Japan	128 100 000	15	1986-87
	Europe	36 000 000	1 to 10	1986 to 1994
	Other	16 700 000	1 to 15	1978 to 1992
Thiess Dampier Mitsui Coal Pty. Ltd.				
Moura — Coking Coal	Japan	51 000 000	1	1985
— Steaming Coal	Japan	8 625 000	10	1992-95
Riverside — Coking Coal	Japan	47 300 000	14½	1998
Gregory Joint Venture	Japan	25 220 000	13	1995
	Korea	6 500 000	13	1995
	Taiwan	3 250 000	13	1995
German Creek Coal Pty. Ltd.	Japan	15 000 000	10	1992
	Taiwan	3 200 000	10	1992
	Korea	2 000 000	10	1992
	Other	12 500 000	10	1992
Oaky Creek Coal Pty. Ltd.	Japan	1 500 000	3	1986
	Europe	25 500 000	15	1998
Collinsville Coal Company Pty. Ltd. — Coking Coal	Japan	15 000 000	15	1999
Newlands Coal Pty. Ltd. — Steaming Coal	Various	39 750 000	2 to 17	2001
Blair Athol Coal Pty. Ltd.	Japan	72 000 000	16	2000
Curragh Queensland Mining Ltd.	Japan	1 500 000	3	1987
	Other	500 000	1 to 5	—
Aberdare Collieries Pty. Ltd.	Japan	2 500 000	5	1990
	Japan	410 000	2	1987
Coal Resources of Queensland Pty. Ltd.	Korea	500 000	5+	1988+
	Taiwan	110 000	1+	1985
	Other	100 000	1	1985

COAL EXPORTS
Year Ended June 30, 1985

	Tonnes
COKING COAL	34 381 645
THERMAL COAL	11 121 893
TOTAL	45 503 538

Queensland coal exports in the year ended June 30, reached an all time record of 45.5 million tonnes, an increase of 37.46% or 12.4 million tonnes on the preceding year. The rise in 1985 is the largest to occur between one year and the next since exports commenced in 1959.

Shipments to Japan totalled 24.6 million tonnes and represented 54.07% of the total exports from Queensland. In 1984 sales to Japan were 19.87 million or 60% and a comparison of figures indicates the diversification in markets that has occurred in the last 12 months. This is again evidenced by the fact that in 1984 exports were made to 24 countries compared to the record 31 in 1985. The top four importers of Queensland coal were, Japan 24.59 million tonnes, Netherlands 3.13, France 2.64 and Italy 2.31.

Some of the new markets were for enterprises in Sweden, Switzerland, Austria, Philippines and Peoples Republic of China. Hawaii and Denmark have both re-entered the list of overseas countries.

Coking coal exports for the year totalled 34.38 million tonnes, an increase over the preceding year of 4.76 million or 16.07%. Thermal coal sales rose from 3.47 million to 11.12 million tonnes, a gain of 7.65 million or 220.46%.

Thermal coal was exported to 22 countries, ten more than during 1984-85. The largest quantity – 4.93 million tonnes – was consigned to Japan. Last year 2.07 million tonnes were shipped to that country. Some export mines have still to reach designed production capacities and others in the West Moreton district are entering the export trade. It is predicted that thermal coal sales will continue to grow at an appreciable rate over the next few years. Many mines currently producing coking coal will market a second product to be sold as thermal coal. This will substantially increase some companies' potential as exporters.

Shipments through the ports were as follows:

Port	Million Tonnes
Brisbane	1.38
Gladstone	12.82
Hay Point	15.69
Dalrymple Bay	11.25
Abbot Point	4.36
	45.50

These coal ports have the ability to handle the expected increase of coal shipments to overseas countries.

EXPORTS TO OVERSEAS COUNTRIES FROM EACH MINE

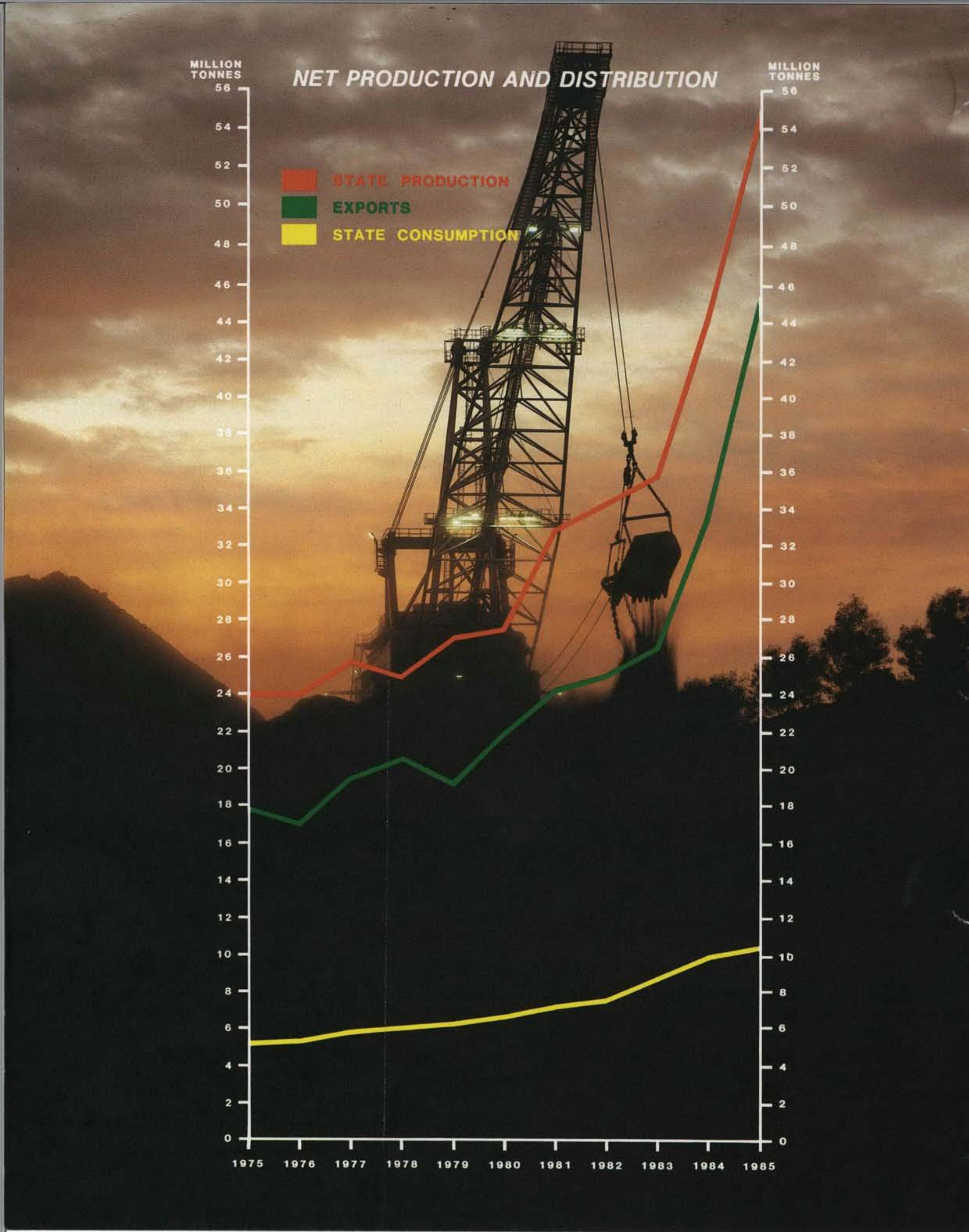
COKING COAL THERMAL COAL TOTAL

Designated port of shipment
(A) Abbot Point
(Br) Brisbane
(D) Dalrymple Bay
(G) Gladstone
(H) Hay Point

	JAPAN	NETHER-LANDS	FRANCE	ITALY	KOREA	TAIWAN	SPAIN	ROMANIA	BRAZIL	DENMARK
SARAJI	1 786 640	542 654	—	1 177 556	—	53 205	191 340	284 912	68 485	—
	—	—	—	—	—	—	—	—	—	—
GOONYELLA	2 485 415	482 349	51 830	—	196 383	265 312	—	—	339 922	—
	—	—	—	—	—	—	—	—	—	—
PEAK DOWNS	1 795 886	—	801 649	—	273 535	—	27 272	609 603	—	—
	—	—	—	—	—	—	—	—	—	—
NEWLANDS	—	—	—	—	—	—	—	—	—	—
	363 279	777 978	376 958	110 195	116 353	594 593	—	—	—	588 126
BLAIR ATHOL	—	—	—	—	—	—	—	—	—	—
	2 547 421	—	66 882	—	—	—	—	—	—	126 810
RIVERSIDE	3 126 066	—	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	—
NORWICH PARK	809 886	189 733	673 552	91 663	184 779	163 399	265 139	119 088	—	
	—	—	28 657	—	—	—	131 074	—	—	65 360
BLACKWATER	1 562 952	—	309 042	—	33 195	144 840	—	—	213 606	—
	236 378	—	—	—	—	—	62 987	—	—	60 661
GREGORY	1 812 735	121 406	208 861	—	297 675	167 497	49 170	—	29 655	—
	—	—	—	—	—	—	—	—	—	—
GERMAN CREEK	1 178 224	301 922	—	—	93 797	195 233	—	—	316 627	—
	—	—	—	—	—	—	—	—	—	—
OAKY CREEK	545 363	657 932	—	808 047	—	—	432 588	—	29 021	—
	—	—	61 362	—	—	—	—	—	—	—
CURRAGH	1 312 995	—	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	—
MOURA	1 218 086	—	—	—	—	—	—	—	—	—
	520 625	—	—	—	—	—	—	—	—	—
SOUTH BLACKWATER	1 084 613	—	—	—	—	—	—	—	—	—
	30 055	57 740	—	121 263	55 000	103 363	—	—	—	—
COLLINSVILLE	784 386	—	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	—
COOK	—	—	—	—	284 237	—	—	—	—	—
	27 939	—	—	—	296 891	—	—	—	—	—
NEW WHITWOOD	—	—	—	—	—	—	—	—	—	—
	509 952	—	—	—	—	84 962	—	—	—	—
AMBERLEY	—	—	—	—	—	—	—	—	—	—
	286 826	—	—	—	—	—	—	—	—	—
YARRABEE	—	—	—	—	—	—	—	—	—	—
	152 780	—	25 680	—	73 536	—	—	—	—	—
HARROW CREEK	86 758	—	31 228	—	—	—	—	26 000	—	—
	—	—	—	—	—	—	—	—	—	—
NEW HOPE GROUP	—	—	—	—	—	—	—	—	—	—
	92 675	—	—	—	—	—	—	—	—	—
RHONDDA	71 209	—	—	—	—	—	—	—	—	—
	53 668	—	—	—	—	222	—	—	—	—
WESTFALEN GROUP	—	—	—	—	—	—	—	—	—	—
	102 732	—	—	—	—	—	—	—	—	—
OAKLEIGH	—	—	—	—	—	—	—	—	—	—
	9 431	—	—	—	—	—	—	—	—	—
MET. COAL	19 661 214	2 295 996	2 076 162	2 077 266	1 363 601	989 486	965 509	1 039 603	997 316	—
NON-MET. COAL	4 933 761	835 718	559 539	231 458	541 780	783 140	194 061	—	—	840 957
TOTAL	24 594 975	3 131 714	2 635 701	2 308 724	1 905 381	1 772 626	1 159 570	1 039 603	997 316	840 957

	U.K.	HONG KONG	INDIA	TURKEY	PHIL-IPPINES	ALGERIA	IRAN	GREECE	INDON-ESIA	A.R. EGYPT	P.R. CHINA	BELGIUM
SARAJI	294 702	—	—	—	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	—	—	—
GOONYELLA	55 846	—	72 280	104 868	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	—	—	—
PEAK DOWNS	—	—	134 240	249 536	—	77 141	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	—	—	—
NEWLANDS	—	—	—	—	—	—	—	—	—	—	—	—
	—	321 621	32 794	—	—	—	—	183 064	—	—	47 528	—
BLAIR ATHOL	—	—	—	—	—	—	—	—	—	—	—	—
	—	71 020	—	—	271 832	—	—	—	264 258	—	23 482	—
RIVERSIDE	—	—	—	—	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	—	—	—
NORWICH PARK	100 393	—	—	—	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	116 120	—	—	—	—
BLACKWATER	—	—	—	—	—	—	—	—	—	263 844	—	—
	—	—	—	—	—	—	—	—	—	—	—	—
GREGORY	—	—	—	—	—	148 320	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	—	—	—
GERMAN CREEK	282 500	—	—	—	—	—	336 101	—	—	—	—	127 716
	—	—	—	—	—	—	—	—	—	—	—	—
OAKY CREEK	—	—	—	—	—	114 774	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	—	—	62 733
CURRAGH	—	—	286 575	61 947	—	—	—	—	—	—	—	—
	—	—	—	—	135 138	—	—	—	—	—	—	—
MOURA	—	—	—	—	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	—	—	—
SOUTH BLACKWATER	—	—	—	—	—	—	—	—	—	—	—	—
	—	248 005	—	—	—	—	—	—	—	—	—	—
COLLINSVILLE	—	—	—	—	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	—	—	—
COOK	—	—	—	—	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	—	—	—
NEW WHITWOOD	—	—	—	—	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	—	—	—
AMBERLEY	—	—	—	—	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	5 224	—	41 472	—
YARRABEE	—	—	—	—	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	—	—	—
HARROW CREEK	—	—	24 755	14 000	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	—	—	—
NEW HOPE GROUP	—	—	—	—	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	10 447	—	74 956	—
RHONDDA	—	—	—	—	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	—	6 084	—
WESTFALEN GROUP	—	—	—	—	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	—	—	—
OAKLEIGH	—	—	—	—	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	—	—	—
MET. COAL	733 441	—	517 850	430 351	—	340 235	336 101	—	—	263 844	—	127 716
NON-MET. COAL	—	640 646	32 794	—	406 970	—	—	299 184	279 929	—	193 522	62 733
TOTAL	733 441	640 646	550 644	430 351	406 970	340 235	336 101	299 184	279 929	263 844	193 522	190 449

	CHILE	F.R. GERMANY	SWEDEN	AUSTRIA	MALAYSIA	SWIT-ZERLAND	USA (HAWAII)	FIJI	BURMA	SUB-TOTAL MET & NON-MET	TOTAL	PORT
SARAJI	—	—	42 389	43 168	—	—	—	—	—	4 485 051	4 485 051	(H) SARAJI
	—	—	—	—	—	—	—	—	—	—		
GOONYELLA	—	—	28 244	—	—	—	—	—	—	4 082 449	4 082 449	(H) GOONYELLA
	—	—	—	—	—	—	—	—	—	—		
PEAK DOWNS	—	—	—	—	—	—	—	—	—	3 968 862	3 968 862	(H) PEAK DOWNS
	—	—	—	—	—	—	—	—	—	—		
NEWLANDS	—	—	—	—	—	—	—	—	—	—	3 576 714	(A) NEWLANDS
	—	—	—	—	61 650	—	—	—	—	3 576 714		
BLAIR ATHOL	—	—	—	—	—	—	—	—	—	—	3 437 542	(D) BLAIR ATHOL
	65 837	—	—	—	—	—	—	—	—	3 437 542		
RIVERSIDE	—	—	—	—	—	—	—	—	—	3 126 066	3 126 066	(D) RIVERSIDE
	—	—	—	—	—	—	—	—	—	—		
NORWICH PARK	—	—	—	—	—	—	—	—	—	2 597 632	2 965 773	(H) NORWICH PARK
	—	—	—	—	—	26 930	—	—	—	368 141		
BLACKWATER	31 690	—	—	—	—	—	—	—	—	2 559 169	2 942 212	(G) BLACKWATER
	—	23 017	—	—	—	—	—	—	—	383 043		
GREGORY	—	—	—	20 463	—	—	—	—	—	2 855 782	2 855 782	(G) GREGORY
	—	—	—	—	—	—	—	—	—	—		
GERMAN CREEK	—	—	—	—	—	—	—	—	—	2 832 120	2 832 120	(D) GERMAN CREEK
	—	—	—	—	—	—	—	—	—	—		
OAKY CREEK	—	—	—	—	—	—	—	—	—	2 587 725	2 711 820	(D) OAKY CREEK
	—	—	—	—	—	—	—	—	—	124 095		
CURRAGH	—	—	—	—	—	—	—	—	—	1 661 517	1 859 458	(G) CURRAGH
	—	62 803	—	—	—	—	—	—	—	197 941		
MOURA	—	—	—	—	—	—	—	—	—	1 218 086	1 738 711	(G) MOURA
	—	—	—	—	—	—	—	—	—	520 625		
SOUTH BLACKWATER	—	—	—	—	—	—	—	—	—	1 084 613	1 716 708	(G) SOUTH BLACKWATER
	—	—	—	—	—	—	—	16 669	—	632 095		
COLLINSVILLE	—	—	—	—	—	—	—	—	—	784 386	784 386	(A) COLLINSVILLE
	—	—	—	—	—	—	—	—	—	—		
COOK	—	—	—	—	—	—	—	—	—	284 237	609 067	(G) COOK
	—	—	—	—	—	—	—	—	—	324 830		
NEW WHITWOOD	—	—	—	—	—	—	—	—	—	—	594 914	(Br) NEW WHITWOOD
	—	—	—	—	—	—	—	—	—	594 914		
AMBERLEY	—	—	—	—	—	—	—	—	—	—	359 742	(Br) AMBERLEY
	—	—	—	—	—	—	21 720	—	4 500	359 742		
YARRABEE	—	—	—	—	—	—	—	—	—	—	251 996	(G) YARRABEE
	—	—	—	—	—	—	—	—	—	251 996		
HARROW CREEK	—	—	—	—	—	—	—	—	—	182 741	182 741	(H) HARROW CREEK
	—	—	—	—	—	—	—	—	—	—		
NEW HOPE GROUP	—	—	—	—	—	—	—	—	—	—	178 078	(Br) NEW HOPE GROUP
	—	—	—	—	—	—	—	—	—	178 078		
RHONDDA	—	—	—	—	—	—	—	—	—	71 209	131 183	(Br) RHONDDA
	—	—	—	—	—	—	—	—	—	59 974		
WESTFALEN GROUP	—	—	—	—	—	—	—	—	—	—	102 732	(Br) WESTFALEN GROUP
	—	—	—	—	—	—	—	—	—	102 732		
OAKLEIGH	—	—	—	—	—	—	—	—	—	—	9 431	(Br) OAKLEIGH
	—	—	—	—	—	—	—	—	—	9 431		
MET. COAL	31 690	—	70 633	63 631	—	—	—	—	—	34 381 645		
NON-MET. COAL	65 837	85 820	—	—	61 650	26 930	21 720	16 669	4 500	11 121 893		
TOTAL	97 527	85 820	70 633	63 631	61 650	26 930	21 720	16 669	4 500	45 503 538	45 503 538	TOTAL



NET PRODUCTION AND DISTRIBUTION
MILLION TONNES
STATE PRODUCTION
EXPORTS
STATE CONSUMPTION
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
50
52
54
56
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985

QUEENSLAND COAL PORTS

PORT	ANNUAL LOADING CAPACITY (tonnes)	HOURLY LOADING RATE (tonnes)	VESSEL SIZE (d.w.t.)	LENGTH OF BERTH (metres)	DEPTH AT BERTH BELOW L.W.D. (metres)	DEPTH OF APPROACH BELOW L.W.D. (metres)
BRISBANE						
— FISHERMAN ISLANDS	3 000 000	2 200	80 000	240	13.0	11.6
GLADSTONE						
— AUCKLAND POINT	5 000 000	1 600	60 000	183	11.3	14.7
— BARNEY POINT	8 000 000	2 000	70 000	205	15.0	14.7
— CLINTON	14 500 000	4 000	140 000	290	17.2	15.0
HAY POINT						
— NO. 1 BERTH	11 000 000	4 000	150 000	213	16.8	13.4
— NO. 2 BERTH	14 000 000	6 000	160 000	344	17.1	13.4
DALRYMPLE BAY	15 000 000	6 600	200 000	254	20.0	13.4
ABBOT POINT	6 500 000	4 600	165 000	264	19.3	17.2

COAL EXPORT FACILITIES

ABBOT POINT

The Abbot Point Coal Facility near Bowen is Australia's most northerly coal port. The first stage was developed at a cost of around $180 million to ship coking coal from Collinsville and steaming coal from Newlands. The present Port Facility, which can accommodate vessels from 15 000 to 165 000 d.w.t., has an annual throughput capacity of 6.5 million tonnes.

During the year 4.4 million tonnes of coal were exported and it is anticipated that over 5 million tonnes will be exported from this Terminal during 1985-86. When the existing capacity becomes insufficient for demand, the annual throughput will be increased to 10 million tonnes. This could ultimately rise to 24 million tonnes.

A total of 56 ships visited the harbour during the year with the largest shipment being some 149 595 tonnes on the vessel "Kildare".

The Abbot Point Coal Facility is owned and administered by the Harbours Corporation of Queensland. However, the day to day management, operation and maintenance of the Terminal is undertaken by Abbot Point Bulkcoal Pty. Ltd., a wholly owned subsidiary of M.I.M. Holdings Limited.

DALRYMPLE BAY

Stage 1 of the Dalrymple Bay Coal Terminal, situated in the Port of Hay Point near Mackay, was developed at a cost of $250 million for the export of coal produced by four companies — Capricorn Coal Management Pty. Ltd., Oaky Creek Coal Joint Venture Pty. Ltd., Thiess Dampier Mitsui Coal Pty. Ltd., and Blair Athol Coal Pty. Ltd.

The first stage of the Terminal has an annual throughput capacity of 15 million tonnes. During 1984-85 11.3 million tonnes were exported through this Terminal. Expansion of the Terminal to Stage 2, which will be commenced when export commitments exceed the existing capacity will increase the annual throughput capacity to 30 million tonnes.

A total of 154 ships used the Terminal during the year with the largest single shipment being 162 773 tonnes on the vessel "British Steel".

The Dalrymple Bay Coal Terminal is owned and administered by the Harbours Corporation of Queensland. The Terminal is operated on behalf of the Harbours Corporation by Dalrymple Bay Coal Terminal Pty. Ltd., a company formed for this purpose by the four committed coal exporters.

Stockpile area Dalrymple Bay

Shiploader Abbot Point

COAL EXPORT FACILITIES (Continued)

BRISBANE

The Coal Export Facility at Fisherman Islands, Brisbane known as QBH, (Queensland Bulk Handling Pty. Limited), is a joint venture between Surrey Properties Pty. Ltd. and TNT Bulkships Limited.

In June 1985, QBH commenced receiving coal by barge from coal facilities adjacent to the Bremer River. This mode of transport is expected to grow and augment the already established rail link.

Coal received by rail or barge is transferred to individual stockpiles where bulldozers are used to build stocks of up to 75 000 tonnes capacity. During shiploading operations the same bulldozers are then used to doze coal towards below ground reclaim pits which are designed to feed coal into the outloading system at a maximum rate of 2 500 tonnes per hour.

Plant upgrading during the year has lifted maximum shiploading rates from 1 500 to 2 200 tonnes per hour resulting in a significant reduction in shiploading time.

The facility has been industrially stable over the past 12 month period.

GLADSTONE

During the financial year ended June 30, 1985 the Port of Gladstone handled in excess of 23 million tonnes on 500 vessels. Coal exports from the three facilities totalled 13 million tonnes.

Clinton Facility

Development of the facility is continuing with the construction of Stockpile No. 8, which has two separate storage areas totalling 240 000 tonnes. Completion is expected by late 1985.

Total storage capacity of the facility on completion of Stockpile No. 8 will be over 2.2 million tonnes.

Extension of the rail balloon loop to allow for stockpile extension and electrification of the railway was completed and in use.

Installation of a retractable Pop-Up Tripper to allow the relocation of coal to different stockpiles was completed and is in operation.

HAY POINT

Hay Point, which is situated eleven nautical miles south of Mackay Harbour, is one of the largest coal ports in the world with a design for a throughput exceeding 20 million tonnes per year.

The port has two berths where ships may be loaded simultaneously. The hourly rates of loading are 4 000 tonnes at No. 1 berth and 6 000 tonnes at No. 2 berth.

The port is owned by Central Queensland Coal Associates and is operated by its subsidiary Hay Point Services Pty. Ltd. Coal is railed from the company's mines at Goonyella, Peak Downs, Saraji, Norwich Park and Harrow Creek. Trains may comprise up to 148 wagons, conveying 8 500 tonnes of coal.

Similar to other coal ports, industrial disputation at Hay Point was minimal.

EXTENSION OF FACILITIES

The present annual loading capacity of the 5 coal ports is approximately 76 million tonnes. This capacity is sufficient for existing contractual requirements. Although no extensions to loading facilities are currently being constructed, provision has been made for the following possible extensions. The Brisbane Terminal could be increased for a throughput of 5 million tonnes and Stage (3) of the Clinton Facility at Gladstone provides for an annual throughput of 30 million tonnes. The capacity of Dalrymple Bay could be doubled to 30 million tonnes, while Abbot Point is designed for an additional 11 million tonnes per annum.

Electrification of the central area railway system is presently being constructed. Conversion from diesel haulage to electric has potential to vastly improve conveyance of huge coal tonnages through faster pick-ups, deliveries and turn-arounds. The electric locomotives will have almost double the horsepower of the diesel engines.

Stage (1) of the programme incorporates lines from Gladstone to Rockhampton and west to the Blackwater district mines. This section of the programme is scheduled for operations in early 1987.

ACTIVITIES OF THE BOARD

CONSTITUTION

The Queensland Coal Board is a body corporate constituted under the Coal Industry (Control) Act 1948-1978. The Board is administered through the portfolio of the Minister for Mines and Energy. There were no amendments to the Act during the year.

BOARD APPOINTMENT

While this report was in preparation Mr. Jack T. Woods, was reappointed Chairman to December 10, 1985.

STAFFING

At June 30, 1985, fifteen officers were employed by the Board.

RETRENCHED EMPLOYEES — SEVERANCE PAYMENTS

The Acland mine near Oakey and the Southern Cross mines in the Bundamba area ceased operations during the year. 56 workers of the retrenched personnel were paid an amount of $885,685 from the Severance Pay Fund.

COAL MARKETING

As previously reported the number of industries available for change to coal as a fuel source is comparatively few. The promotion of coal has continued and additional consumers were gained during 1984-85.

A new boiler plant was installed at a large abattoir in the southern area, three lime works were converted to coal as well as a tea processing plant in the north.

Negotiations are continuing with tobacco and meat processing companies for possible change to coal as a fuel.

COAL QUALITY CONTROL

Mines, consumers' premises, and stockpile areas were visited and inspections made to ensure coal quality standards of domestic coal supplies were maintained.

The coal samplers made 476 visits to mines and consumers. A total of 516 samples were prepared for analyses.

COAL MINERS' HEALTH SCHEME

The Health Scheme is functioning satisfactorily and the small problems associated with pre-entry medical examinations have been overcome. A total of 1,003 medical examinations were conducted during 1984-85 for new employees to the coal industry.

Employees who had been advised of an abnormality as a result of the X-ray programme, which was completed last year, have been contacted again. The Queensland Coal Mines Research Safety Committee is to have further discussions with these employees.

PARTICIPATION ON COMMITTEES

The Board continued to be represented on the Australian Coal Consultative Council Advisory Committee, the National Research Group and asssociated Working Parties. Through these activities the A.C.C.C. has contributed to the improved industrial climate in the industry.

The Council has the support of companies, unions, and the Queensland and New South Wales Governments and in general has fostered an improved level of understanding between the parties in the industry.

The Board also represents the State Government on the Queensland Coal Mining Industry Consultative Committee which assists in minimising potential industrial problems in the industry through discussion and co-operation between parties.

Other organisations — particularly involving research — include the Queensland Coal Mines Safety Research Advisory Committeee, the Mining Technology Committee and the Co-ordinating Committee on Outburst Research.

ACTIVITIES OF THE BOARD (Continued)

An educational booklet entitled "Power Points" which promotes safe use of electrical apparatus in mines was funded by the Board. The publication has been well received by the industry.

The Board is also represented on the board of the Australian Coal Industry Research Laboratories Ltd.

PROMOTION OF COAL

PACOAL 85, the first Pacific Coal Conference and Exhibition was held in Brisbane in late April and early May, 1985. The Conference theme was "The Coal Industry Towards 2000".

Papers on Government Views, Coal Marketing, Coal Handling, Mining Operations, etc., were presented. There were also 170 displays of machinery and equipment associated with coal mining. Delegates and visitors exceeded 5,000.

The Board and the Department of Mines mounted a display entitled – 'Salute to Coal'. The display contained many excellent photographs and a continuous video presentation of the Queensland coal industry.

ACTIVITIES OF THE BOARD (Continued)

PRICE OF COAL

The establishment and maintenance of domestic coal prices is an important function of the Board which has a responsibility for all coal sold within the State.

The pithead selling prices of coal supplied to domestic consumers have risen. Increases were granted to recoup the cost of:–

(i) A rise of 4.1% in the National Wage and increases in special rates and allowances applying from April 9, 1984.

(ii) Increases payable by colliery proprietors to the Coal Miners' Pensions Fund and the Queensland Coal Board from July, 1984.

(iii) A National Wage rise of 2.6% applying from April 8, 1985, and

(iv) A special increase to the only mine still operating in the Maryborough district, granted after consultation with the consumers in order to retain a local mine to service coal dependant industries.

Escalation of costs other than wages and wages on costs resulted in price increases being granted during the financial year.

The table below shows the weighted average pithead prices of coal based on sales during June in the years 1983 to 1985:

DISTRICT	WEIGHTED AVERAGE PITHEAD PRICE PER TONNE AT JUNE 30		
	1983	1984	1985
	$	$	$
West Moreton	36.47	39.50	42.82
Maryborough	34.91	36.74	45.72
Callide	17.59	19.09	23.36
Blair Athol	19.50	19.92	20.32
Bowen	35.86	38.51	40.56

COAL DRILLING

Summary of Coal Drilling Operations 1984-85

Five Mines Department rigs were used to drill 116 holes, including seven redrills, and a further two holes were in progress at the end of the year. Total drilling amounted to 18 302.63 m, of which 8 991.80 m were cored, in the following Districts.

North Bowen Basin	2 552.36 m
North Central Bowen Basin	12 492.38 m
South Central Bowen Basin	406.59 m
South West Bowen Basin	2 351.03 m

Exploration was concentrated mainly on the Rangal Coal Measures in areas north-east of Dysart, but also investigated coal measures in the lower part of the Permian sequence in the Reids Dome beds and in a small outlying basin.

COAL DRILLING (Continued)

NORTH BOWEN BASIN

Red Hill

A reconnaissance drilling programme consisting of 12 cored holes was completed in this area in February, 1985. During 1984-85, three holes were drilled, which aggregated 1 063.84 m, of which 692.48 m was cored. A line of holes at 3-4 km intervals now extends over the subcrop of the Rangal Coal Measures along a strike length of 35 km from Lenton Downs in the north to Broadmeadows in the south.

No basalt was penetrated although there are outcrops in the area. Tertiary cover is commonly less than 20 m, and weathering is less than 30 m deep. Regional dip appears to be less than 6°, but is locally steeper.

In the most prospective central part of the area, the Leichhardt seam is between 2.2 and 2.8 m in thickness. It averages 23.1% raw ash and 13.2% ash in floats at RD 1.60 with a yield of 76%. The Vermont seam consists of two piles 1.0 to 1.9 m thick, separated by a tuff bed up to 1.5 m thick. Both seams split and deteriorate to the north.

A Leichhardt lower seam lies 3-7 m below the Leichhardt seam and consists either of a 1 m coal ply or a banded interval with less coaly material.

The Girrah seam is over 50 m in thickness in some holes, and contains thin coal plies with thick carbonaceous mudstone and tuffaceous beds. A Girrah upper seam occurs in all holes and ranges from approximately 1.3 m to 4 m. Neither seam contains potentially economic coal.

There is little potential for open-cut mining owing to the thinness of the seams. Further drilling is not proposed.

Burton Downs

A programme of four fully cored holes (and one partly cored redrill) to test coal seams in the Rangal Coal Measures on Burton Downs and Ellensfield pastoral holdings some 30 km north-east of Goonyella mine was carried out during the year. As a result of the programme, indicated product coal reserves of 9.5% ash as previously calculated by Utah Development Company remain unchanged at 45 million tonnes at less than 60 m depth and 70 million tonnes between 60 m and 300 m depth. Most of the reserves are located in the northern half of the area in the Burton seam, which is 3 m to 11.3 m thick dipping at 20° to 27.5° to the east. Faulting detected by drilling, and minor basalt sills closely associated with the coal seams, could be related to movement along the Burton Range Fault. These features and the steep dip of the coal seams will prevent open-cut extraction of coal.

NORTH CENTRAL BOWEN BASIN

Vermont North

A drilling programme comprising 30 holes (including 16 cored holes, 5 redrills and 9 open holes) totalling 5 672.4 m (3 813 m cored) was completed in February.

These holes were sited to investigate, in two separate parts of the area, the subcrop of the Rangal Coal Measures at shallow depth, and to continue to the base of the Girrah seam in the Fort Cooper Coal Measures. One hole was deepened to the upper beds of the Moranbah Coal Measures.

In the western part of the area to the north of the Lake Vermont deposit, the Leichhardt seam is 1.6 m to 2.4 m thick but deteriorates to carbonaceous mudstone to the south. It averages 2.1 m in thickness, and has an ash content of 12.5% for floats at R.D. 1.60, with 81% yield. The Vermont seam ranges in thickness from 2.6 m to 4.3 m, averaging 3.7 m. It is capable of producing a coking fraction comprising 51% floats at R.D. 1.35 with an ash content of approximately 5.7%, and C.S.N. of 8.

COAL DRILLING (Continued)

The Girrah seam is a banded seam up to 35 m thick and lies some 30 m to 80 m below the Vermont seam.

In the eastern part of the area, to the east of the major faults bounding the Laker Vermont deposit, the Leichhardt seam ranges in thickness from 1.09 m in the south to 4.75 m in the north. The Vermont seam decreases from 4.6 m in the south to 3.10 m in the north. Highly disturbed strata in the eastern block indicate greater structural complexity than in the western block. Consequently the potential for coal resources in the eastern block is low.

Thick Tertiary cover (average 30 m), deep weathering (average 50 m), reduced thickness of seams (no more than 4 m), and likely steeper dips (up to 10°) reduce the coal potential of the area in comparison to the Lake Vermont deposit to the south. However, part of the Rangal Coal Measures extending northwards in the western block from Lake Vermont, may become potentially workable if the latter area is developed.

Lake Vermont

Data from the gravity survey carried out in 1983-84 are being computer-modulled at the University of Queensland.

A programme of 59 non-cored holes totalling 6 408.00 m was conducted on three lines near the centre of the area, to assist in elucidating geological structures. A dipmeter survey of 12 of these holes was carried out under contract, and the data were processed by computer to assist with interpretation. The drilling located several fault lines attributable to low to medium angle thrust faults running sub-parallel to the strike direction.

Another programme of 30 holes comprising some 3 000 m of non-cored drilling is planned, to further investigate the geological structure of the area.

Rugby

Results from the 1984 drilling programme at Rugby, some 30 km to the south-west of Moranbah, were assessed. A coal seam of up to 9 m in thickness had been intersected at depths exceeding 107 m in a formation considered to be equivalent to the Collinsville and Blair Athol Coal Measures. Analytical results indicate that the coal may be classified as medium volatile bituminous, and that it has a high, mostly organic, sulphur content, high energy content, and high ash fusion temperature. A further programme of six cored holes is in progress to determine the coal resources of the area. At the end of the year one hole had been completed and one was in progress. Drilling totalled 486.63 m of which 474.23 m was cored.

Moorlands

The coal resources of the Moorlands Basin, located in the Drummond Range some 13 km west of Blair Athol, were investigated by a drilling programme early in 1985.

Field investigation suggests the axis of the basin trends north-north-east. The central portion of the basin is covered by Tertiary basalt up to 20 m thick. Shallow dipping Permian sediments lie unconformably on deformed and steeply dipping Anakie Metamorphics consisting variously of schists and meta-arenite with numerous quartz veins throughout. Fourteen fully-cored holes (including 2 redrills) were completed in the area. Drilling totalled 2 020.27 m, of which 1 750.03 m was cored. Two coal intervals of 4.28 m and 1.20 m thickness respectively, separated by approximately 120 m of mainly fine sandstones, were intersected at depths from 40 m to 240 m. Palynological determinations suggest the sediments may be equivalent in age to the upper Cattle Creek Formation or the Aldebaran Sandstone. Analysis of this low rank coal is not yet complete and no estimates of reserves are available.

COAL DRILLING (Continued)

SOUTH CENTRAL BOWEN BASIN

Mount Stuart — Girrah

A six-hole drilling programme to provide stratigraphic information and to evaluate the coal-bearing German Creek Formation and the Rangal Coal Measures in this area was brought to completion with the drilling of the last two holes. Drilling during the period totalled 783.05 m, of which 780.05 m was cored.

A seventh hole, designated GSQ Duaringa 6, was completed at 904 m as a deep stratigraphic test on the site of AFO 1 (Cooroorah) petroleum exploration well, and provided additional useful information.

The drilling programme assisted in interpretation of the stratigraphy, structure and geological distribution of coal seams in the Mount Stuart — Girrah area, and also provided additional data on the thickness and quality of seams in the German Creek Formation, downdip from the Oaky Creek mine.

SOUTH-WEST BOWEN BASIN

Arcturus

The remaining four sites of the seven-hole programme previously commenced in this area, north of Rolleston and west of the Comet River, were drilled. Drilling totalled 732.42 m, of which 701.22 m was cored. Thin unweathered seams in the Bandanna Formation were intersected at depths less than 20 m. Further drilling is warranted.

Cullin-la-ringo

This area lies on the south side of the Fairbairn Reservoir some 28 km south-west of Emerald. A drilling programme of five holes was planned, to test the seams of the Reids Dome beds. Four holes (including one redrill) were complete and one hole was incomplete at the end of the period. Drilling totalled 1 742.15 m, of which 1 384.76 m was cored.

Results so far indicate the presence of over a dozen seams of relatively unbanded and apparently low ash coal between 1 m and 6.5 m thick. The geological structure of the area appears to be rather complex, with depth variations of up to 300 m between adjacent 2 km spaced holes. Regional dip is uncertain since apparent dips to the north, south, and east of between 3° and 15° have been inferred from drillhold intersections. Tertiary basalt up to 80 m thick covers the area, and effectively excludes the possibility of open-cut reserves. Drilling is continuing.

Airlie

A programme of seven fully cored holes was planned for the Airlie area, on the northern side of the Fairbairn Reservoir some 20 km west-south-west of Emerald. It is thought that the thick coal seams in the Reids Dome beds at Cullin-la-ringo south of the reservoir may extend into this area, and as the basalt cover here is fairly thin, the occurrence of significant open-cut reserves is a strong possibility. Drilling will commence in 1985-86.

(By courtesy – The Chief Government Geologist).

QUEENSLAND RESERVES OF BLACK COAL 1985

Estimates by the Department of Mines for the total of proven reserves of black coal in Queensland, as at June, 1985 amounted to 29 940 million tonnes, of which 14 230 million may be classed as coking coal.

These reserves, as calculated according to the Department's parameters for the calculating and reporting of reserves (1968; Mengel, 1977), are tabulated in Table 1 (Permian basins) and Table 2 (Mesozoic basins). Only demonstrated reserves of measured and indicated first-class categories are reported as proven reserves. Indicated second-class and inferred reserves are not quantified. Additional drilling will be necessary to quantify such reserves, and for this reason the present figures are held to be conservative.

The reserves computed in the above categories are also classified into coal suitable for open-cut (O-C) and underground (U-G) mining. In general, an arbitrary maximum depth of 60 m has been used for the purpose of calculating open-cut coal reserves. The present figures for this category are also held to be conservative.

Reserves in the tables are progress totals in millions of tonnes for raw coal *in situ,* and no allowance has been made for losses in mining and beneficiation. The reserves are reported to:

— the nearest 1 million for quantities up to 10 million tonnes,
— the nearest 5 million for quantities up to 500 million tonnes,
— the nearest 10 million for quantities greater than 500 million tonnes.

Currently proven reserves in the various Authorities to Prospect (AP) and Mining Leases (ML) in Queensland are shown in the tables. Companies holding these mining tenures are listed below.

1. Theodore Coal Pty. Ltd.
2. Thiess Dampier Mitsui Coal Pty. Ltd.
3. Brigalow Mines Pty. Ltd.
4. Baralaba Coal Pty. Ltd.
5. Bluff Collieries Pty. Ltd.
6. Mines Administration Pty. Ltd.
7. Mount Isa Mines Ltd.
8. Griffin Queensland Exploration N.L.
9. Central Queensland Coal Associates
10. The Coal Cliff Collieries Pty. Ltd. and others
11. Capricorn Coal Management Pty. Ltd.
12. Tenneco Oil and Minerals of Aust. Inc.
13. BHP Minerals Ltd. and others.
14. Utah Development Co. Ltd. and others.
15. Sirius Creek Coal Pty. Ltd.
16. Thiess Bros. Pty. Ltd.
17. Pacific Coal Pty. Ltd.
18. Brigalow Mines Pty. Ltd. & Rio Grande Group
19. Shell Company of Australia Ltd., Oilmin N.L., Transoil N.L., Petromin N.L.
20. Oilmin N.L., Transoil N.L.
21. Shell Company of Australia Ltd.
22. Millmerran Joint Venture
23. Hail Creek Joint Venture
24. State Electricity Commission of Queensland
25. Bridge Oil Ltd. and others
26. White Industries (Qld.) Pty. Ltd.
27. BP Aust. Ltd,. Drayton Mining Development Pty. Ltd., Westfield Ltd.
28. Kennecott Explorations (Australia) Ltd. and others
29. Hancock Prospecting Pty. Ltd. Wright Prospecting Pty. Ltd.
30. Mount Isa Mines Ltd. and others
31. German Creek Joint Venture
32. Marathon Petroleum Australia Ltd.
33. McIlwraith McEacharn Operations Pty. Ltd.
34. Bligh Coal Ltd. and others
35. New Hope Collieries Group

TABLE I
RESERVES — PERMIAN BASINS

(Figures are progress totals in millions of tonnes for raw coal *in situ*; losses will occur in mining and washing)

AREA AUTHORITY TO PROSPECT OR MINING LEASE	COKING COAL								NON-COKING COAL							
	MEASURED			INDICATED First Class			TOTAL M+I	INFERRED	MEASURED			INDICATED First Class			TOTAL M+I	INFERRED
	O-C	U-G	TOTAL	O-C	U-G	TOTAL			O-C	U-G	TOTAL	O-C	U-G	TOTAL		
BOWEN BASIN																
Theodore																
AP 202C[1]	—	—	—	—	—	—	—	—	125	500	625	20	590	610	=1 235	Large U-G
Moura/Kianga																
(a) Moura Franchise Area[2]	110	750	860	—	—	—	860	Large U-G	40	10	50	—	185	185	235	Large
(b) West Moura	—	—	—	—	365	365	365	—	—	—	—	—	—	—	—	—
Baralaba																
Mining Leases, AP257C[4]	—	—	—	—	—	—	—	—	12	65	77	2	55	57	134	Large
Bluff																
(a) Mining Leases[5]	—	—	—	—	—	—	—	—	—	—	—	—	10	10	10	—
(b) AP 190C[6]	—	—	—	—	—	—	—	—	—	—	—	9	—	9	9	Very Small
Yarrabee																
(a) ML 196[6]	—	—	—	—	—	—	—	—	25	—	25	—	—	—	25	Very Small
(b) AP 123C[3]	—	—	—	—	—	—	—	—	—	—	—	15	—	15	15	Small
Hail Ck/Lake Elphinstone																
ML 312[23]	160	—	160	15	635	650	810	—	—	—	—	—	—	—	—	—
Collinsville																
Mining Leases[7]	30	140	170	5	—	5	=175	—	4	40	44	7	—	7	=51	—
Newlands																
ML 365[7]	—	—	—	—	—	—	—	—	70	85	155	—	10	10	165	Small
Eastern Creek																
MLs 381, 382[7]	—	—	—	—	—	—	—	—	12	15	27	—	—	—	=27	—
Suttor Creek	—	—	—	—	30	30	30	—	—	—	—	35	90	125	125	—
Nebo Project[2]																
(a) Bee Creek, ML 367	—	—	—	—	—	—	—	—	20	25	45	—	35	35	80	
(b) South Walker, ML 368	—	—	—	—	—	—	—	—	85	—	85	—	190	190	275	Large U-G
(c) Walker Ck, ML 367	—	—	—	—	—	—	—	—	40	40	80	—	40	40	120	
(d) Kemmis Ck, ML 367	—	—	—	—	—	—	—	—	15	—	15	—	—	—	15	
(e) Lancewood, ML 370	—	—	—	—	75	75	75	—	—	4	4	—	—	—	4	—
(f) Wards Well, ML 260	—	340	340	—	—	—	340	—	—	85	85	—	—	—	85	—
(g) Riverside, ML 152	95	—	95	—	—	—	95	—	—	—	—	—	—	—	—	—
(h) Poitrel, ML 366	80	35	115	—	—	—	*115	—	—	—	—	—	—	—	—	—
(i) Winchester, ML 261	4	—	4	—	—	—	*4	—	—	—	—	—	—	—	—	—
(j) Moranbah, ML 441	—	—	—	—	—	—	—	—	6	7	13	—	—	—	13	—
Moranbah	—	—	—	—	2 050	2 050	†2 050	Large U-G	—	—	—	—	—	—	—	—
C.Q.C.A. Areas[9]																
(a) Goonyella, ML 127	135	30	165	65	1 110	1 175	1 340	Large U-G	—	—	—	—	—	—	—	—
(b) Peak Downs, ML 210	165	15	180	370	1 230	1 600	1 780	Large U-G	—	—	—	—	—	—	—	—
(c) Daunia, ML 244	55	50	105	20	35	55	160	Large U-G	—	—	—	—	—	—	—	Small
(d) Norwich Park, ML 245	125	30	155	150	450	610	765	—	—	—	—	—	—	—	—	—
Burton Downs	—	—	—	45	70	115	115	—	—	—	—	—	—	—	—	—

Winchester South AP 352C[27]	—	—	—	—	—	—	—	—	90	60	150	—	—	—	=150	—
Blair Athol ML 315[10]	—	—	—	—	—	—	—	—	245	—	245	—	—	—	//245	—
Wolfang AP 294C[26]	—	—	—	—	—	—	—	—	—	‡220	220	—	—	—	=220	—
German Creek ML 1306[31]	††90	220	310	††3	280	283	593	Large U-G	—	—	—	25	—	25	25	—
Middlemount AP 315C[11]	—	—	—	—	—	—	—	—	20	95	115	—	30	30	145	Small
Roper Creek AP 414C[11]	—	—	—	—	—	—	—	—	—	—	—	55	365	420	420	Large
Lake Lindsay AP 388C[28]	15	60	75	—	10	10	=85	—	20	40	60	2	6	8	=68	—
Oaky Creek AP 408C, ML 1315[30]	**90	270	360	—	195	▮195	555	Large U-G	—	—	—	—	—	—	—	—
Gregory																
(a) ML 259[13]	45	15	60	10	55	65	=125	—	—	—	—	—	—	—	—	—
(b) AP 209C[13]	—	—	—	—	170	170	=170	Large U-G	—	—	—	—	—	—	—	—
Gordonstone AP 389C[28]	—	—	—	—	555	555	=555	Large U-G	—	—	—	—	85	85	=85	—
Ensham (Incl. Emerald Nth. & Sth.) AP426C[34]	—	—	—	—	—	—	—	—	•80	85	165	•25	1 225	1 250	1 415	Large U-G
Capella AP 418C[10]	—	—	—	—	—	—	—	Large	90	—	90	15	—	15	105	Large
Blackwater																
(a) Departmental areas																
(i) Jellinbah/Caledonia	—	—	—	—	—	—	—	—	—	—	—	—	90	90	=90	—
(ii) Minyango	—	—	—	—	265	265	265	—	—	—	—	—	15	15	15	—
(iii) Togara	—	—	—	—	—	—	—	—	—	—	—	—	970	970	970	Large U-G
(b) Company areas																
(i) AP 369C[24]	90	—	90	30	100	130	=220	—	,120	25	145	270	1 240	1 510	=1 655	—
(ii) ML 110[14]	70	—	70	—	525	525	595	—	35	—	35	—	205	205	240	—
(iii) ML 121[14]	35	—	35	—	380	380	415	Large U-G	2	—	2	—	65	65	67	—
(iv) MLs 194, 195, 242, 296[33]	—	105	105	—	635	635	740	Large U-G	—	—	—	—	—	—	—	—
(v) MLs197, 1866[15]	—	130	130	—	360	360	=490	Large U-G	—	—	—	—	—	—	—	—
(vi) AP 261C, MLs 193, 198, 199, 284, 622 1110, 1768, 1773[16]	35	300	335	5	—	5	=340	Large U-G	4	—	4	—	370	370	=374	—
Rolleston AP 57C[16]	—	—	—	—	—	—	—	—	275	—	275	—	150	150	425	Small
TOTAL—BOWEN BASIN	**1 429**	**2 490**	**3 919**	**718**	**9 590**	**10 308**	**14 227**	**Very Large**	**1 435**	**1 401**	**2 836**	**480**	**6 021**	**6 501**	**9 337**	**Very Large**
GALILEE BASIN																
AP 245C[25]	—	—	—	—	—	—	—	—	220	1 015	1 235	—	—	—	1 235	Large
AP 244C[29]	—	—	—	—	—	—	—	—	125	155	280	140	490	630	910	Large
TOTAL—GALILEE BASIN	—	—	—	—	—	—	—	—	**345**	**1 170**	**1 515**	**140**	**490**	**630**	**2 145**	**Very Large**
TOTAL—PERMIAN BASINS	1 429	2 490	3 919	718	9 590	10 308	14 227	Very Large	1 780	2 571	4 351	620	6 511	7 131	11 482	Very Large

* Crucible swelling number. 3. † Includes 555 million tonnes which yield washed product of ash 11-14%. • Includes 13 million tonnes in seams < 1.5 m thick.
†† Includes 30 million tonnes in seams < 1.5 m thick. ** Includes 45 million tonnes in seams < 1.5 m thick. ▮ Departmental estimate.
= Under review. ‡ May be open cut in future. // Excludes seam < 6 m thick.

RECOVERABLE RESERVES — PERMIAN BASINS

On the assumption that 90 per cent of open-cut coal and 50 per cent of underground coal are extracted by mining, and using existing experimental data, or otherwise an arbitrary figure of 65 per cent, for the recovery of coking coal after washing, recoverable reserves are

COKING COAL — 5 540 million tonnes. NON-COKING COAL — 5 820 million tonnes.

TABLE 2

RESERVES — MESOZOIC BASINS

(Figures are progress totals in millions of tonnes for raw coal *in situ*; losses will occur in mining and washing)

AREA AUTHORITY TO PROSPECT OR MINING LEASE	NON-COKING COAL							
	MEASURED			INDICATED First Class			TOTAL M + 1	INFERRED
	O-C	U-G	TOTAL	O-C	U-G	TOTAL		
IPSWICH BASIN								
IPSWICH								
Mining Leases	—	440	440	17	190	207	*647	Large
TARONG BASIN								
TARONG								
AP 235C[17]	245	15	260	10	10	20	*280	Large
CALLIDE BASIN								
CALLIDE								
AP 188C Mining Leases[16]	72	93	165	6	29	35	200	Large
MULGILDIE BASIN								
MULGILDIE								
AP 303C[3]	—	—	—	20	—	20	=20	Small
SURAT/MORETON BASIN								
INJUNE-TAROOM								
Bymount	—	—	—	20	—	20	20	Small
Glen Arden	—	—	—	35	—	35	35	Small
TAROOM-WANDOAN								
AP 189C[16]	115	—	115	55	—	55	=*170	Large
AP 152C[18]	—	—	—	55	—	55	=55	Small
AP 157C[3]	280	—	280	200	—	200	=480	Large
AP 182C[18]	110	—	110	25	—	25	135	Small
AP 138C[18]	35	—	35	45	—	45	80	Large
WANDOAN-DALBY								
AP 312C[19]	—	—	—	100	—	100	=100	Large
AP 102C[18]	30	—	30	45	—	45	=*75	Large
AP 150C[18]	25	—	25	5	—	5	*30	Very Small
AP 401C[20]	120	—	120	115	—	115	*235	Large
AP 413C[32]	265	—	265	120	—	120	*385	Large
DALBY-MILLMERRAN								
AP 205C[19]	—	—	—	330	40	370	*370	Large
AP 129C[21]	145	—	145	85	—	85	=*230	Large
Acland mining leases	—	10	10	—	—	—	10	—
Rosewood mining leases								
AP 416C[35]	2	14	16	50	—	§50	66	—
AP 424C[12]	20	—	20	—	5	5	*25	—
AP 203C[22]	175	—	175	400	—	400	=*575	Large
TOTAL — SURAT/ MORETON BASIN	**1 322**	**24**	**1 346**	**1 685**	**45**	**1 730**	**3 076**	**Large**
STYX BASIN								
STYX	—	4	4	—	—	—	4	—
TOTAL — MESOZOIC BASINS	**1 639**	**576**	**2 215**	**1 738**	**274**	**2 012**	**4 227**	**Large**

* Washing may be required to produce a marketable coal = Under review § Reserve status under review

RECOVERABLE RESERVES — MESOZOIC BASINS

On the assumption that 90 per cent of open-cut coal and 50 per cent of underground coal are extracted by mining, and using existing experimental data or otherwise an arbitrary figure of 65 per cent, where washing is required to produce a marketable coal, recoverable reserves are NON-COKING COAL — 2 495 million tonnes.

ACIRL RESEARCH

EXPLORATION

In-seam Seismics

The in-seam seismic method is a geophysical technique for proving coal seam continuity ahead of workings. Results are invaluable in mine planning. A three year research programme into in-seam seismic methods has been completed. Objectives were principally to investigate the application of the method in Australian conditions and to develop an in-house capability for conducting surveys.

Features successfully mapped during the project included faults with throws greater and less than seam thickness, low angle thrusts and stress zones, dykes, sand channels, thinning seams, and changes in roof conditions. Surveys may be conducted from underground faces between face and boreholes or between boreholes.

Surveys conducted in Queensland were at Collinsville (two underground sites), at Spring Mountain near Ipswich (borehole-to-borehole survey), and at Cook Colliery (face-to-borehole survey). Other surveys were carried out in New South Wales.

As a result of this research, ACIRL now offers a commercial in-seam seismic service to the industry.

MINING

Underground Telemetric Monitoring Systems

With the recent developments in electronic technology and industry demand for underground monitoring systems, ACIRL through NERDDP funding is undertaking research into the development of an integrated approach to the problem of underground data acquisition. Many mines are faced with the prospect of having several different monitoring systems, all servicing the different areas of the mining operation. The aim of this project is to develop guidelines for the implementation of underground data acquisition systems, communication links, and the integration of presentation and storage of data at the surface.

Underground Thick Seam Mining

The Utah Development Company has been considering various alternate underground mining methods for the extraction of its thick underground coal reserves in the Bowen Basin. To assess the viability of 6 m single pass longwalling in weak coal a NERDDP grant was awarded to Utah and subcontracted to ACIRL in January, 1985. Problems to be investigated include, face and pillar stability and shearer and longwall support design.

Rapid Access Longwalling from Open-cuts

A novel method of longwall mining from a highwall of an open-cut is being investigated in a subcontracted CAPCOAL project. The use of longwall mining techniques in panels down dip from the highwall, offers a cost effective alternative when stripping ratios exceed their economic cut off and provides lower development and mining costs compared to conventional underground mines.

Flexible Conveyor Train

ACIRL is acting as project managers for the introduction and demonstration of a flexible conveyor train (F.C.T.) at Box Flat No. 9 colliery. The project will directly assist continuous miner operations by enabling higher production rates per unit, through the elimination of shuttle cars. The F.C.T. allows for continuous haulage from the continuous miner through to the panel belt.

ACIRL RESEARCH (Continued)

Bucketwheel Excavation Diggability Assessment from Surface Refraction Seismic Profiling

This subcontracted Utah Project aims to establish procedures for the enhancement of the application of surface refraction seismic profiling as a technique to investigating large areas of overburden for bucketwheel cuttability assessment.

COAL PREPARATION

The Walloon Coal Study

Various difficulties anticipated with the large scale production of coal from the Walloon coal measures of the Moreton-Surat Basins in Queensland are being studied. These coal measures contain bentonitic clays which degrade on contact with water and lead to difficult handling conditions and ultrafine clay suspensions. The project has investigated the testing of claystone bands, methods of handling the coal, coal preparation and tailings disposal, water utilisation and coal combustion properties.

Improved Precision of Laboratory Froth Flotation Testing

This project has investigated the various procedures for testing the floatability of coal in the laboratory and has sought to correlate the results with pilot plant and full scale commercial processes. Three coals have been extensively investigated, including two from New South Wales and one from the Bowen Basin of Central Queensland. A final report on the project was submitted to NERDDC in March 1985.

The Beneficiation of Fine Coal by Dense Medium Cyclones

An efficient and controllable process for fine coal beneficiation is being developed. A test circuit containing a 225 mm diameter dense medium cyclone has been installed at the ACIRL Coal Preparation Research Station at Maitland, New South Wales. Instrumentation has been added to the circuit containing the cyclone and has been interfaced with a micro-computer for data collection and process control. The circuit is now available for commercial trials on fine coal samples from operating plants.

Alternative Magnetite Supplies and Technology for Use in Dense Medium Coal Preparation

About 90 000 tonnes of magnetite are consumed by the Australian coal industry each year and it is anticipated that the major sources in Australia will be exhausted within five years and new sources are not immediately obvious. Alternative magnetite sources and the performance of these materials in coal preparation (including recovery and demagnetisation) are being studied.

CARBONISATION

Carbonisation research is currently focusing on partial briquetting of Australian coals in Japanese blending practice and also on reactivity studies. Coke reactivity and coke strength after reaction have become of prime importance to blast furnace operators. ACIRL employs the NSC coke reactivity test procedure.

ACIRL's pilot coke ovens and coke evaluation procedures are used regularly by Australian coking coal producers to provide coal/coke quality appraisals to support coal marketing activities.

ACIRL RESEARCH (Continued)

COAL AND COKE PETROGRAPHY

The applied coal coke petrographic unit has enlarged the range of services available in response to the change in emphaisis from exploration to coal utilisation and resource evaluation. To complement the standard analyses of maceral composition and vitrinite reflectance the following techniques have been introduced:—

— Microlithotype analyses including grain count analysis, a method developed by CSIRO and modified by ACIRL to study froth flotation products and assess mineral liberation in coal-water mixture studies.

— Analysis of blends of different ranks, for quality control, according to ICCP method.

— Etching to study to origin of vitrinite in relation to coking potential.

— Qualitative/quantitative assessment of coal derived products including coke, char, hydrogenation residues, fly ash etc./or product quality control and efficiency of operating conditions.

— Microscopy of dust samples for environmental studies.

ACIRL continues to participate in the ICCP working committees on behalf of the ACA. The current activities include combustion; coal classification including ECE classification and Gondwana coals vs. Carboniferous coals; standardisation of analyses; reactive inertinite.

AUTOMATIC IMAGE ANALYSIS

The Quantimet 900 image analyser has been further developed to rapidly characterise coal and coke. Good correlation has been found between mean random reflectance of vitrinite (determined by Quantimet) and manually determined values. Important structural parameters of metallurgical coke such as porosity and cell wall thickness can be determined simply and these provide, in conjunction with drum test indices and reactivity, a more complete description of coke quality. The instrument has been developed also for determination of particle size distribution of samples such as clay and fly ash, coal-water mixtures.

ELECTROSTATIC PRECIPITATION

The effectiveness of an electrostatic precipitator depends on the electric field which can be sustained across the precipitator plates without developing back corona and on the drift velocity of the fly ash particles in that field.

ACIRL's earlier research has led to the development of techniques for preparing simulated fly ash from coals of interest and the measurement of electrical resistivity and point plane corona characteristics of that simulated fly ash. The purpose of these two test techniques is to estimate the maximum effective operating fields that can be sustained in full scale electrostatic precipitators when collecting the fly ash being tested.

Now ACIRL, with support from NERDDC, has successfully developed a method for the direct measurement of fly ash drift velocity. Thus a complete physical model has been established to provide a reliable set of empirical tests to predict fly ash precipitability for any given coal.

LABORATORY COMBUSTION TESTING

The fly ash precipitation test work described above forms part of a wider test package designed to test the behaviour of Australian thermal coals in the various unit operations involved in a combustion facility. Aspects which may be tested include:—

- spontaneous combustion behaviour;
- coal milling performance
- coal combustion performance
- fouling and slagging
- boiler tube erosion
- fly ash fabric filter collection
- fly ash pozzolinic properties
- trace element analyses.

SPECTROSCOPY

The spectroscopic facilities available in ACIRL are:—

(i) X-ray Fluorescence Spectrometer which is used for coal ash analysis and some trace elements.

(ii) Dual Beam Atomic Absorption Spectrometer with a graphite furnace and vapour generation accessory. This equipment is also used in trace element analysis.

(iii) Scanning Electron Microscope equipped with energy dispersive X-ray analyser. This apparatus is used for studies of the morphology and chemistry of particles including fly ash.

The trace elements most commonly analysed are those which are potentially harmful to the environment or of special interest in coal utilisation.

COAL TRANSPORT AND STORAGE

A technical and economic assessment has commenced into the manufacture of transportable thermal briquettes as a possible market outlet for excessive coal fines.

Other client specific studies are underway in the areas of moisture reduction and dust suppression.

New end-use technologies which involve the introduction of coal as a pneumatic or slurry suspension are under study. Examples include pulverised coal injection into the blast furnace and slurry-fired gasifiers

COAL-WATER MIXTURES

There are potentially large markets in the countries of Asia and Europe for coal for preparation into coal-water mixtures which provide a lower-cost substitute for fuel oil in utility and industrial boilers and industrial furnaces. ACIRL is undertaking research in order to elaborate the quality requirements of coal-water mixture feedstock coals, particularly with respect to fine coal cleaning technology and ignition of the coal-water fuel. In addition, ACIRL offers an evaluation service to the industry which includes fine coal washability determinations, coal-water mixture formulation and rheology studies, and combustion characteristics of CWM prepared from a specific coal.

COAL LIQUEFACTION

The major hydroliquefaction project sponsored by NERDDC over recent years is drawing to a close. The project resulted in the successful operation, over a period of 5 years of a 25 kg/day coal continuous reactor unit. Among the findings of the project were:—

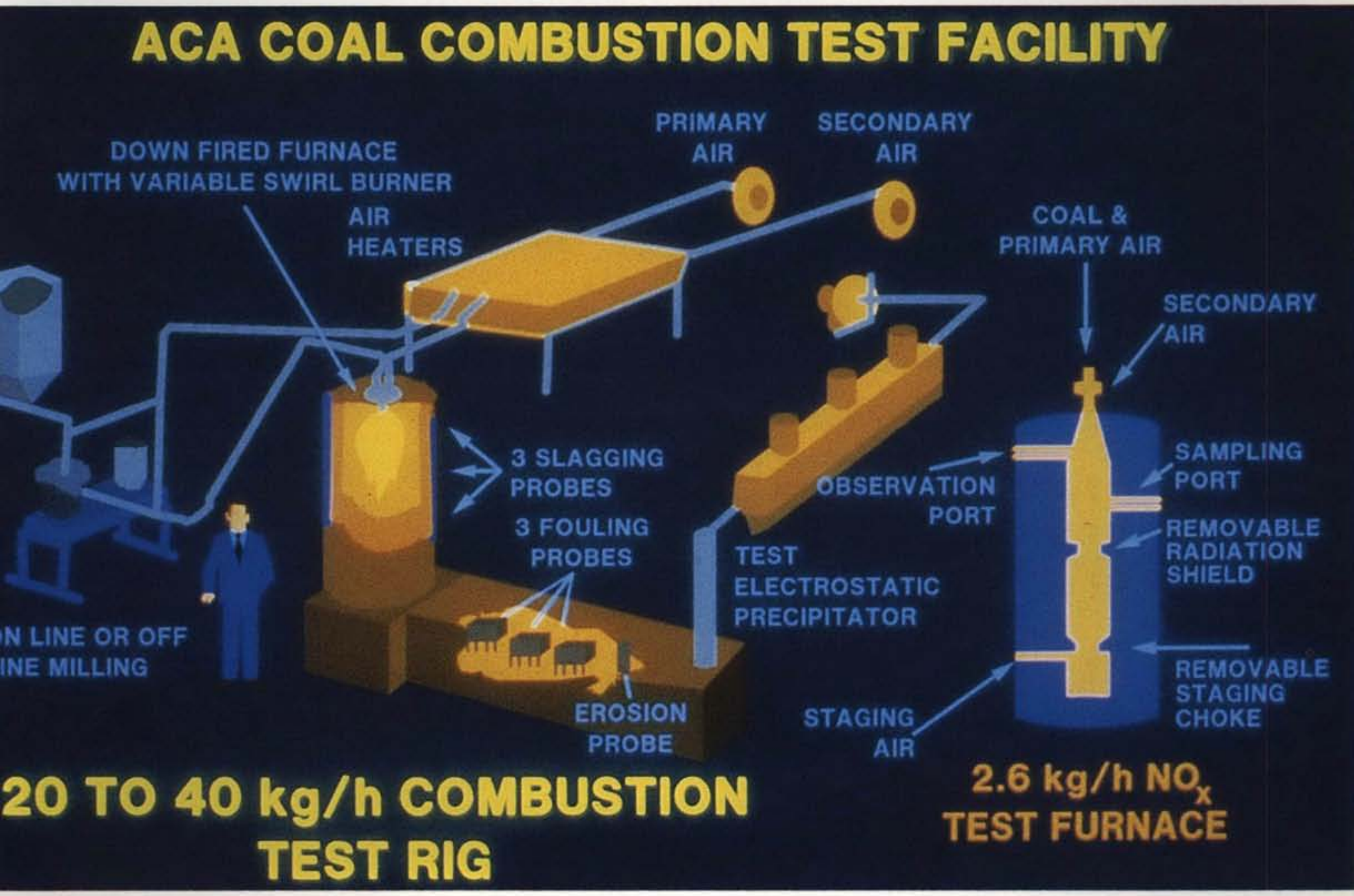
ACIRL RESEARCH (Continued)

- Surat Basin (e.g., Wandoan) coals are ideally suited to liquefaction by current West German processing technology, i.e., at pressures in the range of 20-35 MPa in the presence of red mud-sulphur catalysts. Yields of up to 500 litres per tonne of Surat Basin coal washed to 8-12% ash have been obtained.

- West German type hydrogenation yields up to 50% more liquids from Wandoan coal than donor solvent processing in the absence of red mud-sulphur and at lower pressures (i.e., 10-15 MPa).

- Preliminary indications from the combined work by ACIRL and Ampol are that the refined product slate from direct hydrogenation of Wandoan coal would be about 60% gasoline, 20% kerosene (jet fuel), and 20% diesel fuel.

ACIRL's hydroliquefaction studies have not resulted in the development of a cost-effective coal assay. The assay is based on a semi-continuous reactor system and provides intrinsic coal hydroliquefaction properties which can be related to any of the numerous processes under development throughout the world. The procedure should be particularly relevant to those coal resources which have not found a ready market in conventional end-uses.



ACIRL RESEARCH (Continued)
THE ACA COAL COMBUSTION TEST FACILITY

Four levels of testing are available to test the suitability of a particular coal for a specific application such as a pulverised coal fired power station. Basic tests are carried out at the laboratory scale to test compliance with basic specifications and require only a few kilograms of coal. More detailed laboratory scale test procedures are also available to test the performance of coal in more detail. Pilot scale combustion testing requires something between a few hundred kilograms of coal and several tonnes depending on the scope of the investigation. Full scale trials can be performed at the specific power station if several thousand tonnes are available.

These levels of testing have the potential to provide data which can be interpreted with increasing levels of confidence provided the test procedures and their methods of interpretation are established. The ACA coal combustion test facility shown on the figure will provide the testing at the pilot scale level.

The facility includes a pilot scale vertical spindle mill suitable for testing coal for their milling performance.

The main part of the facility is a 0.17 MW test rig with a nominal firing rate of 23 kg/h of bituminous coal. This rig can test the performance of a coal in pulverised coal fired installations for combustion behaviour, such as burnout and flame stability, boilers furnace and convective section deposits, convective section erosion, measures needed to control solids emission using either electrostatic precipitators or fabric collectors, and gaseous emission that can be expected.

The facility also includes a test rig to determine NO_x levels that will be generated using either excess air or staged combustion.

(By courtesy — Australian Coal Industry Research Laboratories Ltd. (A.C.I.R.L.), Sydney)

SOME REPORTED SHAREHOLDINGS IN CERTAIN COAL MINES AND PROJECTS

ACI COAL LIMITED
Curragh — 30%

ACI RESOURCES LIMITED
Blair Athol — 12.195%

AMAX IRON ORE CORPORATION
Millmerran — 65.625%

AMP SOCIETY
Boundary Hill, Callide – each — 15%
Blackwater, Goonyella, Gregory, Harrow Creek, Norwich Park, Peak Downs, Saraji – each — 7.75%

ANACONDA AUSTRALIA INC.
Blair Athol — 15.39%
Curragh — 30%

AUSTEN & BUTTA COLLIERIES
German Creek — 21.4%

BHP MINERALS LIMITED/UTAH DEVELOPMENT COMPANY LIMITED
Blackwater, Goonyella, Harrow Creek, Norwich Park, Peak Downs, Saraji – each — 43.5%

BHP MINERALS LIMITED
Gregory — 55.5%

BELL RESOURCES LTD.
Blackwater, Goonyella, Gregory, Harrow Creek, Norwich Park, Peak Downs, Saraji – each — 10%

BUNDABERG SUGAR COMPANY
Box Flat, Westfalen – each — 100%

COAL CLIFF COLLIERIES PTY. LIMITED
Blair Athol — 50.22%

CRA LIMITED
Tarong — 100%
Hail Creek — 25%

CSR LIMITED
South Blackwater, Taroom, Yarrabee – each — 100%
Theodore — 60%
Boundary Hill, Callide – each — 55%
Monto, Rolleston, Wandoan, West Moura, Yarrabee South – each — 50%
Hail Creek — 44%
Chinchilla, Taroom Extd., Wandoan Extd. – each — 42.67%
Moura, Nebo, Riverside – each — 22%

DAMPIER COAL (QUEENSLAND) PTY. LTD.
Moura, Nebo, Riverside – each — 58%

ESSO EXPLORATION (AUST.)
Hail Creek — 25%

JENA (SFIT) PTY. LTD.
German Creek — 13.03%

KENNECOTT EXPLORATIONS (AUSTRALIA) LTD.
Gordonstone — 45%

McILWRAITH McEACHERN OPERATIONS PTY. LTD.
Cook — 100%

MARATHON OIL COMPANY
Macalister — 100%

MILLER, R.W. & CO.
Curragh — 30%

MILLMERRAN COAL PTY. LIMITED
Millmerran — 20%

M.I.M. HOLDINGS LTD.
Collinsville, Newlands – each — 100%
Oaky Creek — 79%
Monto, Rolleston, Wandoan, West Moura, Yarrabee South – each — 50%
Chinchilla, Taroom Extd., Wandoan Extd. – each — 42.67%

MITSUBISHI DEVELOPMENT PTY. LTD.
Wolfang — 25%
Blackwater, Goonyella, Harrow Creek, Norwich Park, Peak Downs, Saraji – each — 12%

MITSUI COAL DEVELOPMENT (AUSTRALIA) PTY. LIMITED
Curragh — 10%
Millmerran — 9.375%

MITSUI & CO. LTD. (JAPAN)
Moura, Nebo, Riverside – each — 13.3%

NATIONAL COAL BOARD/COMMERCIAL UNION ASSURANCE
German Creek — 12.06%

NATIONAL MUTUAL LIFE ASSOCIATION OF AUSTRALASIA
German Creek — 13.03%

OILMIN/PETROMIN/TRANSOIL
Bowenville — 50%

P.L. MINING PTY. LIMITED
German Creek — 13.03%

QUEENSLAND COAL TRUST
Blackwater, Goonyella, Gregory, Harrow Creek, Norwich Park, Peak Downs, Saraji – each — 21.75%

RUHRKHOLE AUSTRALIA PTY. LIMITED
German Creek — 10.77%

SHELL COMPANY OF AUSTRALIA
Acland, Pentland – each — 100%
Bowenville — 50%
Theodore — 40%
Boundary Hill, Callide – each — 30%
German Creek — 16.68%

STATE GOVERNMENT INSURANCE OFFICE (QUEENSLAND)
Gordonstone — 22.5%

UTAH DEVELOPMENT COMPANY LIMITED/ BHP MINERALS LIMITED
Blackwater, Goonyella, Harrow Creek, Norwich Park, Peak Downs, Saraji – each — 43.5%

WHITE INDUSTRIES (QLD) PTY. LTD.
Wolfang — 75%

WM. McQUEEN & CO. PTY. LTD.
Chinchilla, Taroom Extd., Wandoan Extd. – each — 14.66%

MINING SECTION

General information on some developed mines and potential coal fields appears in this section.

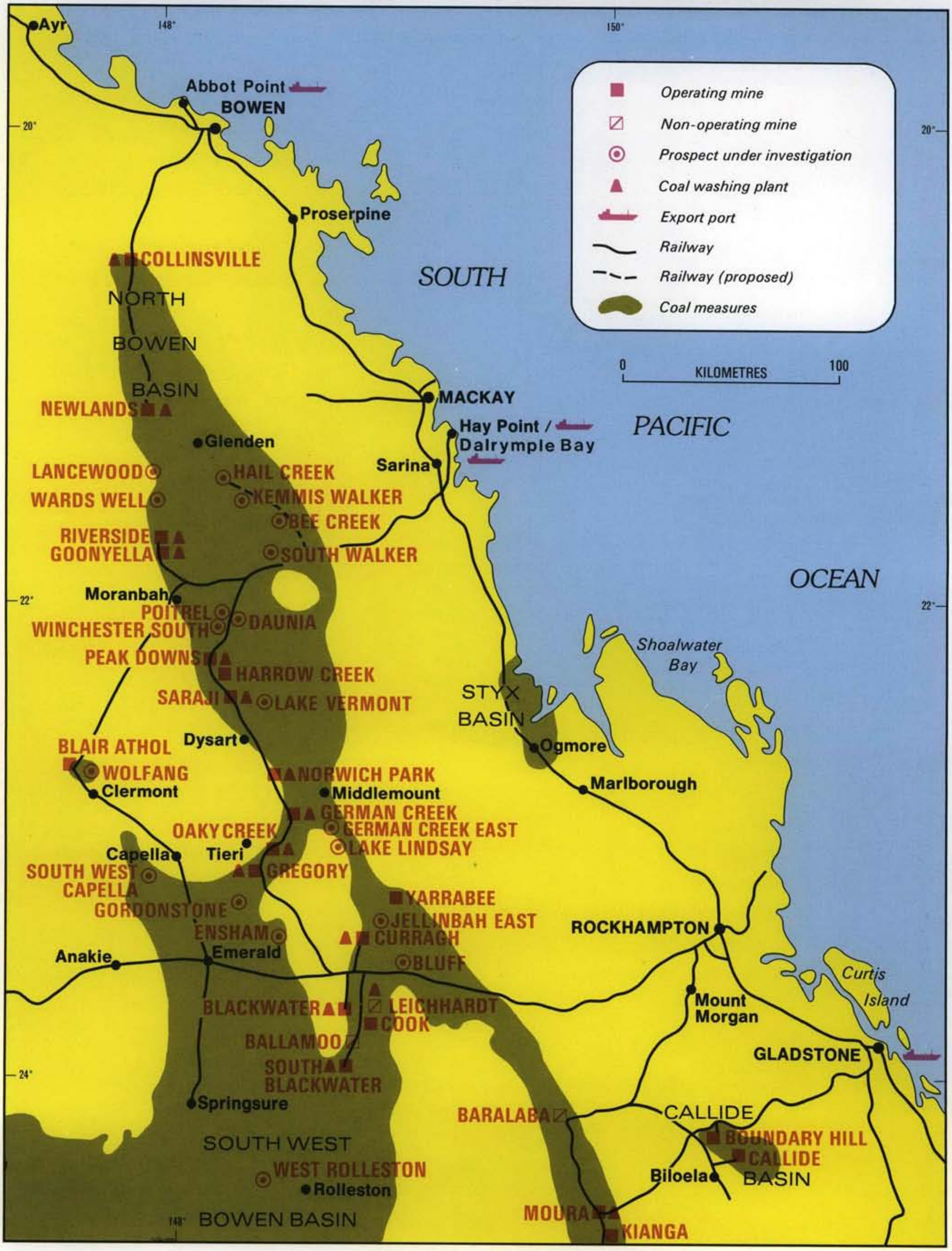
Similar details have appeared in previous Annual Reports. Where necessary this information has been updated by the mining companies concerned.

INDEX

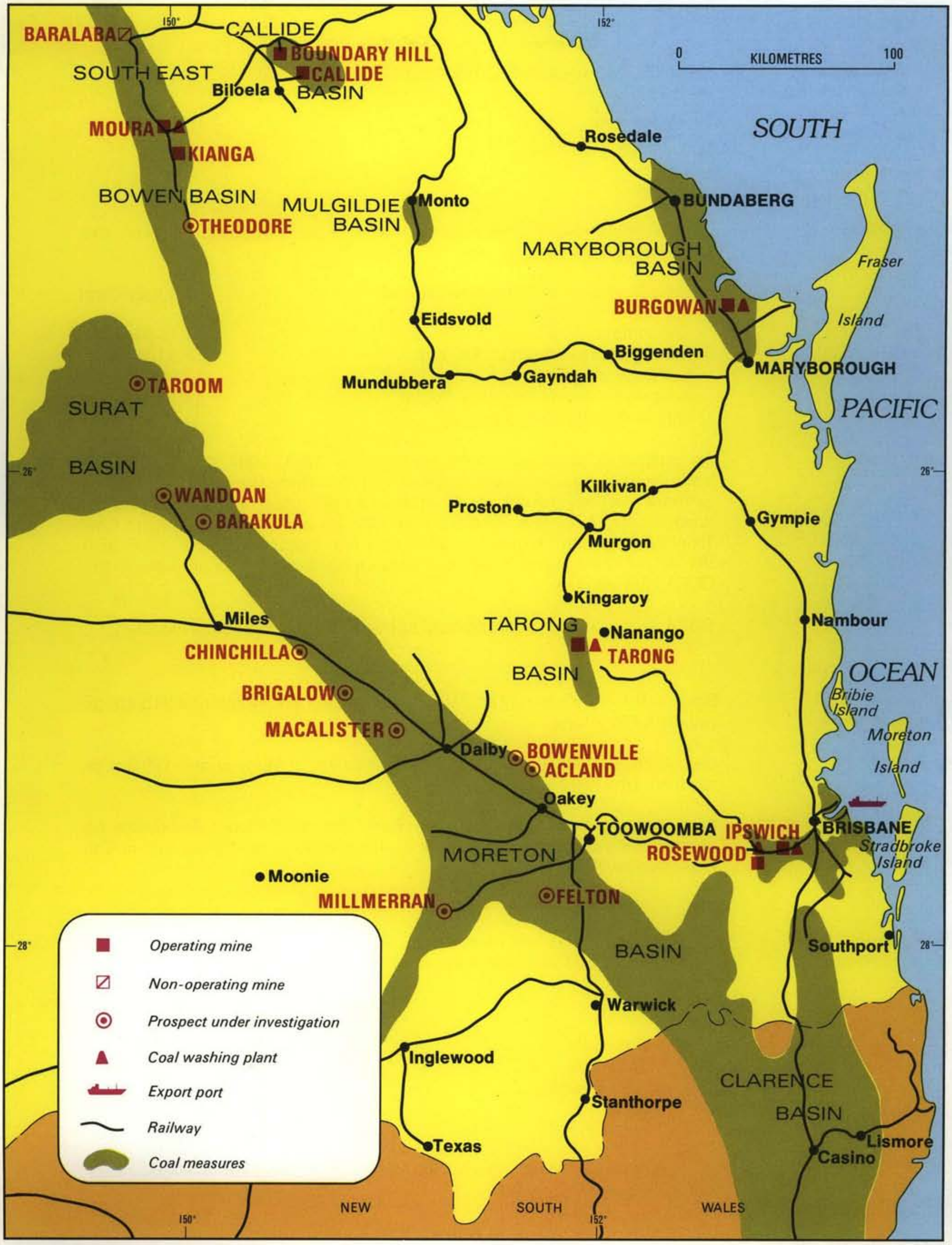
DEVELOPED MINES

POTENTIAL COAL FIELDS

NORTHERN AND CENTRAL COAL BASINS



SOUTHERN COAL BASINS



DEVELOPED MINES

BLACKWATER, GOONYELLA, HARROW CREEK, NORWICH PARK, PEAK DOWNS AND SARAJI

CENTRAL QUEENSLAND COAL ASSOCIATES

Information

Central Queensland Coal Associates is a joint venture between the following participants:-

Utah Development Company Limited/ BHP Minerals Limited	(43.50 per cent)
Queensland Coal Trust	(21.75 per cent)
Mitsubishi Development Pty. Ltd.	(12.00 per cent)
Bell Resources Ltd.	(10.00 per cent)
Australian Mutual Provident Society	(7.75 per cent)
Pancontinental Mining Limited	(5.00 per cent)

As part of a corporate reorganisation in April, 1984 the CQCA Joint Venture was expanded and restructured to include the Blackwater Mine, formerly wholly-owned and operated by Utah, and new equity participants. Australian entities now own 88 per cent. Queensland Coal Trust Management Limited has entered into discussions with Utah with the aim of Queensland Coal Trust acquiring a further 3.25 per cent in the CQCA Joint Venture.

CQCA also owns the coal terminal at Hay Point 40 km south of Mackay.

Locations Open-cut Mines

Blackwater mine is situated 216 km west of Rockhampton and 315 km by rail from Gladstone.

Goonyella is approximately 225 km south-west of Mackay and 198 km by rail from Hay Point.

Peak Downs, Saraji and Norwich Park are south from Goonyella on another railway line. Norwich Park is the southern most mine and is 256 km from Hay Point.

Operations

The following mines are operated as open-cuts and are designed for the annual production quantities of coking coal as indicated:-

		(Tonnes)
Blackwater	—	4 000 000
Goonyella	—	4 500 000
Peak Downs	—	5 400 000
Saraji	—	4 700 000
Norwich Park	—	4 300 000

The Blackwater mine has a steaming coal production capacity of 2 600 000 tonnes per year.

Employees at the mines totalled 2 906 at June 30, 1985.

DEVELOPED MINES

Coal Quality

Blackwater, Goonyella and Peak Downs coals are medium volatile, while Saraji and Norwich Park are low volatile. The coals are hard coking with International Standard Classifications 434. Typical washed coal analyses are:-

	Black-water	Goon-yella	Peak Downs	Saraji	Norwich Park
Total Moisture (As Received)	10.0%	10.0%	10.0%	10.0%	10.0%
(Air Dried)					
Inherent Moisture	2.0%	1.3%	1.0%	1.2%	1.2%
Volatile Matter	26.5%	25.5%	21.0%	19.5%	17.0%
Fixed Carbon	63.2%	65.4%	68.5%	69.8%	71.5%
Ash	8.3%	7.7%	9.5%	9.5%	9.5%
Total Sulphur	0.50%	0.51%	0.65%	0.53%	0.65%
C.S.N.	$5^1/_2$	8	8-9	8-9	8-9
Specific Energy	32.06 MJ/kg	32.94 MJ/kg	32.69 MJ/kg	32.69 MJ/kg	31.90 MJ/kg

A total of 23 large draglines are used at the open-cuts to strip overburden from above the coal seams. Coal is extracted using electric shovels and/or front end loaders with 110 capacity bottom-dump coal haulers. After crushing in rotary breakers, the coal is processed to customer specifications in mine preparation plants using heavy medium cyclones for the coarse coal fraction and froth flotation for the fine coal product. Both coarse and fine coal are combined and conveyed to a radial stacker for stockpiling prior to railing.

Underground Operation

Harrow Creek Trial Colliery is an underground mine which is situated 6 km south-east of Peak Downs mine industrial area. The fundamental aim of this initial underground venture is to determine the physical and economic mining conditions at depth on CQCA's leases.

Mining Method and Production

Mining is by bord and pillar system using a continuous miner and shuttle cars. Presently the mine is designed to produce 350 000 tonnes per year. The coal is treated at Peak Downs mine. At June 30, 1985 60 men were employed at the mine.

Coal Quality

Harrow Creek coal is medium volatile, bituminous, medium rank and strongly coking.

Port of Shipment

Coal from five northern mines is shipped from Hay Point. The Hay Point facilities have loaded ships of over 179 000 tonnes capacity. The port is designed for an annual loading in excess of 20 million tonnes. Blackwater coal is shipped through the Clinton loading facility at Gladstone.

Townships

Blackwater mine employees and their families live in the town of Blackwater, which has a population of around 7 500 people. Employees at Goonyella and Peak Downs live in Moranbah, which has a population of approximately 7 000. Dysart is the centre for Saraji, Norwich Park and Harrow Creek employees, and has a population exceeding 4 000.

DEVELOPED MINES

General Information

Prior to the April, 1984 reorganisation, CQCA was authorised to export a total of 457.2 million tonnes of coking coal from its Special Coal Mining Lease areas with the provision that should exports exceed 20.3 million tonnes in any one year, the excess will be mined from depths greater than 200 feet (approximately 60 metres). An additional 101.6 million tonnes may be exported provided it is mined from depths greater than 200 feet. CQCA is also authorised to export a total of 101.6 million tonnes of coking coal from its Blackwater leases.

Japanese export contracts from Goonyella and Peak Downs are presently running at 7 million tonnes per year. Peak Downs coal is exported under contract to European and North-East Asian countries. Saraji and Norwich Park coals are exported to Japan as well as Asian and European countries.

BLAIR ATHOL

BLAIR ATHOL COAL PROJECT

Company Information

Current interests in the Project are:–

The Coal Cliff Collieries Pty. Limited	(50.22 per cent)
Anaconda Australia Inc.	(15.39 per cent)
ACI Resources Limited	(12.195 per cent)
Bundaberg Sugar Company Limited, Millaquin Sugar Company Pty. Limited, Gibson and Howes Pty. Limited	(12.195 per cent)
EPDC (Australia) Pty. Ltd. and J.C.D. Australia Ltd.	(10.00 per cent)

The Manager is Pacific Coal Pty. Limited (a subsidiary of CRA Limited)

Location

The Blair Athol coal field, located 22 km from the township of Clermont, is contained within an isolated sub-basin on the western margin of the Bowen Basin – already well established as a major coal producing area. Blair Athol is about 280 km south-west of Mackay.

Reserves

Recoverable reserves are estimated to 240 million tonnes of good quality steaming coal.

Coal Quality

The typical coal quality is indicated in the table:-

(Air Dried)	
Inherent Moisture	7.5%
Volatile Matter	27.2%
Fixed Carbon	57.3%
Ash	8.0%
Total Sulphur	0.3%
Hardgrove Index	60
Specific Energy (at 7.5% moisture)	27.25 MJ/kg

Export Operations

The new open-cut mine was opened in 1984. The initial capacity is 5 million tonnes per annum and the coal is being exported chiefly to power utilities in Japan.

Blair Athol

DEVELOPED MINES

Development of the project involved constructions of a major new mining facility, of 110 km of high-voltage power line and of 110 km of railway track, linking with the rail network to Hay Point. The township of Clermont was expanded and a new water supply was provided. There was also participation with the Queensland Government and other coal companies concerning construction of the Dalrymple Bay coal terminal.

The township of Clermont has benefitted both economically and socially from the development of the Blair Athol Mine. The project has included the provision of accommodation and facilities for the housing of the mine workforce in Clermont.

Eventually 250 houses will be constructed to accommodate married employees. A motel style complex has been constructed to house about 60 single employees.

A workforce exceeding 300 could be required for an annual production of 5 million tonnes. There is a capability to eventually expand production to 8 million tonnes per year.

BOUNDARY HILL AND CALLIDE

THIESS BROS. PTY. LIMITED

Company Information

Thiess Bros. Pty. Limited is a wholly owned subsidiary of CSR Limited. Callide coal field is a co-venture between:-

Thiess Bros. Pty. Limited	(55 per cent)
The Shell Company of Australia Limited	(30 per cent)
Australian Mutual Provident Society (AMP)	(15 per cent)

Management of the mines and further development of reserves and marketing is the responsibility of Thiess Bros. Pty. Limited.

Location

The Callide coal field is located 120 km west of Gladstone.

Operation

The current annual production rate from the Callide coal field is approximately 3.5 million tonnes per year from the two open-cut mines. One is based on the Dunn Creek/Trap Gully area in the southern end of the field and the other is located at Boundary Hill at the northern end. The mines are designed to produce 4.5 million tonnes per year. At June 30, 1985, 386 people were employed at the mines.

Coal Quality

The coal is sub-bituminous with excellent combustion characteristics. A typical analysis is as follows:-

(Air Dried)	Callide	Boundary Hill
Inherent Moisture	9.3%	11.7%
Volatile Matter	24.5%	25.1%
Fixed Carbon	49.7%	50.4%
Ash	16.5%	12.8%
Specific Energy	20.7 MJ/kg	20.4 MJ/kg

DEVELOPED MINES

Remarks

In the Dunn Creek/Trap Gully mine the majority of overburden is removed by using a 1350W (32 cubic metres) dragline on a continuous shift basis while pre-stripping for this dragline and removal of intra-seam partings is accomplished by a front-end loader and rear dump truck fleet.

At the Boundary Hill mine a 24 cubic metre face shovel and a fleet of 154-tonne rear dump trucks are used to remove overburden in a series of benches down to the coal seam.

Markets

Steaming coal production is for local markets, the major users being the Queensland Alumina Refinery at Gladstone and the power stations at Callide and Gladstone. A graded, screened product is supplied to local hospitals and meat works for steam raising and hot water supply. Callide coal is also used to bunker the coal-fired ships on the Weipa/Gladstone bauxite run.

COLLINSVILLE

COLLINSVILLE COAL COMPANY PTY. LTD.

Company Information

This company is a wholly owned subsidiary of M.I.M. Holdings Limited.

Mines

NO. 2 MINE UNDERGROUND
NO. 3 MINE UNDERGROUND
OPEN-CUT MINES

Location

These mines are located at Collinsville, 86 km by rail south-west of the port of Bowen.

Operation

Coal is won by both underground and open-cut mining methods. Approximately 670 persons are employed in the operations..

Coal Quality

The Blake seam coal is a high ash, low sulphur steaming coal. Coal from the Bowen seam is a medium volatile steaming/coking coal with a sulphur content varying from 0.4 to 3.0 per cent in the underground mines and from 0.5 to 1.2 per cent in the open-cut operations.

Typical analyses (nominal Air Dried) are:-

	Bowen R.O.M.	Blake R.O.M.
Inherent Moisture	1.5%	1.5%
Volatile Matter	20.0%	19.5%
Fixed Carbon	63.5%	58.3%
Ash	15.0%	20.7%
Total Sulphur	2.0%	1.0%
C.S.N.	5	0-1
Specific Energy	29.5 MJ/kg	27.0 MJ/kg

The Scott, Denison and Garrick seams are blended and washed to produce coking quality coal. Typical washed product qualities for a 4:1 blend of Scott Denison seam and Garrick seam are:-

Inherent Moisture	1.5%
Volatile Matter	26.0%
Fixed Carbon	63.5%
Ash	9.0%
Total Sulphur	0.9%
C.S.N.	6

Research Research into the gas outburst problem was halted in 1985 and NERDDC final report issued.

130 000 tonnes of coal were mined from an area which had been drilled and drained of gas.

Remarks On the domestic market, coal is primarily supplied to Mount Isa Mines Limited, Queensland Electricity Commission, Queensland Nickel Pty. Ltd., North Australian Cement Limited and Bowen Coke Works.

Coking coal production totalled 823 000 tonnes, most of which was exported to Japanese steel mills under long term contract, with a smaller tonnage sold to State-owned Bowen Coke Works which produces coke for Mount Isa Lead Smelter.

Late in the year new entries were opened from highwall of the Bowen Central Open-cut. This new steaming and coking coal underground mine in the Bowen seam will replace the No. 3 Underground Mine where mining was completed.

While no further major construction was undertaken, modifications are being made to improve the performance of the coking coal Preparation Plant.

COOK — COAL RESOURCES OF QUEENSLAND PTY. LTD.

Company Information This company is a subsidiary of McIlwraith McEacharn Operations Pty. Ltd.

Mine COOK COLLIERY

Location The Cook underground mine is located on the Blackwater field 216 km west of Rockhampton and 20 km south of Blackwater. Coal mined at Cook is hauled 11 km to the preparation plant and rail loadout. The product coal is railed 330 km to the port at Gladstone.

Operation Since acquisition of Cook colliery in May, 1983 expenditure has been incurred in constructing a new coal preparation plant facility and in acquiring new mining equipment the new coal preparation plant was commissioned in July, 1984.

Coal Quality There are two coal products:–

- a high grade coking coal (7% Ash, 0.4% Sulphur, 27% Volatiles, CSN 7 to 8).
- a high energy thermal coal (13% Ash, 0.4% Sulphur, 23-25% Volatiles, Specific Energy 29.68 MJ/kg Air Dried).

Sales Thermal coal is also being sold to the Taiwanese market.

DEVELOPED MINES

CURRAGH

CURRAGH QUEENSLAND MINING LIMITED (CQML)

Company Information

CQML operates the Curragh Mine on behalf of a co-venture comprising:-

ACI Coal Limited	(30 per cent)
Anaconda Australia Inc.	(30 per cent)
R.W. Miller & Company Pty. Limited	(30 per cent)
Mitsui Coal Development (Australia) Pty. Ltd.	(10 per cent)

Location

10 km north of Blackwater in Central Queensland.

Operation

Both steaming coal and coking coal is produced at Curragh. The steaming coal is for use by the Queensland Electricity Commission at Gladstone Power Station and ultimately for the new power station to be built at Stanwell near Rockhampton.

Steaming coal is being sold under a coal supply agreement between the co-venturers, The Queensland Coal Board and the Queensland Electricity Commission. This agreement involves the supply of 66.4 million tonnes of steaming coal over a period of twenty years.

The coking coal is exported on the following specifications:-

Total Moisture (As Received)	10.0% max.
Volatile Matter (Air Dried)	23.0% max.
Ash (Air Dried)	7.0% max.
Total Sulphur	0.60% max.
C.S.N.	$6^1/_2$-9
Hardgrove Index	70 min.

In situ measured surface mine coal reserves within the lease area are in the order of 170 million tonnes.

Mine Development

The Curragh Mine capacity is now 2.3 million tonnes of steaming coal and 2 million tonnes of coking coal per annum. The mine will be expanded in line with The Electricity Commission's coal supply agreement for 4 million tonnes of steaming coal and 2.8 million tonnes of coking coal.

Port

Export coal is shipped through the Gladstone Harbour Board Clinton Estate Facility. Curragh has two stockpile areas each of 300 000 tonnes capacity.

Town

Curragh developed housing for the mine workforce in Blackwater. The Curragh development has resulted in a population increase exceeding 1 200 in that town.

Marketing

A contract has been signed for the supply of 1.5 million tonnes of coking coal per annum to the Japanese steel mills. The balance of production is being sold to markets in Asia, Eruope and the Middle East.

DEVELOPED MINES

GERMAN CREEK — CAPRICORN COAL MANAGEMENT PTY. LTD.

Company Information

The participants in the joint venture are:-

Austen & Butta Collieries Pty. Ltd.	(21.40 per cent)
The Shell Company of Australia Limited	(16.68 per cent)
P.L. Mining Pty. Limited	(13.03 per cent)
National Mutual Life Association of Australasia	(13.03 per cent)
Jena (SFIT) Pty. Ltd.	(13.03 per cent)
Coal Developments (German Creek) Pty. Ltd. comprising:- National Coal Board and Commercial Union Assurance Company Ltd.	(12.06 per cent)
Ruhrkohle Australia Pty. Limited	(10.77 per cent)

Capricorn Coal Management Pty. Ltd. is managing the $400 million project on behalf of the joint venture.

Location

The mine is located approximately 180 km inland and can be reached from either of the regional coastal centres of Mackay or Rockhampton – 275 km and 302 km by road respectively.

Operation

During its early years of operation, the German Creek Mine will depend heavily on open-cut mining using four large draglines. However, Stage 2 development, the underground Central Colliery will be expanded in early 1986 with the introduction of the first longwall face in Queensland. This will increase production at the Central Colliery from its present level of 350 000 tonnes to 1.3 million tonnes per year.

Currently the annual output from the German Creek open-cut and underground operations is at the rate of 3.25 million tonnes. The coal handling and preparation plant employs dense medium, spirals and froth flotation processes. Because of the scale and nature of operations necessary to ensure the viability of the project, and its location in a semi-remote part of the State, development has included provision of major supporting infrastructure. Certain of this infrastructure is being expanded to meet the additional requirements of the Central Colliery developments.

Reserves

The main coking coal reserves in the leases are contained in three major seams — German Creek, Tieri and Aquila. These vary in average thickness from 1.7 m to 2.5 m.

Total *in situ* reserves of coking coal available to open-cut production by present mining methods are now estimated at 90 million tonnes. A further 1 110 million tonnes of *in situ* coal are mineable by underground methods.

Coal Quality

Coking coal produced from the project is of the following quality:-

Total Moisture (As Received)	10.0%
(Air Dried)	
Volatile Matter	20-22%
Ash	8.5%

Total Sulphur	0.8%
C.S.N.	8-9
Size	50 mm x 0

Railway

Exports of German Creek coal are shipped through Dalrymple Bay Coal Terminal at Hay Point, near Mackay.

Township

The company has established the town of Middlemount, 25 km from the mine, to accommodate 646 employees and their families. A total of 659 houses are planned to be built and the town has been designed to accommodate a population of 3 400 with provision for future expansion to 7 500. At June 30, 1985 the population was 2 683.

Preparation plant German Creek – spiral concentrators for treatment of fine coal in the 0.5–0.1 mm range.

DEVELOPED MINES

GREGORY — THE GREGORY JOINT VENTURE

Company Information

The Gregory Joint Venture was formed in April, 1984 to take up equity in the Gregory Mine, formerly owned and operated by BHP Minerals Limited.

The Gregory Joint Venture comprises:-

BHP Minerals Limited	(55.5 per cent)
Queensland Coal Trust	(21.75 per cent)
Bell Resources Ltd.	(10.00 per cent)
Australian Mutual Provident Society	(7.75 per cent)
Pancontinental Mining Limited	(5.00 per cent)

As from April 2, 1984 Utah Development Company Limited became responsible for the management of Gregory Mine for the Gregory Joint Venture. Queensland Coal Trust Management Limited has entered into discussions with Utah with the aim of Queensland Coal Trust acquiring a further 3.25 per cent in the Gregory Joint Venture.

Location

The Gregory open-cut mine is located 60 km north-east of Emerald.

Operation

Gregory Mine has a production capacity of 3 million tonnes of coking coal a year. A single seam, known as the Lilyvale seam, which forms part of the German Creek coal measures, is mined.

Employees at the mine as at June 30, 1985 totalled 412.

Coal Quality

Typical washed coal analyses for Gregory Mine are:-

Total Moisture (As Received)	10.0%
(Air Dried)	
Inherent Moisture	2.0%
Volatile Matter	32.0%
Ash	8.5%
Sulphur	0.65%
C.S.N.	8 - 9
Size	50 mm x 0

Exports

The bulk of Gregory coal is exported to Japan. During 1984-85 sales were also made to customers in Korea, Taiwan, Spain, France, Brazil and Algeria.

LALEHAM AND SOUTH BLACKWATER — THIESS BROS. PTY. LIMITED

Company Information

The South Blackwater mines are owned by Thiess Bros. Pty. Limited, a wholly owned subsidiary of CSR Limited and are operated as part of CSR's Coal Division.

Location

The mines are located 225 km west of Rockhampton and 343 km by rail from Gladstone.

DEVELOPED MINES

Operation

At June 30, 1985, 600 employees were engaged at the mines.

The operations have a production capacity currently in excess of 2 million tonnes per year and are capable of major expansion. Coal is produced from the open-cut areas of Terang, Togara, Laleham B and Kenmare using two draglines and a fleet of scrapers for overburden removal. At the Laleham underground mine continuous miners and shuttle cars are used.

Coal Quality

South Blackwater is a multi-seam operation which is worked by both open-cut and underground operations. By selective mining and preparation, coals of the following specifications can be produced:-

(Air Dried)	Coking Coal (Medium Volatile)	Steaming Coal
Inherent Moisture	1.5 - 2%	2.0%
Volatile Matter	27 - 28.7%	25.5%
Fixed Carbon	62.1 - 64.6%	62%
Ash	7 - 7.3%	10.5%
Sulphur	0.4 - 0.5%	0.75%
C.S.N.	6 - 7 1/2	-
Specific Energy	-	30.6 MJ/kg

Markets

Coking coal is supplied under annual contracts to the Japanese steel mills which in the fiscal year 1984-85 amount to 800 000 to one million tonnes. Steaming coal is exported to markets in the Pacific Basin and Europe. Coal is shipped from the three facilities at Gladstone.

MOURA — THIESS DAMPIER MITSUI COAL PTY. LTD.

Company Information

This company is a consortium comprising:-

Dampier Coal (Queensland) Pty. Ltd.	(58.0 per cent)
Thiess Holdings Limited	(22.0 per cent)
Mitsui & Co. Ltd. - Japan	(13.3 per cent)
Mitsui & Co. (Australia) Ltd.	(6.7 per cent)

Mines

MOURA UNDERGROUND NO. 2
MOURA UNDERGROUND NO. 4
OPEN-CUT MINES

Location

The open-cut and underground coal mining operations are located in the south-east flank of the Bowen Basin of Central Queensland.

Operation

OPEN-CUT – Overburden is stripped, after being drilled and blasted, by the use of four walking draglines. The exposed coal seam is also drilled and blasted before being trucked to an overland conveyor belt for transport to the preparation plant

UNDERGROUND – Two underground mines, Moura Nos. 2 and 4, are operating in the northern part of the mining area. Access to underground reserves is by direct entry through portals in exposed coal seams in previously strip-mined areas. All coal is mined by continuous miners and is transported by conveyor belts to the preparation plant.

DEVELOPED MINES

Coal Preparation

The minus 125 mm raw coal is delivered to the washplant feed stockpile via a 16 km, 2 000 tph overland conveyor system. Four dump stations/stockpiling installations are located along this conveyor to receive and crush run-of-mine coal to a topsize of 125 mm.

Railway

Coal is railed 184 km to the Port of Gladstone. Each train consists of three diesel locomotives and sixty wagons, containing approximately 3 000 tonnes.

Port of Shipment

The Barney Point Coal terminal at Gladstone is a private facility owned by Thiess Dampier Mitsui Coal Pty. Ltd., and operated by Bulk Handling and General Services Pty. Ltd. The facility handles coal from this consortium's Moura mines as well as coal from Thiess South Blackwater Mine, and other companies by arrangement. Moura coking coal is shipped through the Clinton Coal Loading Facility.

Coal Quality

The Moura operations mine medium volatile and high volatile coals from several locations. These coals are blended in specific proportions to produce a coking coal for the steel industry. The higher coking coal quality from the underground mines is necessary in order to maintain coking coal quality in the final export blend.

Open-cut coals of inferior coking properties are blended with washery middlings to produce a steaming coal. A low ash content variant of this blend is also marketed as non-coking coal for use for briquetting or blast furnace pulverised coal injection purposes.

Current export contracts call for the sale of 1.28 to 6 million tonnes per annum of coking coal to Japan and 1.0 million tonnes of energy coal to Japan and Asia.

The specification of Moura coal is:-

	Coking Coal	Non-Coking	Energy Coal
Total Moisture (As Received)	10.0%	10.0%	10.0%
(Air Dried)			
Inherent Moisture	–	–	2.5%
Volatile Matter	28-31%	30%	27-30%
Ash	8% with + 0.5% tolerance	8.5%	13.0%
Specific Energy	–	–	28.9 MJ/kg
Total Sulphur	0.55% max	0.6%	0.6%
Hardgrove Index	–	–	55 min
C.S.N.	6-8	2-3	-
Size	30 mm x 0	30 mm x 0	-

Future Development

Stripping capacity has been increased by an additional dragline and this will allow raw coal production to be increased by approximately one million tonnes per annum. To handle this increased tonnage upgrading of the washery is required. Detailed engineering design work for this upgrade has been completed. However, the project has been deferred pending an upturn in the demand for coal.

DEVELOPED MINES

NEWLANDS — NEWLANDS COAL PTY. LTD.

Company Information

The lease is held by Mount Isa Mines Limited, a member of the M.I.M. Holdings Limited Group.

Location

The field occurs within M.L. 365 and is situated 129 km west of Mackay and 81 km south of Collinsville. Further reserves are available from adjacent leases M.L. 381 and M.L. 382.

Reserves

The quoted reserves are contained in the Upper Newlands seam of 7.2 m average thickness. *In situ* reserves are:-

	Open-Cut (Million tonnes)	Underground (Million tonnes)
Measured (M.L. 365)	85	80

Coal Quality

Proximate analysis for washed coal product:-

Total Moisture (As Received)	8.0%
(Air Dried)	
Inherent Moisture	2.7%
Volatile Matter	25.8%
Fixed Carbon	57.5%
Ash	14.0%
Total Sulphur	0.5%
Specific Energy	28.46 MJ/kg

Remarks

Production commenced January 1984 and is currently achieving an annual rate of 4 million tonnes.

The township of Glenden is located approximately 32 km south of the mine site and accommodates mine personnel and their families.

The mine produces steaming coal exclusively for the export market and it is railed to the Port of Abbot Point, north of Bowen. The Port and rail facilities were constructed by M.I.M. and are dedicated to the Newlands and Collinsville mines.

Shipment of 3.6 million tonnes of saleable coal was achieved in 1984-85. The product is being sold to overseas steaming coal markets in Europe and Asia.

OAKY CREEK — OAKY CREEK COAL PROJECT - JOINT VENTURE

Ownership

The joint venturers in the Oaky Creek Mine comprise the following:-

Mount Isa Mines Ltd.	(79.0 per cent)
Hoogovens Delfstoffen B.V.	(8.5 per cent)
Nuova Italsider S.p.A.	(7.5 per cent)
Empresa Nacional Siderurgica S.A.	(5.0 per cent)

Mount Isa Mines Limited is the Manager for the joint venture.

DEVELOPED MINES

Location Oaky Creek is located 50 km north-east of Capella, which is 366 km by road north-west of Rockhampton.

Coal Quality The coal is medium volatile coking coal with the following proximate analysis:-

Total moisture (As Received)	10.0%
(Air Dried)	
Volatile Matter	28.9%
Ash	8.0%
Total Sulphur	0.8%
Size	50 mm x 0
C.S.N.	8-8$^1/_2$
Specific Energy	32.82 MJ/kg

Reserves Measured reserves of *in situ* coal are in excess of 300 million tonnes.

Remarks The mine is producing at an annual rate of 2.5 million tonnes. Three draglines, two Bucyrus Erie of 45 cubic metres bucket capacity and one Marion of 57 cubic metres bucket capacity, are operating.

All shipments are made from Dalrymple Bay Coal Terminal.

The mining workforce and dependents who are housed at Tieri, which is located 15 km from the mine, has a full range of services and recreational facilities.

Long term contracts are in force for the supply of 1.7 million tonnes of coking coal per year to consumers in Italy, the Netherlands and Spain; together with an additional contract for 500 000 tonnes per year to the Japanese steel mills.

RIVERSIDE — THIESS DAMPIER MITSUI COAL PTY. LTD.

Company Information See Moura

Mine RIVERSIDE OPEN-CUT

Location The Riverside area is immediately west of and adjacent to Utah's Goonyella mine. Most of the reserves occur in the Goonyella Lower seam some 8 m thick though nominal tonnages occur in the overlying Goonyella Middle seam which outcrops in three localities in the eastern part of the area.

Reserves *In situ* mineable reserves total 107.1 million raw tonnes. Estimated recoverable commercial product is 64.7 million tonnes. All reserves are mineable by open-cut methods.

DEVELOPED MINES

Mining Method

Conventional open-cut strip mining utilising three draglines each with 49 m^3 buckets is used to uncover the coal. After drilling and blasting, the exposed coal is loaded by electric shovel or front-end loader into 136 tonne bottom dump trucks for haulage to the dump station. From there the coal will be crushed to 45 mm by rotary breaker and stacked in one of two 50 000 tonne raw coal stockpiles prior to being fed to the preparation plant.

Coal Preparation

The 1350 raw tph preparation plant will clean 50 x 50 mm coal via 0.71 m diameter heavy medium cyclones and – 0.5 mm material via froth flotation. To optimise recovery of – 0.5 mm material alternative processing via water only cyclones is available. For ease of maintenance the plant is divided into six modules of equal capacity.

Coal Quality

Riverside product coal is medium prime coking with good plastic properties and blendability characteristics. The Riverside specification is:-

Total Moisture (As Received)	10.0% max.
(Air Dried)	
Volatile Matter	22.5-24.5%
Ash	9.8% max with + 0.5% tolerance
Total Sulphur	0.65% max.
C.S.N.	6-8
Size	50 mm x 0

Railway

A 10 km spur line was constructed from Goonyella to Riverside. The train loading facility at Riverside has a capacity of 2 500 tonnes per hour and the coal is railed to the port in unit trains each carrying 6 600 tonnes.

Port/Coal Loader

Riverside coal is shipped via the port facility at Dalrymple Bay which is adjacent to the existing Utah facility at Hay Point. The facility is designed for an initial throughput of 15 million tonnes per year.

Remarks

A long term contract for an output of 3.3 million tonnes per annum has been signed with Japanese Steel Mills.

TARONG

TARONG COAL

Company Information

Tarong Coal is owned and managed by Pacific Coal Pty. Limited, a wholly owned subsidiary of CRA Limited.

Mine

MEANDU OPEN-CUT

Location

South of Kingaroy, about 180 km north-west of Brisbane.

Reverves

In excess of 180 million tonnes within usual open-cut depths have been defined within the Meandu lease area. In addition, 190 million tonnes of open-cut potential occur within an Authority to Prospect held by the Company.

DEVELOPED MINES

Coal Quality

Indicative quality after washing is as follows:-

Total Moisture	14%
Volatile Matter	22% min.
Ash Content	28%
Total Sulphur	0.55% max.
Specific Energy	19.38 MJ/kg
Hardgrove Index	50 min.

Remarks

The Tarong mine was developed to supply coal to Tarong Power Station.

Output during 1984-85 was 1.15 million tonnes of coal. This is expected to increase to 5 million tonnes per year when the Tarong Power Station reaches full generating capacity. The coal preparation plant currently being constructed will ensure that coal quality meets the contract specifications of the Queensland Electricity Commission. The preparation plant will be commissioned in 1986.

Coal is transported to the power station by an overland conveyor which is 2 km in length.

At June 30, 1985, 126 people were working at the mine. This will increase to around 300 when full production is reached.

Housing has been established in the nearby towns of Yarraman, Nanango and Kingaroy.

YARRABEE — THIESS BROS. PTY. LIMITED

Company Information

The Yarrabee mine is operated by Thiess Bros. Pty. Limited, a wholly owned subsidiary of CSR Limited, and is operated as part of CSR's Coal Division.

Location

The mine is located approximately 40 km north of Blackwater and 280 km from Gladstone.

Reserves

Measured and Indicated Class 1 reserves of coal within M.L.196 stand at 37 million tonnes. Measured reserves suitable for mining by open-cut operation total 22.9 million tonnes.

Coal Quality

Yarrabee coal ranges from semi-anthracite to anthracite. Its high energy and carbon content makes it suitable for a wide range of processes including, steam raising, briquetting and for use in the carbide cement and ferro-alloy industries and metallurgical and electrode manufacturing and calcination. It is also suitable for blending with high volatile coking coal for use in steel making. The coal is low volatile, sub-hydrous and non-coking.

Several coal qualities can be produced; typical proximate analyses are as follows:-

	Low Ash	Medium Ash
(Air Dried)		
Inherent Moisture	1.5%	1.5%
Volatile Matter	9.5%	10.0%
Fixed Carbon	78.0%	69.0%
Ash	10.5%	18.0%
Total Sulphur	0.85%	0.85%
C.S.N.	0	0
Specific Energy	31.19 MJ/kg	28.47 MJ/kg

Operation

The mine is an open-cut operation with the capacity to produce 350 000 tonnes per year. It is crushed and screened to control sizing and is sold as an unwashed product.

Markets

Yarrabee coal is produced and exported for cement manufacture, briquetting purposes, domestic heating and a wide range of industrial uses in the Pacific Basin, South East Asia and Europe. The coal is also sold within Australia for a range of industrial uses and home heating. Export coal is shipped generally through Auckland Point, Gladstone.

Crushing and screning plant – Yarrabee

POTENTIAL COAL FIELDS

ACLAND
A. to P. 129C

THE SHELL COMPANY OF AUSTRALIA LIMITED

Location

The Acland Authority to Prospect comprises 47 sub-blocks, and is located 35 km north-west of Toowoomba.

Geology

The area is situated on the northern side of the Moreton Basin, and near surface lithologies comprise sediments representing the lower interval of the Walloon Coal Measures, which are of mid-Jurassic age.

Reserves

Surface mineable measured and first class indicated *in situ* reserves with overburden to coal ratios better than 5:1 (m^3/tonne) amount to 443 million tonnes distributed amongst three major deposit localities: Glen Roslyn (247 million tonnes), Sabine (104 million tonnes) and Manning Vale (92 million tonnes). The Manning Vale deposit is contiguous with a similar deposit in the adjacent Bowenville area – A. to P. 205C. Additional shallow and deeper second class indicated reserves in A. to P. 129C exceed 360 million tonnes.

Coal Quality

In the principal deposit, Glen Roslyn, the aggregate thickness of workable coal within a 20 m thick seam interval averages 10 m to 12 m. A selectively mined raw coal from this interval would have an ash content of approximately 33% and specific energy of 19.2 MJ/kg. However, washing of selected seams could generate products meeting significantly cleaner market specifications whilst still providing acceptable recovery of the resource.

The quality of Acland coal is similar to other Surat-Moreton Basin coals in that it is per-hydrous, high volatile, bituminous, with a high reactives content and low Hardgrove grindability index. Acland coal is in the upper half of Surat-Moreton coal ash content range, and at the lower end of the moisture range.

Remarks

Mining studies have indicated that feasibility of a truck/shovel based mining operation producing up to 2.6 million tonnes per year from a single pit in the northern part of the Glen Roslyn area, with option to double this capacity with an additional operation in a contiguous pit to the south. Product coal would ideally be supplied (as received) at 30% ash, 10% moisture and 19.6 Mj/kg specific energy to an electricity generating facility constructed locally.

Resource development is contingent on the availability of a suitable market. The Acland reserves are large, shallow and strategically located, and offer a relatively low-cost source of energy for power generation or, in the longer term, gasification or conversion.

POTENTIAL COAL FIELDS

BARALABA
M.L.'s 54, 70, 77, 107 & 166
A. to P. 257C

BARALABA COAL PTY. LTD.

Company Information

Baralaba Coal Pty. Ltd. is a wholly owned subsidiary of Allied Queensland Coalfields Limited, Brisbane.

Mine

DAWSON VALLEY MINE, BARALABA

Location

At Baralaba in the Dawson River Valley, 157 km by rail south-west of Rockhampton and 257 km by rail west of Gladstone.

Reserves

Detailed drilling has defined the structure in three areas referred to as the Mine Lease Area, Southern Area and North Western Area. The bulk of coal reserves in each of these areas occur in plunging synclines generally separated by thrust faulting. Measured reserves are given only for the Mine Lease Area where the average drill hole spacing is around 250 m.

In situ coal reserves total 439.55 million tonnes of which 176.74 million tonnes are placed in the measured and indicated categories. 21.97 million tonnes of measured and indicated reserves occur at a depth of less than 60 m.

Coal Quality

The coal at Baralaba is low volatile, semi-anthracite, ortho-hydrous, feebly caking and non-coking. It is suitable for steam raising, ore smelting, briquette manufacture and blending into coking coals.

Seams of prime importance are Boyd, Cameron, Reid, Doubtful, Dawson, Dunstan and Coolum Seams, for which the following specifications on an air dried basis could be expected.

Proximate Analysis	Raw Coal	Clean Coal
Inherent Moisture	1.50-2.10%	1.40-1.70%
Volatile Matter	10.90-12.90%	10.30-12.70%
Fixed Carbon	70.00-77.30%	76.90-81.00%
Ash	10.10-15.50%	6.90-8.90%
Total Sulphur	0.48-0.57%	0.43-0.46%
Specific Energy MJ/kg	28.83-31.57	32.26-33.18
Hardgrove Index		80

Remarks

The company has entered into a contract to purchase the surface area of M.L. 166 from the local farmer. Plans to extract a 60 000 tonnes sample in 1986 for shipment through Gladstone to Japan for burning tests are currently being finalised. Following the successful completion of these tests and further sale contracts negotiated in both Japan and Korea, an open-cut mine of 260 000 tonnes per year (an extension of the sample pit) will operate for 3 years. During this time a one million tonnes per year hydraulic underground mine will be developed to extract the 26 million tonnes of mineable reserves in the immediate area.

POTENTIAL COAL FIELDS

BOWENVILLE A. to P. 205C — SHELL-OILMIN JOINT VENTURE

Ownership

The A. to P. is held by a joint venture comprising the Shell Company of Australia Limited (50%) and the Oilmin N.L. Petromin N.L. and Transoil N.L. group (50%).

Location

The A. to P. includes 56 sub-blocks in two groups, on the northern side of the Warrego Highway between Dalby and Jondaryan.

Geology

The areas are situated on the northern side of the Moreton Basin close to the ridge marking the westerly transition into the Surat Basin. Near surface lithologies comprise sediments representing the lower interval of the Walloon Coal Measures, which are of mid-Jurassic age.

Reserves

Surface mineable *in situ* reserves occurring at overburden to coal ratios of up to 3.5:1 (m^3/tonne) are estimated at 134 million tonnes (western 28 sub-blocks, measured and indicated) and 206 million tonnes (eastern 28 sub-blocks, indicated).

Coal Quality

The raw coal is typically high in ash and volatiles, low in sulphur and strongly per hydrous. However, it is readily washable to lower ash levels at acceptable yields. A typical product coal quality (as received) could be 28% ash, 12% moisture, 37% volatiles, 0.4% sulphur and 19.6 MJ/kg specific energy.

CHINCHILLA A. to P. 431C, TAROOM EXTENDED A. to P. 432C, WANDOAN EXTENDED A. to P. 433C — SURAT JOINT VENTURE

Ownership

Ownership is:-

CSR Limited	(42.67 per cent)
M.I.M. Holdings Limited	(42.67 per cent)
Wm. McQueen & Co. Pty. Ltd.	(14.66 per cent)

Location

The Chinchilla, Wandoan Extended and Taroom Extended are located in the Surat Basin, South East Queensland, 320, 400 and 450 km respectively west of Brisbane.

Reserves

Measured and indicated reserves in the tenements are as follows:—

	Measured (Million Tonnes)	Indicated (Million Tonnes)	Total (Million Tonnes)
Chinchilla	101	38	139
Taroom Extended	9	276	285
Wandoan Extended	132	253	385
Total	242	576	809

In addition, inferred coal resources are large.

Remarks

Mining studies have been completed for the 28 million tonnes Sefton Park deposit. These studies favoured development for domestic power station supply or small scale export. Production building up from a rate of 0.25 to 0.75 million tonnes per year of washed steaming coal is proposed. Mining of the low overburden Sefton Park deposit by shovel and truck methods has been planned.

Coal Quality

Sefton Park coal is high volatile bituminous, low rank, with a moderate ash and is suitable for power generation and cement manufacture.

A typical analysis of the washed Sefton Park coal is as follows:-

Total Moisture	11.6%
Inherent Moisture	6.0%
Volatile Matter	40.5%
Fixed Carbon	39.5%
Ash	14.0%
Total Sulphur	0.35%
Specific Energy	26.33 MJ/kg
Hardgrove Index	37

Drilling – Wandoan Extended

POTENTIAL COAL FIELDS

ENSHAM
A. to P. 426C

A.Q.C. – PACIFIC PTY. LTD.

Company Information

The Ensham Coal Project is a joint venture comprising:—

Bligh Coal Limited	(22.5 per cent)
Idemitsu Queensland Pty. Limited	(22.5 per cent)
Allied Queensland Coalfields Ltd.	(15.0 per cent)
Pacific Coal Pty. Limited	(15.0 per cent)
Agip Coal Australia Pty. Ltd.	(15.0 per cent)
Lucky Goldstar International (Australia) Pty. Ltd.	(5.0 per cent)
Rheinbraun Australia Pty. Limited	(5.0 per cent)

A.Q.C. — Pacific Pty. Ltd. a jointly owned company formed by two of the joint venturers has been appointed as operator.

Location

The Ensham Authority to Prospect is situated in central Queensland, between Emerald and Comet, about 220 km west of Rockhampton. The open-cut area lies near the eastern boundary of the Authority to the north-west of Comet.

Geology

The coal occurs in the Bowen Basin in the Rangal Coal Measures of late Permian age. Most of the reserves in the open-cut deposit occur where the Aries 2 and Castor seams coalesce to form a 5.5 m thick seam.

Reserves

Open-cut mineable *in situ* reserves in the measured category are estimated as follows:–

	Million Tonnes
To 60 m	75
60 m to 100 m	85

Extensive underground reserves also occur within the Authority to Prospect.

Coal Quality

The raw coal is classified as high volatile bituminous coal of moderate ash suitable for power generation. The average properties on an air dried basis of the raw coal from the 1984 drilling programme are as follows:

Moisture	4.2%
Ash	12.7%
Volatile Matter	26.7%
Fixed Carbon	56.4%
Total Sulphur	0.6%
Specific Energy	27.9 MJ/kg

Remarks

A trial pit has been excavated and a bulk sample extracted for testing purposes.

A detailed feasibility study is in progress and is expected to be completed at the end of 1986.

POTENTIAL COAL FIELDS

GORDONSTONE A. to P. 389C

DENHAM COAL ASSOCIATES

Information

Denham Coal Associates is a joint venture comprising:—

Kennecott Explorations (Australia) Ltd.	(45.0 per cent)
State Government Insurance Office (Qld.)	(22.5 per cent)
Lend Lease Resources Pty. Ltd.	(15.0 per cent)
John Holland Management Services Pty. Ltd.	(10.0 per cent)
New Hope Collieries Pty. Ltd.	(7.5 per cent)

Denham Coal Management Pty. Ltd., (Denham), a subsidiary of Kennecott Explorations (Australia) Ltd., manages the project on behalf of the Joint Venturers.

The Denham Coal Associates Joint Venture was awarded an Authority to Prospect for coal at Gordonstone (formerly Gregory South) in Central Queensland in March 1982. Since that time Denham has carried out a programme of exploration, coal and coke testing, engineering and market studies to assess the feasibility of an underground coal project in the region.

Location

Gordonstone is situated within the Bowen Basin of Central Queensland. Distance by rail to the major coal export port at Gladstone is 365 km. The tenement area comprises some 26 000 hectares.

The main Gregory to Gladstone railway runs across the eastern corner of the area and sealed roads link the mine site with the existing towns of Emerald and Capella, approximately 40 km distant.

Reserves

Exploration work carried out at Gordonstone by Denham since 1982 has proved over 900 million tonnes of *in situ* coal. On a conservative basis the exploitation of the reserves in the first phase of mine development would recover 108 million tonnes of raw coal, sufficient for a mine life of over 20 years at an annual raw coal output in excess of 4 million tonnes.

The reserves are located in a physical environment that will enable the German Creek Seam to be exploited by a conventional but flexible underground mine development.

The seam section and adjacent strata are amenable to the application of longwall retreat extraction systems giving high capacity and high productivity operations. Development necessary to block out longwall panels with low geological risk, will be adequately undertaken by conventional room and pillar techniques using continuous miners.

The high yield properties at Gordonstone coal enable the production of a lower ash premium grade coking coal together with an attendant high quality steam coal. The preparation plant has been designed with this inbuilt flexibility.

Coal Quality

Gordonstone coking coal is a medium to high volatile, low ash, strongly caking coal ideally suited for metallurgical coke blends. Laboratory analyses of bore coal samples have enabled the selection of the beneficiated product properties as detailed below. The product ash level has been selected at a zone on the washability curve that will allow optimum yield and ease of operation of the preparation plant at dense medium circuit gravities within normal operating ranges.

Target Contract Specifications:—

	Coking Coal	Steaming Coal
Total Moisture	8.0%	8-10%
(Air Dried)		
Inherent Moisture	2.0%	2.2%
Ash Content	6-7%	10–14%
Volatile Matter	33.5%	30%
Total Sulphur	0.60%	0.60%
CSN	8–9	—
Specific Energy	32.0 MJ/kg	29-30 MJ/kg

Mine and Surface Design

The mine and design criteria which have been adopted recognise the market requirement for a competitively priced, high quality coal product while maintaining an economically viable project.

Since approximately 50% of cash costs at the mine are labour related, the mine plan has been designed to maximise productivity levels of all operations. The area of the German Creek seam to be worked is essentially flat. The development plan envisages a two sided pit operation accessed by a combined coal belt and men and materials drift, and ventilation shafts. It has the flexibility to concentrate on longwall retreat faces as high capacity production units.

The German Creek seam is extensively worked in the Bowen Basin area of Queensland and its washability characteristics are fully known and understood. Beneficiation would be carried out by dense medium baths and cyclones and by froth flotation.

The surface facilities have been designed to provide a continuing high level of productivity from raw coal and coal preparation, through overhead product loadout silos into unit train rail cars. A prime aim has been to optimise clean coal recovery at target ash specifications yet achieving low operating costs. The concept of the preparation plant has been modular design employing parallel circuits.

Railway and Port

Product coal will be transported from mine to port at Gladstone by the Government Railways system which will be connected to the mine via a spur and loadout loop. Overhead supplied electric unit trains of 5 400 tonne capacity will haul the coal to the Clinton Coal Facility at Gladstone.

Employment

It is planned that the mine will employ 530 persons including staff.

Remarks

Denham has made application for the grant of a Mining Lease over the Gordonstone reserves. Leases are normally granted for 21 years with the option of renewal. The lease conditions are yet to be negotiated with the Queensland Government.

POTENTIAL COAL FIELDS

HAIL CREEK M.L. 312

HAIL CREEK COAL PTY. LIMITED

Company Information

The Hail Creek coal project is a joint venture between:-

AAR Limited – (a wholly owned subsidiary of CSR Limited)	(44 per cent)
Esso Exploration and Production Australia Inc. – (a subsidiary of Exxon Corporation)	(25 per cent)
IOL Coal Pty. Limited – (a subsidiary of CRA Limited)	(25 per cent)
Marubeni Coal Pty. Ltd. – (a subsidiary of Marubeni Corporation)	(4 per cent)
Sumisho Coal Development Pty. Ltd. – (a subsidiary of Sumitomo Corporation)	(2 per cent)

Hail Creek Coal Pty. Limited, a wholly owned subsidiary of CSR Limited, has been appointed Operator for the Joint Venture and Sales Representative for each of the Venturers.

Reserves

The Hail Creek coal field contains 740 million tonnes of low volatile, hard coking coal. Measured reserves are 158 million tonnes and indicated Class 1 reserves are 582 million tonnes. Approximately 90% of the *in situ* measured reserves are considered to be amenable to open-cut mining.

Drilling has indicated a further 96 million tonnes of coking coal in the Lake Elphinstone coal field, 15 km west of Hail Creek.

Coal Quality

Processing Hail Creek coal to an ash content of 10.5% gives a 70% yield of low volatile, low sulphur, hard coking coal with the following average properties:-

Inherent Moisture	1.0%
Volatile Matter	19.9%
Fixed Carbon	68.6%
Ash	10.5%
Total Sulphur	0.38%
Phosphorus	0.068%
C.S.N.	6-7
Fluidity	60 dd/m
Mean Max. Reflectance (R_0 (max.))	1.30
Coke Strength J.I.S. 30 revs/ +15 mm	93.5

Development

The planning of the mine, preparation plant, town, railway, water and power supplies and port, for an annual production of up to 4 500 000 tonnes of product coal is being undertaken by Hail Creek Coal Pty. Ltd. A decision to proceed with construction is primarily dependent on securing sales contracts for the project.

MACALISTER A. to P. 413C

MARATHON PETROLEUM AUSTRALIA, LTD.

Company Information

Marathon Petroleum Australia, Ltd. is a wholly owned subsidiary of the Marathon Oil Company of the U.S.A. Marathon Oil is wholly owned by the United States Steel Corporation.

Location

Macalister is 40 km north-west of Dalby, about 250 km west of Brisbane.

Reserves

The reserves are typically contained in 3 to 6 seams up to 12 metres thick. The average thickness of coal over the deposits is in excess of 8 metres.

Over 440 million tonnes of reserves with less than 60 metres overburden have been delineated.

The status of the reserves:-

	Million Tonnes
Measured	265
Indicated Class I	157
Indicated Class II	18
	440

Coal Quality

The Macalister coal is a typical per-hydrous Walloon coal suitable for steam raising or as a feedstock for coal conversion.

An indicative specification for a washed coal product is:-

Proximate Analysis (Air Dried)

Inherent Moisture	8%
Volatile Matter	39%
Fixed Carbon	39%
Ash	14%
Total Sulphur	0.4% max.
Specific Energy	25.1 MJ/kg
Hardgrove Index	32

Remarks

Detailed engineering studies have been completed of projects for both export and domestic markets.

An open-cut trial pit has been excavated at Macalister to provide bulk samples for further evaluation.

Mine Planning

The coal will be mined by open-cut methods using compact bucketwheel excavators to remove the relatively soft overburden.

Regional Infrastructure

The mine workforce will be housed at Dalby which will be expanded to provide for the additional population.

It is proposed to develop a flood harvesting scheme on the Condamine River to provide water for the mine.

Transport

Detailed evaluations of both railway and slurry pipeline transport systems to port sites in southern Queensland have been completed.

POTENTIAL COAL FIELDS

MILLMERRAN A. to P. 203C

AMAX-MITSUI-MILLMERRAN JOINT VENTURE

Company Information

Amax Iron Ore Corporation	(65.625 per cent)
Millmerran Coal Pty. Limited	(20.00 per cent)
Mitsui Coal Development (Australia) Pty. Limited	(9.375 per cent)
Picon Explorations Pty. Limited	(5.00 per cent)

Location

A. to P. 203C (1) and (2) are situated south of Pittsworth and Millmerran, 160 km and 230 km respectively west of Brisbane. The A. to P. portions cover 121 sub-blocks (367 sq. km) and 115 sub-blocks (348 sq. km).

Resource

Exploration within the Walloon Coal Measures has delineated five deposits containing 1 950 million tonnes of *in situ* measured plus indicated coal reserves to 80 m depth, a minimum of 0.5 m seam thickness and maximum 10:1 volume waste:tonnes of coal overburden ratio. These reserves are distributed as:-

	Measured (Million Tonnes)	Indicated (Million Tonnes)
Felton East	420	150
Felton West	240	530
A. to P. 203C (1)	660	680
Commodore	185	45
Lochbar	50	-
Bringalily	190	140
A. to P. 203C (2)	425	185

Reserves are typically contained in two to six seams up to 12 m in cumulative thickness and at less than 7:1 cumulative mine areas overburden ratio.

Coal Quality

The coal is perhydrous and is suitable for use as a steaming coal. It may be beneficiated by conventional methods to the following coal quality:–

(Air Dried)	
Inherent Moisture	5%
Volatile Matter	42%
Ash	18%
Total Sulphur	0.5%
Specific Energy	25.5 MJ/kg
Hardgrove Index	35

Remarks

A trial box-cut has been established on the Commodore deposit and numerous samples have been taken for test work. Mining plans and feasibility studies have been prepared at various production levels up to 8 mtpa.

Successful revegetation of the box-cut spoil has been achieved. Mining studies on the remaining deposits are in progress.

POTENTIAL COAL FIELDS

A.'s to P. 53C, 57C, 123C and 303C

BRIGALOW MINES PTY. LTD.

Company Information

Brigalow Mines is a joint venture between:-

Thiess Bros. Pty. Limited (CSR Limited 100%)	(50 per cent)
Mount Isa Mines Limited (M.I.M. Holdings Ltd. 100%)	(50 per cent)

MONTO
A. to P. 303C

The Monto coal field, 120 km south of Gladstone contains measured plus indicated reserves to 80 m depth totalling 170 million tonnes. Quality of coal is suitable for steam raising.

ROLLESTON
A. to P. 57C

Rolleston is located in Central Queensland 350 km due west of the port of Gladstone.

Reserves

The Meteor Park deposit within A. to P. 57C near Rolleston has *in situ* measured reserves of 274 million tonnes contained at a depth of less than 80 m.

Measured and indicated *in situ* reserves of non-coking coal within A. to P. 57C total 422 million tonnes.

Coal Quality

Rolleston coal is a uniform, high volatile, non-coking coal with excellent steaming characteristics. It has a low ash content and will not require beneficiation to produce an export quality product.
The coal will be marketed with the following typical analysis:-

Total Moisture	15.0%
(Air Dried)	
Inherent Moisture	11.0%
Volatile Matter	28.7%
Fixed Carbon	50.2%
Ash	10.1%
Total Sulphur	0.5%
Specific Energy - Gross Air Dried	25.29 MJ/kg
Hardgrove Index	53

Remarks

The joint venture is proposing to develop an open-cut export project with scheduled production of 2 million tonnes in Year 1, 4 million tonnes in Year 2, and 5 million tonnes in Years 3 to 20.

WEST MOURA
A. to P.53C Area (1)

Investigations are aimed at establishing a small semi-anthracite export mine based on the West Moura Area 1 (Baralaba) deposit, where 20 million tonnes of shallow semi-anthracite suitable for surface mining are inferred.

YARRABEE SOUTH
A. to P. 123C

Semi-anthracite (16 million tonnes indicated) also occurs at shallow depth on A. to P. 123C Yarrabee South, adjacent to and as an extension of the CSR Yarrabee Mine deposit. Drilling indicates potential for development of a small-scale operation.

POTENTIAL COAL FIELDS

NEBO RESOURCE AREA — THIESS DAMPIER MITSUI COAL PTY. LTD.

Company Information

See Moura

Location

Six mineable coal deposits (Nebo Resource Area) have been delineated on both limbs of the North Bowen Basin some 140 km to 210 km by road west of the coastal city of Mackay.

These areas designated Wards Well, Poitrell, Kemmis Walker, South Walker, Bee Creek and Suttor Creek are collectively known as the Nebo Resource Area, the name being derived from the adjacent Nebo township. All deposits except Wards Well, may be mined by open-cut methods, and all except Suttor Creek are held under Mining Leases. Suttor Creek being a Mining Lease Application, has been recommended for grant by the Mining Warden's Court.

Coal Quality

The virgin deposits of the Nebo Resource Area are able to be geared to meet changing consumer demands in the future due to large reserves and the vast range of coal quality from one field to another. Coal quality and rank include medium volatile metallurgical blend coals, high medium and low volatile energy coals and high rank semi-anthracites.

The first step in the current strategy for the development of the Nebo Resource Area is based on the establishment of an open-cut mine to exploit the hard coking coal reserves at Riverside. This mine commenced operation in 1983 and is now producing as scheduled. This will be followed by successive developments of the other coal fields for the extraction of both energy coal and metallurgical blend coal when market conditions improve.

Reserves

Raw coal reserves amount to 1 242 million tonnes of which 334 million tonnes are mineable by open-cut methods and 908 million tonnes by underground methods.

PENTLAND A. to P. 249C — THE SHELL COMPANY OF AUSTRALIA LIMITED

Location

The Pentland Authority to Prospect comprises 80 sub-blocks in two groups, which are some 25 km apart and located 250 km to the south-west of Townsville. The northern area is crossed by the Flinders Highway and the Townsville-Mount Isa railway.

Geology

The areas are underlain by Late Permian coal measures deposited near the north-eastern margin of the Galilee Basin. Triassic and Tertiary sediments overlie the coal measure sequence, the Betts Creek Beds, which contain two groups of coal seams. The Pentland Upper group of seams is 10 m to 20 m thick, but is characteristically shaley and is of limited economic significance. The Lower Pentland group of seams has a thickness range of 20 m to 80 m, including up top 30 m of coal.

Reserves

The northern part of the A. to P. contains the Elimeek and Lauderdale deposits. Drilling has so far established *in situ* reserves of 389 million tonnes measured and indicated at Ellimeek, and 191 million tonnes measured at Lauderdale. All of these reserves are at stripping ratios of less than 6:1 and 52 milion at Lauderdale are at ratios of less than

4:1(m/tonne). The southern part of the A. to P. contains the Milray deposit, where indicated *in situ* reserves total 187 million tonnes at stripping ratios of up to 5:1 (m/tonne). Alternatively underground mineable *in situ* reserves of 208 million tonnes are available from a single seam at depths less than 200 m.

Coal Quality

The coal is high volatile bituminous, of low rank and with a high inherent ash. Typical raw coal quality (Air Dried) for the reserves is:-

	Surface Mineable	Underground Mineable
Moisture	8%	9%
Volatile Matter	22%	24%
Fixed Carbon	39%	50%
Ash	31%	17%
Total Sulphur	0.3%	0.3%
Specific Energy	18.4 MJ/kg	23.8 MJ/kg

Remarks

The coal reserves in the Pentland A. to P. represent a very large energy resource suitable for power generation and industrial use in the region.

TAROOM
A. to P. 189C
M.L. 52 ROMA

CSR LIMITED

Location

The deposit is situated approximately 7 km south-east of the town of Taroom in South Central Queensland. Taroom is 250 km south-west of the Port of Gladstone and is 400 km north-west of Brisbane.

Reserves

Measured and indicated reserves presently stand at 230 million tonnes, of which 195 million tonnes are available at depths of less than 60 m.

Coal Quality

Taroom coal has good combustion properties and thus represents a premium coal for power generation in Queensland or overseas. A typical analysis is as follows:-

(Air Dried)	Raw Coal	Washed Coal
Inherent Moisture	8.0%	7.6%
Volatile Matter	38.0%	43.1%
Fixed Carbon	33.0%	36.7%
Ash	21.0%	12.6%
Total Sulphur	0.31%	0.33%
Specific Energy	22.5 MJ/kg	26.0 MJ/kg

Remarks

Coal from Taroom has been tendered for domestic power supply contracts and preliminary export market studies have been completed. An open-cut operation is envisaged producing some 4 million tonnes of coal each year.

POTENTIAL COAL FIELDS

THEODORE
A. to P. 202C

THEODORE COAL PTY. LTD.

Company Information

The Theodore Coal Project is a joint venture between:-

Thiess Holdings Ltd.	(60 per cent)
The Shell Company of Australia	(40 per cent)

Reserves

This area contains 1340 million tonnes of measured and indicated Class1 bituminous coal, of which 250 million tonnes are capable of being won by open-cut mining. The coal is low in ash and sulphur and ideally suited for steam raising.

Coal Quality

In situ analysis is as follows:-

	Theodore North	Theodore South
(Air Dried)		
Inherent Moisture	4.6%	6.5%
Volatile Matter	30.9%	32.0%
Fixed Carbon	50.6%	52.0%
Ash	13.9%	9.5%
Total Sulphur	0.5%	0.4%
CSN	1	$^1/_2$
Specific Energy	27.3 MJ/kg	27.5 MJ/kg
Hardgrove Index	53	53

Development

Planning for the development of a 4.5 million tonnes a year open-cut mining operation at Theodore North is being undertaken by Theodore Coal Pty. Ltd., a CSR Limited subsidiary that has been appointed manager of the project. The opening of mines at Theodore South could increase total production from Theodore to 9 million tonnes a year. A decision to proceed with construction of the Theodore North mine is primarily dependent on securing sales contracts.

WANDOAN
A. to P. 157C

BRIGALOW MINES PTY. LTD.

Ownership

CSR Limited	(50 per cent)
M.I.M. Holdings	(50 per cent)

Location

In the Surat Basin, 373 km south-west of Gladstone.

Reserves

Measured and indicated *in situ* reserves total 650 million tonnes of low overburden coal at depths less than 80 m.

Coal Quality

Wandoan coal is eminently suitable for domestic electricity generation, export steaming coal and domestic coal conversion.

Proximate analyses are as follows:-

(Air Dried)	Raw Coal	Washed Coal
Inherent Moisture	8.9%	7.9%
Volatile Matter	35.0%	40.5%
Fixed Carbon	32.5%	40.9%
Ash	23.6%	10.7%
Total Sulphur	0.32%	0.28%
Specific Energy	21.23 MJ/kg	26.17 MJ/kg
Hardgrove Index	41	

Remarks

Feasibility studies have been completed for supply to both domestic and export markets. Production of raw coal with 20GJ/tonne and 25% ash delivered quality for a domestic power station has been proposed. Nominal initial production of 5 million tonnes per year of washed steaming quality coal for export is planned.

The Wandoan coal field was nominated by the Queensland Government for feasibility evaluation under the Imhausen Coal Conversion Study. The high quality and low cost of the very large resource is the basis for a number of feasibility studies by several coal conversion technology groups overseas.

Japan has entered a new phase in coal liquefaction research and development with the decision by NEDO's (New Energy Development Organisation) Sunshine Project to establish a 250 tpd pilot plant in Japan at a cost of $A400 million.

Brigalow Mines Pty. Ltd. has to date supplied over 600 tonnes of Wandoan coal for coal liquefaction testing purposes to the Sunshine Project.

WOLFANG M.L's 1874 and 1980

THE CLERMONT PROJECT - CLERMONT COAL MINES LTD.

Company Information

Clermont Coal Mines Ltd. is a joint venture between White Industries Ltd. (75%) and Mitsubishi Development Pty. Ltd. (25%).

Exploration

An Authority to Prospect was awarded to White Industries (Qld) Pty. Limited. The prospect area covered 614 square kilometres within which 5 sedimentary basins were delineated, all of which showed varying degrees of coal deposition.

Major economic reserves have been shown to exist in the Wolfang Basin and it is in this area that exploration was concentrated.

Since the granting of the Authority, total exploration drilling has been:-

	Open Hole (metres)	Cored (metres)
Exploratory	29 044	9 065
Large Diameter (200 mm)	570	157
Geotechnical	138	999
Groundwater Studies	3 019	
	32 771	10 221

POTENTIAL COAL FIELDS

Wolfang Basin Reserves

The drilling and core logging programme has defined six seams within the basin, with total reserves in excess of 260 million tonnes.

Most of the coal is readily accessible to open-cut mining operations and within the proposed mine area *in situ* reserves have been calculated at 241 million tonnes. Overburden to coal ratios average 3.2BCM overburden:1 tonne coal.

Of the reserves nominated in the open-cut area, 229 million tonnes are contained in the main Wolfang Seam, which has an average thickness of 29.8 m. In certain areas it is greater than 50 m thick and is of a remarkable consistent quality throughout the deposit.

Coal Quality

The indicated product coal specification is:-

(Air Dried)	
Inherent Moisture	5.5-6.5%
Ash	10-12%
Volatile Matter	28%
Fixed Carbon	58.5-55.5
Total Sulphur	0.2-0.4%
Hardgrove Index	56
Specific Energy	27.65 MJ/kg

Testing and analysis has been carried out on core samples from 50 mm and 200 mm diameter drill holes.

Because of the depth of overburden and the consequent cost of obtaining bulk samples use was made of core recovery from the thick seam to obtain sufficient coal for testing and analysis.

Indications are that the product specification can be achieved without washing.

Mine Planning

Feasibility studies for the development of an open-cut mine operation, employing trucks and shovels, have been completed and planning for detailed design is well advanced.

Initial minimum production is 3.5 million tonnes per year. Planning and design of the mine will allow for expansion to 10 million tonnes per year.

Railway

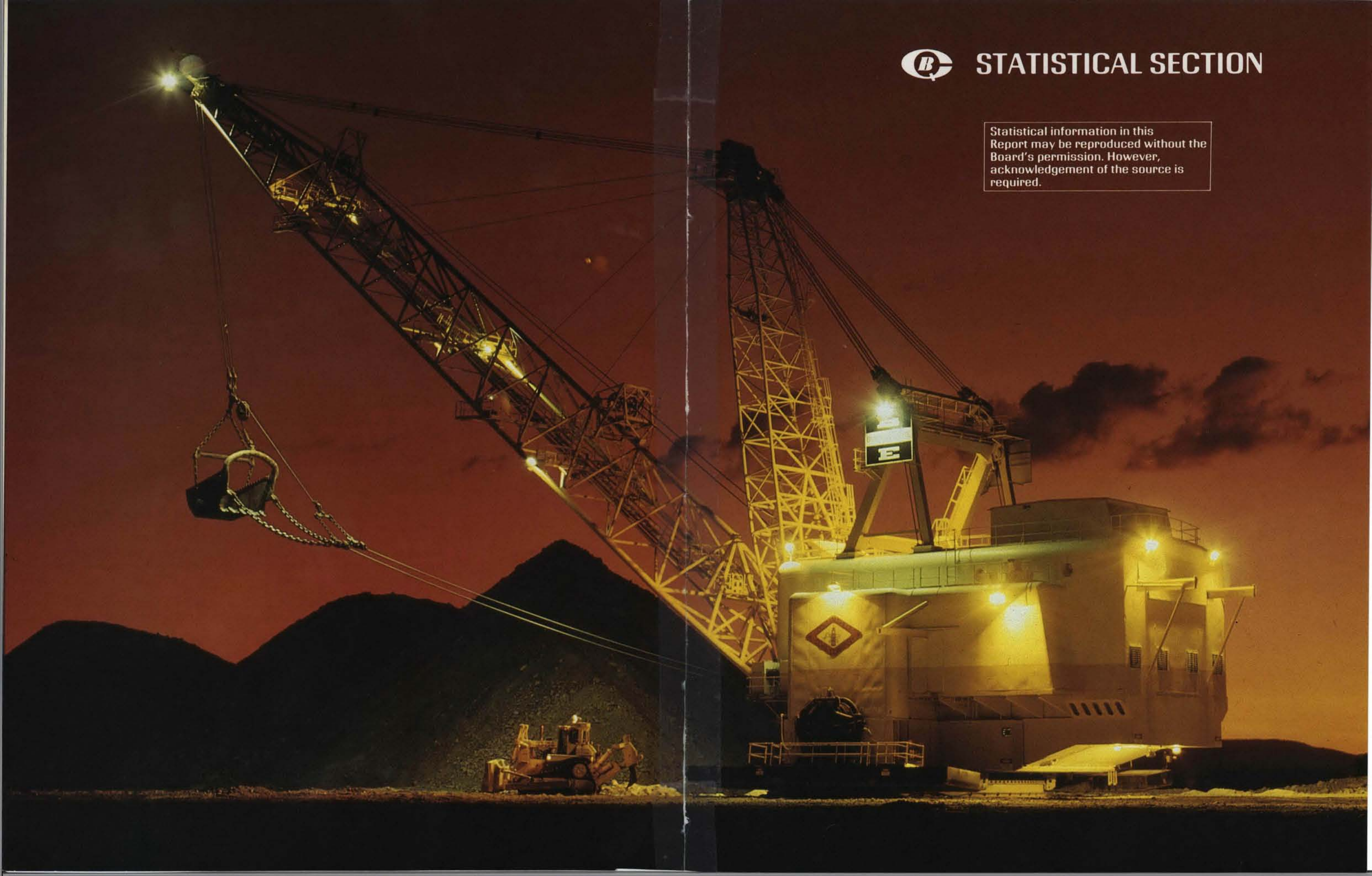
A 10 km spur line will connect the Wolfang Mine rail loop to the Blair Athol/Dalrymple Bay rail link, and where necessary, duplication and upgrading of the existing track will be carried out to handle the additional traffic.

Port

It is proposed that product coal from Clermont Coal Project will be loaded through the Dalrymple Bay Coal Terminal.

Workforce

The projected workforce is 270 persons.



STATISTICAL SECTION

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TABLE 1

QUEENSLAND'S COAL INDUSTRY — 10 YEARS SUMMARY

Years Ended June 30, 1976-1985.

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
MINES OPERATING —										
As at June 30	43	48	45	40	45	46	48	50	54	52
EMPLOYEES IN COAL INDUSTRY —										
As at June 30	5 777	5 955	6 180	6 424	7 374	7 965	8 664	8 773	9 674	10 393
MANSHIFTS WORKED AS PERCENTAGE OF MANSHIFTS POSSIBLE	88.87	90.02	90.19	90.69	86.06	85.27	87.39	93.15	93.05	90.16
NET PRODUCTION—'000 TONNES BY DISTRICTS										
(i) UNDERGROUND MINES										
West Moreton	1 393	1 565	1 511	1 443	1 252	1 611	1 555	1 727	1 701	1 400
Darling Downs	10	9	8	7	9	9	10	12	10	3
Maryborough	67	58	41	43	21	18	13	16	17	12
Kianga-Moura	425	573	531	404	430	423	512	507	395	461
Blackwater	511	658	678	581	762	681	883	927	852	1 208
Mackay	..	..	..	202	245	258	125	218	196	177
Bowen	536	457	435	414	271	350	329	418	446	471
	2 942	**3 320**	**3 204**	**3 094**	**2 990**	**3 350**	**3 427**	**3 825**	**3 617**	**3 732**
(ii) OPEN-CUT MINES										
West Moreton	1 065	1 229	1 130	779	715	1 065	1 210	1 354	1 236	1 590
Nanango	..	..	..	..	..	..	..	..	603	1 154
Kianga-Moura	2 017	1 959	1 739	2 082	1 742	1 838	2 094	1 396	1 856	1 558
Callide	1 330	1 254	1 530	1 906	2 086	2 444	2 313	3 542	3 737	3 002
Blackwater	4 186	4 048	4 066	5 401	5 626	7 416	8 918	10 309	14 547	16 833
Blair Athol	209	144	147	113	111	100	96	132	934	3 668
Mackay	11 877	13 401	12 658	13 148	13 850	15 968	15 425	14 288	16 761	21 384
Bowen	296	316	479	416	390	668	793	966	745	1 367
	20 980	**22 351**	**21 749**	**23 845**	**24 520**	**29 499**	**30 849**	**31 987**	**40 419**	**50 556**
STATE TOTAL	**23 922**	**25 671**	**24 953**	**26 939**	**27 510**	**32 849**	**34 276**	**35 812**	**44 036**	**54 288**

NET SALEABLE OUTPUT—TONNES										
(a) State—Per Employee	4 141	4 311	4 038	4 194	3 731	4 124	3 956	4 082	4 552	5 224
(b) State—Per Working Day Possible	104 007	109 240	108 491	117 127	119 607	142 204	144 015	147 983	184 251	228 102
(c) Per Manshift Worked										
Underground Mines										
Face	22.79	23.41	23.82	20.96	21.66	22.71	21.95	22.70	24.45	25.18
Overall	6.58	6.49	6.33	6.15	6.11	6.01	6.06	6.53	7.05	7.59
Open-cut Mines										
Overall	22.56	21.35	20.12	20.76	20.69	22.69	21.14	18.99	21.27	24.76
STATE OVERALL	**17.47**	**16.54**	**15.76**	**16.36**	**16.43**	**17.66**	**16.93**	**15.78**	**18.25**	**21.43**
COAL CONSUMPTION—'000 TONNES										
AREAS										
Brisbane Metropolitan	467	551	635	422	468	462	490	473	503	409
Southern Queensland	2 341	2 407	1 917	1 587	1 856	1 703	1 539	1 441	1 943	2 681
Central Queensland	1 716	2 063	2 573	3 318	3 652	4 218	4 600	5 649	6 315	6 211
North Queensland	799	863	905	826	653	735	869	1 053	1 070	1 146
STATE TOTAL	**5 323**	**5 884**	**6 030**	**6 153**	**6 629**	**7 118**	**7 498**	**8 616**	**9 831**	**10 447**
INDUSTRY										
Electricity	3 848	4 315	4 540	4 520	4 882	5 346	5 653	6 709	7 636	8 240
Metal Processing	1 004	1 107	1 043	1 179	1 256	1 261	1 201	1 224	1 437	1 439
Building Materials	280	284	272	277	283	266	362	357	274	314
Paper Pulp and Board	60	61	55	56	61	61	77	80	81	80
Coke Works	49	40	54	56	53	66	53	66	67	62
Food Processing	48	43	33	31	51	74	103	102	107	103
Miscellaneous	34	34	33	34	43	44	49	78	229	209
STATE TOTAL	**5 323**	**5 884**	**6 030**	**6 153**	**6 629**	**7 118**	**7 498**	**8 616**	**9 831**	**10 447**
EXPORTS—'000 TONNES										
Interstate Sales	435	499	383	383	579	497	128	91	15	18
Overseas Countries	16 388	18 965	20 118	18 836	21 296	23 727	24 862	26 405	33 095	45 504
STATE TOTAL	**16 823**	**19 464**	**20 501**	**19 219**	**21 875**	**24 224**	**24 990**	**26 496**	**33 110**	**45 522**

TABLE 2

NET COAL PRODUCTION (SALEABLE) BY DISTRICTS

Years Ended June 30, 1965-1985 ('000 Tonnes)

YEAR	DISTRICT											
	WEST MORETON			DARLING DOWNS	NANANGO	MARY-BOROUGH	ROCK-H'TON	KIANGA-MOURA			CALLIDE	BLAIR ATHOL
	U/ground	Open-Cut	Total	U/ground	Open-Cut	U/ground	U/ground	U/ground	Open-Cut	Total	Open-Cut	Open-Cut
1965	1 927	..	1 927	74	..	179	70	381	847	1 228	126	113
1966	2 158	..	2 158	71	..	174	56	452	1 186	1 638	151	79
1967	2 101	48	2 149	60	..	141	38	505	1 258	1 763	204	83
1968	1 917	155	2 072	41	..	134	34	492	1 624	2 116	316	74
1969	1 936	234	2 170	20	..	116	23	531	2 435	2 966	356	52
1970	1 859	274	2 133	14	..	107	..	581	2 831	3 412	396	48
1971	1 921	337	2 258	12	..	110	..	736	2 795	3 531	443	82
1972	1 900	505	2 405	13	..	96	..	812	2 606	3 418	485	122
1973	1 720	574	2 294	13	..	72	..	859	2 803	3 662	587	118
1974	1 559	658	2 217	12	..	64	..	625	2 599	3 224	729	127
1975	1 481	1 000	2 481	11	..	67	..	646	2 171	2 817	1 005	216
1976	1 393	1 065	2 458	10	..	67	..	425	2 017	2 442	1 330	209
1977	1 565	1 229	2 794	9	..	58	..	573	1 959	2 532	1 254	144
1978	1 511	1 130	2 641	8	..	41	..	531	1 739	2 270	1 530	147
1979	1 443	779	2 222	7	..	43	..	404	2 082	2 486	1 906	113
1980	1 252	715	1 967	9	..	21	..	430	1 742	2 172	2 086	111
1981	1 611	1 065	2 676	9	..	18	..	423	1 838	2 261	2 444	100
1982	1 555	1 210	2 765	10	..	13	..	512	2 094	2 606	2 313	96
1983	1 727	1 354	3 081	12	..	16	..	507	1 396	1 903	3 542	132
1984	1 701	1 236	2 937	10	603	17	..	395	1 856	2 251	3 737	934
1985	1 400	1 590	2 990	3	1 154	12	..	461	1 558	2 019	3 002	3 668

DISTRICT									TOTAL			YEAR
BLACKWATER			MACKAY			BOWEN						
U/ground	Open-Cut	Total	U/ground	Open-Cut	Total	U/ground	Open-Cut	Total	UNDER-GROUND	OPEN-CUT	STATE TOTAL	
..	..	..	..	..	..	229	12	241	2 860	1 098	3 958	1965
..	..	..	..	..	..	326	..	326	3 237	1 416	4 653	1966
..	..	..	..	..	..	374	..	374	3 219	1 593	4 812	1967
..	502	502	..	..	..	316	..	316	2 934	2 671	5 605	1968
5	1 358	1 363	..	..	..	436	..	436	3 067	4 435	7 502	1969
2	2 841	2 843	..	..	..	492	..	492	3 055	6 390	9 445	1970
208	3 747	3 955	..	214	214	517	..	517	3 504	7 618	11 122	1971
480	3 506	3 986	..	3 150	3 150	575	122	697	3 876	10 496	14 372	1972
502	3 910	4 412	..	6 856	6 856	633	170	803	3 799	15 018	18 817	1973
608	4 090	4 698	..	8 174	8 174	615	164	779	3 483	16 541	20 024	1974
606	4 342	4 948	..	11 438	11 438	638	281	919	3 449	20 453	23 902	1975
511	4 186	4 697	..	11 877	11 877	536	296	832	2 942	20 980	23 922	1976
658	4 048	4 706	..	13 401	13 401	457	316	773	3 320	22 351	25 671	1977
678	4 066	4 744	..	12 658	12 658	435	479	914	3 204	21 749	24 953	1978
581	5 401	5 982	202	13 148	13 350	414	416	830	3 094	23 845	26 939	1979
762	5 626	6 388	245	13 850	14 095	271	390	661	2 990	24 520	27 510	1980
681	7 416	8 097	258	15 968	16 226	350	668	1 018	3 350	29 499	32 849	1981
883	8 918	9 801	125	15 425	15 550	329	793	1 122	3 427	30 849	34 276	1982
927	10 309	11 236	218	14 288	14 506	418	966	1 384	3 825	31 987	35 812	1983
852	14 547	15 399	196	16 761	16 957	446	745	1 191	3 617	40 419	44 036	1984
1 208	16 833	18 041	177	21 384	21 561	471	1 367	1 838	3 732	50 556	54 288	1985

TABLE 3

PRODUCTION OF NET SALEABLE COAL BY INDIVIDUAL MINES

Years Ended June 30, 1981-1985 (Tonnes)

DISTRICT AND MINES	1981	1982	1983	1984	1985
WEST MORETON					
UNDERGROUND					
Box Flat No. 8	121 827	117 881	74 253	81 280	102 695
Box Flat No. 9	211 897	212 210	250 655	179 872	186 773
M.W. Haenke No. 1	264 504	216 219	189 112	182 737	122 405
M.W. Haenke No. 2	. .	1 963	87 869	144 601	143 228
New Hope	204 635	232 907	315 782	366 766	362 369
Oakleigh No. 3 and 5	123 565	116 247	125 268	114 327	115 980
Rhondda No. 1	119 988	86 197	79 970	105 085	41 184
Rhondda No. 5	154 948	172 021	150 052	137 692	125 873
Southern Cross No. 9	51 074	69 010	103 663	11 375	. .
Southern Cross No. 11	76 736	54 449	. .	. .	. .
Southern Cross No. 12	74 303	64 795	73 338	70 536	1 521
Southern Cross No. 14	. .	40	33 427	45 579	. .
Southern Cross No. 15	. .	. .	. .	5 210	28 497
Westfalen No. 3	207 081	210 843	243 645	255 534	169 182
	1 610 558	**1 554 782**	**1 727 034**	**1 700 594**	**1 399 707**
OPEN-CUT					
Amberley	95 184	114 017	228 908	329 176	525 166
Blackheath	23 290	21 260	5 969	. .	1 186
Bogside Extd.	. .	. .	. .	. .	6 672
Box Flat No. 2	48 380	58 625	62 623	85 132	139 117
New Hope	258 186	153 085	136 224	31 652	146 564
New Whitwood	201 165	366 150	392 320	454 788	496 936
Oakleigh	30 570	44 430	78 874	60 926	71 789
Rhondda Rob Roy	. .	. .	. .	. .	5 948
Rylance No. 3	114 705	108 309	57 263	. .	. .
Southern Cross No. 3	184 158	209 278	264 442	179 686	59 443
Wattle Glen	109 662	135 327	127 753	91 193	. .
Wattle Glen Extd.	. .	. .	. .	3 524	137 784
	1 065 300	**1 210 481**	**1 354 376**	**1 236 077**	**1 590 605**
DISTRICT TOTAL	**2 675 858**	**2 765 263**	**3 081 410**	**2 936 671**	**2 990 312**

Table 3 (Continued)

DISTRICT AND MINES	1981	1982	1983	1984	1985
DARLING DOWNS					
UNDERGROUND					
Acland No. 3	9 322	9 792	12 202	9 833	3 104
NANANGO					
OPEN-CUT					
Meandu	..	..	..	602 980	1 153 474
MARYBOROUGH					
UNDERGROUND					
Burgowan No. 12	17 438	13 133	16 389	17 013	11 767
KIANGA-MOURA					
UNDERGROUND					
Moura No. 2	246 361	302 027	239 319	246 619	309 712
Moura No. 4	177 039	209 673	267 711	148 156	151 501
	423 400	**511 700**	**507 030**	**394 775**	**461 213**
OPEN-CUT					
Kianga	602 215	..	..	..	
Moura	1 235 561	2 093 929	1 396 422	1 856 431	1 558 166
	1 837 776	**2 093 929**	**1 396 422**	**1 856 431**	**1 558 166**
DISTRICT TOTAL	2 261 176	2 605 629	1 903 452	2 251 206	2 019 379
CALLIDE					
OPEN-CUT					
Boundary Hill	..	..	874 060	1 463 585	1 341 687
Callide	2 444 261	2 312 680	2 667 613	2 273 613	1 659 955
	2 444 261	2 312 680	3 541 673	3 736 661	3 001 642
BLAIR ATHOL					
OPEN-CUT	99 758	95 688	132 437	934 174	3 667 935

Table 3 (Continued)

DISTRICT AND MINES	1981	1982	1983	1984	1985
BLACKWATER					
UNDERGROUND					
Ballamoo	..	..	12 192	..	..
Cook	325 254	436 091	361 691	519 452	668 842
*German Creek Central	..	..	1 400	54 820	163 562
Leichhardt	13 630	8 617	..	..	..
South Blackwater No. 1	342 542	437 965	551 176	277 913	376 170
	681 426	**882 673**	**926 459**	**852 185**	1 208 574
OPEN-CUT					
Blackwater	4 741 326	4 724 642	4 150 399	4 021 103	3 791 857
Curragh	..	..	..	2 173 099	3 405 797
German Creek	..	510 642	2 302 609	2 462 158	2 601 639
Gregory	1 438 618	2 341 711	2 001 807	2 012 348	2 894 097
Oaky Creek	..	..	535 343	2 457 598	2 534 903
South Blackwater	1 236 445	1 199 180	1 117 433	1 200 498	1 372 982
Yarrabee	..	142 002	201 175	219 898	231 373
	7 416 389	**8 918 177**	**10 308 766**	**14 546 702**	**16 832 648**
DISTRICT TOTAL	**8 097 815**	**9 800 850**	**11 235 225**	**15 398 887**	**18 041 222**
MACKAY					
UNDERGROUND					
Harrow Creek	**257 751**	**125 299**	**217 647**	**196 407**	**176 652**
OPEN-CUT					
Goonyella	4 300 878	4 325 597	4 248 587	4 451 347	3 743 740
Newlands	..	..	..	515 021	3 745 681
Norwich Park	3 952 624	4 389 813	2 527 094	2 497 902	2 720 203
Peak Downs	4 035 768	3 608 190	3 872 258	3 276 366	3 986 964
Riverside	..	..	..	2 021 047	3 053 853
Saraji	3 678 338	3 101 525	3 640 113	3 998 855	4 133 891
	15 967 608	**15 425 125**	**14 288 052**	**16 760 538**	**21 384 332**
DISTRICT TOTAL	**16 225 359**	**15 550 424**	**14 505 699**	**16 956 945**	**21 560 984**
BOWEN					
UNDERGROUND					
Bocum	..	..	..	..	2 648
Bowen No. 2	233 025	215 689	299 038	309 182	311 275
Bowen No. 3	117 126	113 497	118 832	137 358	157 309
	350 151	**329 186**	**417 870**	**446 540**	**471 232**
OPEN-CUT					
Bowen Central No. 3	95 815	485 628	915 171	396 854	**477 039**
Dacon East No. 4	572 231	307 240	50 428	..	..
Garrick West S/D	..	..	..	348 327	890 172
	668 046	**792 868**	**965 599**	**745 181**	**1 367 211**
DISTRICT TOTAL	**1 018 197**	**1 122 054**	**1 383 469**	**1 191 721**	**1 838 443**

* Developing mines

TABLE 4

SOME EQUIPMENT INSTALLED AT QUEENSLAND MINES*

Number of Installed Units June 30, 1985

UNDERGROUND MINES	
Air Compressors	37
Belt Conveyors	186
Chain Conveyors	27
Coal Cutters	1
Coal Loaders	2
Continuous Miners	50
Haulages and Winders	12
Preparation Plants	7
Roofbolters	18
Shuttle Cars	96
Trickle and Pod Dusters	19
Ventilating Fans	38
Water Pumps	138
Workshops	14
Miscellaneous	35
OPEN-CUT MINES	
Air Compressors	152
Belt Conveyors	50
Coal Haulers	208
Cranes	87
Dozers	194
Draglines	52
Explosive Vehicles	30
Fire Units	25
Front-end Loaders	107
Preparation Plants	18
Pumps	316
Rotary Drills	68
Scrapers	135
Shovels	30
Trucks	1 274
Ventilation Fans	19

**By courtesy of the Department of Mines*

TABLE 5
AVERAGE DAILY OUTPUT SALEABLE COAL
— (238 WORKING DAYS POSSIBLE)

Years Ended June 30, 1984 and 1985 (Tonnes)

DISTRICT AND MINES	1984	1985
WEST MORETON		
UNDERGROUND		
Box Flat No. 8	340	431
Box Flat No. 9	752	785
New Hope	1 535	1 523
Oakleigh	478	487
Rhondda No. 1	440	173
Rhondda No. 5	576	529
M.W. Haenke Nos. 1 & 2	1 370	1 116
Southern Cross No. 9	* 47	..
Southern Cross No. 12	295	* 6
Southern Cross No. 14	191	..
Southern Cross No. 15	* 22	* 120
Westfalen No. 3	1 069	711
OPEN-CUT		
Amberley	1 377	2 206
Blackheath	..	* 5
Bogside Extd.	..	* 28
Box Flat No. 2	356	584
New Hope	132	616
New Whitwood	1 903	2 088
Oakleigh	255	302
Rhondda Rob Roy	..	* 25
Southern Cross No. 3	752	* 250
Wattle Glen	* 382	..
Wattle Glen Extd.	* 15	579
DARLING DOWNS		
UNDERGROUND		
Acland No. 3	41	* 13
MARYBOROUGH		
UNDERGROUND		
Burgowan No. 12	71	50
NANANGO		
OPEN-CUT		
Meandu	*2 523	4 847
KIANGA-MOURA		
UNDERGROUND		
Moura No. 2	1 032	1 301
Moura No. 4	620	637
OPEN-CUT		
Moura	7 767	6 547

** Not producing for full year*

DISTRICT AND MINES	1984	1985
CALLIDE		
OPEN-CUT		
Boundary Hill	6 124	5 637
Callide	9 510	6 975
BLACKWATER		
UNDERGROUND		
Cook	2 173	2 810
German Creek Central	230	687
South Blackwater No. 1	1 163	1 581
OPEN-CUT		
Blackwater	16 825	15 932
Curragh	*9 092	14 310
German Creek	10 302	10 931
Gregory	8 420	12 160
Oaky Creek	10 283	10 651
South Blackwater	5 023	5 769
Yarrabee	920	972
BLAIR ATHOL		
OPEN-CUT		
Blair Athol	3 909	15 411
MACKAY		
UNDERGROUND		
Harrow Creek	822	742
OPEN-CUT		
Goonyella	18 625	15 730
Newlands	*2 155	15 738
Norwich Park	10 451	11 430
Peak Downs	13 709	16 752
Riverside	*8 456	12 831
Saraji	16 732	17 369
BOWEN		
UNDERGROUND		
Bocum		* 11
Bowen No. 2	1 293	1 308
Bowen No. 3	575	661
OPEN-CUT		
Bowen Central No. 3	1 661	2 005
Garrick West S/D	1 457	3 740
TOTAL — UNDERGROUND	**15 135**	15 682
— OPEN-CUT	**169 116**	212 420
— STATE	**184 251**	228 102

TABLE 6

(A) OUTPUT OF SALEABLE COAL PER MANSHIFT WORKED

Years Ended June 30, 1981-1985 (Tonnes)

DISTRICT	1981	1982	1983	1984	1985
UNDERGROUND MINES					
West Moreton					
Face	21.77	19.32	19.70	20.14	19.38
Overall	6.44	6.15	6.22	6.73	6.49
Darling Downs					
Face	13.57	14.66	15.37	14.88	10.70
Overall	3.36	3.82	4.63	3.94	2.80
Maryborough					
Face	12.25	11.44	11.56	12.55	9.77
Overall	5.77	4.74	5.11	5.99	4.67
Kianga-Moura					
Face	15.65	18.71	18.44	18.15	24.12
Overall	6.51	7.67	7.57	8.01	8.92
Blackwater					
Face	22.51	26.80	26.39	31.30	27.82
Overall	4.33	5.45	6.30	6.79	8.23
Mackay					
Face	73.35	32.15	45.78	54.12	46.49
Overall	17.35	8.83	13.22	12.44	11.39
Bowen					
Face	33.11	34.23	37.10	50.74	57.87
Overall	5.35	5.12	5.81	6.91	8.10
Face	**22.71**	**21.95**	**22.70**	**24.45**	**25.18**
Overall	**5.99**	**6.06**	**6.53**	**7.05**	**7.59**
OPEN-CUT MINES					
West Moreton					
Overall	19.47	19.84	22.77	24.17	28.08
Nanango					
Overall	..	..	..	22.60	41.29
Kianga-Moura					
Overall	9.75	10.52	7.27	11.70	9.57
Callide					
Overall	41.06	38.15	34.47	35.33	30.03
Blackwater					
Overall	25.22	21.78	19.77	23.10	23.82
Blair-Athol					
Overall	9.92	9.37	11.25	26.29	67.79
Mackay					
Overall	25.33	23.72	20.10	21.15	25.72
Bowen					
Overall	10.42	11.52	11.83	7.42	13.36
Overall	**22.67**	**21.14**	**18.99**	**21.27**	**24.76**
STATE Overall—All Mines	**17.66**	**16.93**	**15.77**	**18.25**	**21.43**

TABLE 6

(B) OUTPUT OF SALEABLE COAL PER MAN YEAR

Years Ended June 30, 1981-1985 (Tonnes)

DISTRICT	1981	1982	1983	1984	1985
UNDERGROUND MINES					
West Moreton	1 607	1 464	1 629	1 917	1 684
Darling Downs	777	890	1 017	819	517
Maryborough	1 453	1 010	1 366	1 418	905
Kianga-Moura	1 455	1 808	2 095	1 935	2 078
Blackwater	962	1 302	2 222	1 567	1 897
Mackay	3 790	1 816	3 201	2 976	2 677
Bowen	1 273	1 131	1 492	1 738	1 939
UNDERGROUND	**1 415**	**1 424**	**1 829**	**1 825**	**1 855**
OPEN-CUT MINES					
West Moreton	5 548	5 086	7 829	6 792	6 797
Nanango	..	..	..	5 854	8 544
Kianga-Moura	2 247	2 604	2 081	2 779	2 393
Callide	10 863	8 201	9 345	9 508	7 716
Blackwater	5 433	4 772	4 888	5 745	5 818
Blair Athol	2 494	2 278	2 037	5 338	14 272
Mackay	6 014	5 700	5 127	5 228	6 301
Bowen	2 212	2 509	2 367	1 721	3 194
OPEN-CUT	**5 271**	**4 930**	**4 787**	**5 255**	**6 032**
STATE	**4 124**	**3 956**	**4 082**	**4 552**	**5 224**

TABLE 7

EMPLOYMENT QUEENSLAND COAL INDUSTRY

Years Ended June 30, 1981-1985

YEAR	DISTRICT											YEAR
	West Moreton	Darling Downs	Mary-borough	Nanango	Kianga/ Moura	Callide	Black-water	Blair Athol	Mackay	Bowen	**TOTAL**	
					UNDERGROUND AND OPEN-CUT MINES TOTAL							
1981	1 194	12	12	..	1 109	225	2 073	40	2 723	577	**7 965**	1981
1982	1 300	11	13	..	1 087	282	2 547	42	2 775	607	**8 664**	1982
1983	1 233	12	12	90	913	379	2 526	65	2 855	688	**8 773**	1983
1984	1 069	12	12	103	872	393	3 076	175	3 272	690	**9 674**	1984
1985	1 065	..	13	135	873	389	3 530	257	3 460	671	**10 393**	1985
					UNDERGROUND MINES							
					Below Ground — Coal Face							
1981	335	3	6	..	127	..	156	..	17	53	**697**	1981
1982	378	4	6	..	115	..	155	..	20	48	**726**	1982
1983	383	4	6	..	98	..	95	..	20	40	**646**	1983
1984	357	4	6	..	78	..	175	..	13	39	**672**	1984
1985	332	..	6	..	40	..	201	..	18	39	**636**	1985
					Below Ground — Elsewhere							
1981	342	3	1	..	83	..	288	..	34	111	**862**	1981
1982	332	1	2	..	83	..	290	..	32	116	**856**	1982
1983	320	1	2	..	76	..	151	..	32	122	**704**	1983
1984	209	1	2	..	61	..	200	..	36	110	**619**	1984
1985	195	..	2	..	96	..	228	..	31	102	**654**	1985

					Above Ground — General							
1981	180	5	3	..	51	..	108	..	3	48	**398**	1981
1982	192	5	3	..	54	..	90	..	3	55	**402**	1982
1983	205	6	2	..	43	..	62	..	3	55	**376**	1983
1984	184	6	2	..	45	..	56	..	3	52	**348**	1984
1985	177	..	3	..	64	..	79	..	4	49	**376**	1985
					Above Ground — Administrative and Clerical							
1981	145	1	2	..	30	..	156	..	14	63	**411**	1981
1982	160	1	2	..	31	..	143	..	14	72	**423**	1982
1983	152	1	2	..	25	..	109	..	13	63	**365**	1983
1984	137	1	2	..	20	..	113	..	14	56	**343**	1984
1985	127	..	2	..	22	..	129	..	13	53	**346**	1985
					UNDERGROUND MINES — ALL CATEGORIES							
1981	1 002	12	12	..	291	..	708	..	68	275	**2 368**	1981
1982	1 062	11	13	..	283	..	678	..	69	291	**2 407**	1982
1983	1 060	12	12	..	242	..	417	..	68	280	**2 091**	1983
1984	887	12	12	..	204	..	544	..	66	257	**1 982**	1984
1985	831	..	13	..	222	..	637	..	66	243	**2 012**	1985

TABLE 7—Continued

YEAR	West Moreton	Nanango	Kianga/ Moura	Callide	Blackwater	Blair Athol	Mackay	Bowen	TOTAL	YEAR
	DISTRICT									
					OPEN-CUT MINES					
					General					
1981	179	..	597	156	943	30	1 964	234	**4 103**	1981
1982	227	..	601	202	1 329	31	2 073	239	**4 702**	1982
1983	166	47	522	281	1 493	51	2 100	294	**4 954**	1983
1984	170	52	518	292	1 838	115	2 328	316	**5 629**	1984
1985	221	77	476	294	2 122	185	2 530	320	**6 225**	1985
					Administrative and Clerical					
1981	13	..	221	69	422	10	691	68	**1 494**	1981
1982	11	..	203	80	540	11	633	77	**1 555**	1982
1983	7	43	149	98	616	14	687	114	**1 728**	1983
1984	12	51	150	101	694	60	878	117	**2 063**	1984
1985	13	58	175	95	771	72	864	108	**2 156**	1985
					OPEN-CUT MINES — ALL CATEGORIES					
1981	192	..	818	225	1 365	40	2 655	302	**5 597**	1981
1982	238	.	804	282	1 869	42	2 706	316	**6 257**	1982
1983	173	90	671	379	2 109	65	2 787	408	**6 682**	1983
1984	182	103	668	393	2 532	175	3 206	433	**7 692**	1984
1985	234	135	651	389	2 893	257	3 394	428	**8 381**	1985

TABLE 8

SUMMARY OF MANSHIFTS WORKED AND LOST AT QUEENSLAND MINES

Years Ended June 30, 1980-1985

YEAR	MANSHIFTS POSSIBLE	NUMBER WORKED		NUMBER LOST THROUGH									
				Industrial Disputes		Sickness		Compensation		Absenteeism		Other Causes	
		Number	% of Possible	Number	% of Possible	Number	% of Possible	Number	% of Possible	Number	% of Possible	Number	% of Possible
1980	1 959 466	1 686 323	86.06	152 135	7.76	42 955	2.19	26 366	1.35	51 301	2.62	386	0.02
1981	2 181 674	1 860 336	85.27	211 615	9.70	49 745	2.28	27 093	1.24	32 558	1.49	327	0.02
1982	2 316 773	2 024 705	87.39	160 133	6.91	55 366	2.39	30 305	1.31	45 921	1.98	343	0.02
1983	2 437 162	2 270 241	93.15	28 190	1.16	68 162	2.79	27 788	1.14	40 654	1.67	2 127	0.09
1984	2 593 687	2 413 495	93.05	51 153	1.97	65 785	2.54	26 040	1.00	37 061	1.43	153	0.01
1985	2 809 876	2 533 403	90.16	128 210	4.56	76 242	2.71	31 590	1.13	39 863	1.42	568	0.02

TABLE 9

MANSHIFTS WORKED AND LOST AND REASONS FOR LOSS

Years Ended June 30, 1983-1985

DISTRICT	MAN-SHIFTS POSSIBLE	MANSHIFTS WORKED		MANSHIFTS LOST		INDUSTRIAL DISPUTES	
		Number	% of Possible	Number	% of Possible	Number	% of Possible
UNDERGROUND MINES							
West Moreton							
1983	302 381	277 700	91.84	24 681	8.16	2 671	0.88
1984	274 751	252 612	91.94	22 139	8.06	2 223	0.81
1985	242 464	215 593	88.92	26 871	11.08	8 944	3.69
Darling Downs							
1983	2 869	2 637	91.91	232	8.09	10	0.35
1984	2 669	2 495	93.48	174	6.52	8	0.30
1985	1 178	1 109	94.14	69	5.86	..	..
Maryborough							
1983	3 435	3 209	93.42	226	6.58	10	0.29
1984	2 933	2 839	96.79	94	3.21	..	..
1985	2 815	2 521	89.56	294	10.44	102	3.62
Kianga-Moura							
1983	73 506	66 939	91.07	6 567	8.93	868	1.18
1984	54 677	49 296	90.16	5 381	9.84	974	1.78
1985	60 145	51 722	86.00	8 423	14.00	3 085	5.13
Blackwater							
1983	166 208	147 158	88.54	19 050	11.46	3 442	2.07
1984	140 657	125 458	89.19	15 199	10.81	5 257	3.74
1985	168 409	146 889	87.22	21 520	12.78	6 614	3.93
Mackay							
1983	18 084	16 461	91.03	1 623	8.97	153	0.85
1984	17 164	15 783	91.95	1 381	8.05	144	0.84
1985	17 853	15 506	86.85	2 347	13.15	8.58	4.81
Bowen							
1983	78 984	71 878	91.00	7 106	9.00	1 509	1.91
1984	71 172	64 580	90.74	6 592	9.26	842	1.18
1985	66 203	58 172	87.87	8 031	12.13	2 625	3.96
TOTAL UNDERGROUND MINES							
1983	**645 467**	**585 982**	**90.78**	**59 485**	**9.22**	**8 663**	**1.34**
1984	**564 023**	**513 063**	**90.96**	**50 960**	**9.04**	**9 448**	**1.68**
1985	**559 067**	**491 512**	**87.92**	**67 555**	**12.08**	**22 228**	**3.98**

REASONS FOR LOSS								YEAR
SICKNESS		COMPENSATION		ABSENTEEISM		OTHER CAUSES		
Number	% of Possible	Number	% of Possible	Number	% of Possible	Number	% of Possible	
10 427	3.45	7 774	2.57	3 785	1.25	24	0.01	1983
8 723	3.18	7 671	2.79	3 512	1.28	10	..	1984
6 942	2.86	7 529	3.11	3 379	1.39	77	0.03	1985
111	3.87	68	2.37	43	1.50	..	..	1983
80	3.00	60	2.25	26	0.97	..	..	1984
43	3.65	25	2.12	1	0.09	..	..	1985
144	4.19	41	1.19	19	0.56	12	0.35	1983
26	0.89	36	1.23	32	1.09	..	..	1984
38	1.35	135	4.79	14	0.50	5	0.18	1985
3 092	4.21	894	1.21	1 713	2.33	..	..	1983
2 303	4.21	732	1.34	1 372	2.51	..	..	1984
2 151	3.57	1 285	2.14	1 902	3.16	..	..	1985
5 676	3.41	4 453	2.68	5 022	3.02	457	0.28	1983
4 477	3.18	3 458	2.46	2 007	1.43	..	..	1984
6 592	3.91	5 137	3.05	3 028	1.80	149	0.09	1985
406	2.24	818	4.52	246	1.36	..	..	1983
311	1.81	580	3.38	346	2.02	..	..	1984
425	2.38	740	4.14	324	1.82	..	..	1985
2 892	3.66	959	1.22	1 746	2.21	..	..	1983
3 205	4.50	1 007	1.42	1 538	2.16	..	..	1984
3 155	4.77	807	1.22	1 444	2.18	..	..	1985
22 748	**3.52**	**15 007**	**2.33**	**12 574**	**1.95**	**493**	**0.08**	**1983**
19 125	**3.39**	**13 544**	**2.40**	**8 833**	**1.57**	**10**	**..**	**1984**
19 346	**3.46**	**15 658**	**2.80**	**10 092**	**1.80**	**231**	**0.04**	**1985**

TABLE 9 – (Continued)

DISTRICT	MAN-SHIFTS POSSIBLE	MANSHIFTS WORKED		MANSHIFTS LOST			
						INDUSTRIAL DISPUTES	
		Number	% of Possible	Number	% of Possible	Number	% of Possible
OPEN-CUT MINES							
West Moreton							
1983	61 594	59 475	95.56	2 119	3.44	260	0.42
1984	52 628	51 135	97.16	1 493	2.84	288	0.55
1985	59 491	56 646	95.22	2 845	4.78	1 573	2.64
Nanango							
1983	4 256	4 166	97.89	90	2.11	..	..
1984	27 093	26 686	98.50	407	1.50	..	..
1985	29 068	27 933	96.10	1 135	3.90	619	2.13
Kianga-Moura							
1983	209 108	192 131	91.88	16 977	8.12	1 537	0.74
1984	175 298	158 628	90.49	16 670	9.51	3 896	2.22
1985	182 734	162 748	89.06	19 986	10.94	7 855	4.30
Callide							
1983	108 299	102 737	94.86	5 562	5.14	1 308	1.21
1984	111 846	105 763	94.56	6 083	5.44	728	0.65
1985	108 941	99 964	91.76	8 977	8.24	3 838	3.52
Blackwater							
1983	555 727	521 394	93.82	34 333	6.18	4 215	0.76
1984	672 238	629 590	93.66	42 648	6.34	15 471	2.30
1985	773 468	706 740	91.37	66 728	8.63	32 929	4.26
Blair Athol							
1983	12 234	11 776	96.26	458	3.74	89	0.73
1984	38 015	35 539	93.49	2 476	6.51	306	0.80
1985	59 737	54 107	90.58	5 630	9.42	2 652	4.44
Mackay							
1983	750 984	710 991	94.67	39 993	5.33	10 417	1.39
1984	843 709	792 643	93.95	51 066	6.05	19 690	2.33
1985	922 967	831 407	90.08	91 560	9.92	52 231	5.66
Bowen							
1983	89 493	81 589	91.17	7 904	8.83	1 701	1.90
1984	108 837	100 448	92.29	8 389	7.71	1 326	1.22
1985	114 403	102 346	89.46	12 067	10.54	4 285	3.75
TOTAL OPEN-CUT MINES							
1983	**1 791 695**	**1 684 259**	**94.00**	**107 436**	**6.00**	**19 527**	**1.09**
1984	**2 029 664**	**1 900 432**	**93.63**	**129 232**	**6.37**	**41 705**	**2.05**
1985	**2 250 809**	**2 041 891**	**90.72**	**208 918**	**9.28**	**105 982**	**4.71**
STATE							
1983	**2 437 162**	**2 270 241**	**93.15**	**166 921**	**6.85**	**28 190**	**1.16**
1984	**2 593 687**	**2 413 495**	**93.05**	**180 192**	**6.95**	**51 153**	**1.97**
1985	**2 809 876**	**2 533 403**	**90.16**	**276 473**	**9.84**	**128 210**	**4.56**

REASONS FOR LOSS								
SICKNESS		COMPENSATION		ABSENTEEISM		OTHER CAUSES		YEAR
Number	% of Possible	Number	% of Possible	Number	% of Possible	Number	% of Possible	
546	0.89	837	1.36	293	0.47	183	0.30	1983
393	0.75	463	0.88	211	0.40	138	0.26	1984
456	0.77	482	0.81	144	0.24	190	0.32	1985
10	0.23	..	..	3	0.07	77	1.81	1983
242	0.89	63	0.23	102	0.38	..	..	1984
423	1.45	5	0.02	88	0.30	..	..	1985
7 709	3.69	2 410	1.15	5 321	2.54	..	..	1983
6 262	3.57	1 541	0.88	4 971	2.84	..	..	1984
5 920	3.24	1 713	0.94	4 498	2.46	..	..	1985
2 755	2.54	246	0.23	1 253	1.16	..	..	1983
3 182	2.85	961	0.86	1 212	1.08	..	..	1984
3 018	2.77	1 006	0.92	1 115	1.03	..	..	1985
13 394	2.41	5 379	0.97	10 024	1.80	1 321	0.24	1983
14 861	2.21	5 123	0.76	7 188	1.07	5	..	1984
18 849	2.44	6 621	0.85	8 183	1.06	146	0.02	1985
206	1.68	25	0.20	138	1.13	..	..	1983
679	1.79	20	0.05	1 471	3.87	..	..	1984
1 012	1.69	110	0.18	1 856	3.11	..	..	1985
17 343	2.31	3 123	0.41	9 057	1.21	53	0.01	1983
17 176	2.04	3 482	0.41	10 718	1.27	..	..	1984
22 513	2.44	4 994	0.54	11 821	1.28	1	..	1985
3 451	3.86	761	0.85	1 991	2.22	..	..	1983
3 865	3.55	843	0.78	2 355	2.16	..	..	1984
4 705	4.11	1 001	0.87	2 066	1.81	..	..	1985
45 414	2.54	12 781	0.71	28 080	1.57	1 634	0.09	1983
46 660	2.30	12 496	0.62	28 228	1.39	143	0.01	1984
56 896	2.53	15 932	0.71	29 771	1.32	337	0.01	1985
68 162	2.79	27 788	1.14	40 654	1.67	2 127	0.09	1983
65 785	2.54	26 040	1.00	37 061	1.43	153	0.01	1984
76 242	2.71	31 590	1.12	39 863	1.42	568	0.03	1985

TABLE 10

QUEENSLAND COAL CONSUMPTION BY CONSUMER GROUPS

Years Ended June 30, 1981-1985 ('000 Tonnes)

CONSUMER GROUP	1981	1982	1983	1984	1985
ELECTRICITY					
Steam Power Stations	5 346	5 653	6 709	7 636	8 240
METAL PROCESSING					
Alumina Refining	1 177	1 025	916	1 174	1 127
Lead Smelting	84	89	89	85	87
Nickel Refining	..	87	219	178	225
BUILDING MATERIALS					
Cement Works	244	332	332	251	290
Bricks and Pottery	22	30	25	23	24
PAPER PULP AND BOARD					
Paper and Hardboard Mills	61	77	80	81	80
FOOD PROCESSING					
Meat and Bacon	21	30	33	34	34
Sugar Mills	30	30	23	26	22
Dairy Products	3	4	6	6	7
Canneries	5	9	10	12	12
Breweries	15	16	16	16	15
Margarine & Edible Oils	..	14	14	13	13
COKE MAKING					
Coke Works	66	53	66	67	62
MISCELLANEOUS					
Hospitals	31	35	37	35	35
Ships' Bunkers	..	..	28	184	158
Sundry	13	14	13	10	16
STATE TOTAL	**7 118**	**7 498**	**8 616**	**9 831**	**10 447**

TABLE 11
BRISBANE METROPOLITAN COAL CONSUMPTION
Years Ended June 30, 1981-1985 ('000 Tonnes)

CONSUMER GROUP	1981	1982	1983	1984	1985
Electricity	232	184	212	327	197
Cement Works	155	202	157	76	112
Hospitals	23	27	29	28	28
Sugar Refinery	10	12	11	11	12
Breweries	15	16	16	16	15
Meat and Bacon	8	8	15	14	12
Margarine and Edible Oils	..	12	11	10	9
Bricks and Pottery	11	15	9	6	7
Canneries	5	9	10	12	12
Miscellaneous	3	5	3	3	5
TOTAL	**462**	**490**	**473**	**503**	**409**

TABLE 12
SOUTHERN QUEENSLAND COAL CONSUMPTION
(Excluding Brisbane)
Years Ended June 30, 1981-1985 ('000 Tonnes)

CONSUMER GROUP	1981	1982	1983	1984	1985
Electricity	1 595	1 416	1 311	1 809	2 547
Paper and Hardboard Mills	61	77	80	81	80
Hospitals	8	8	8	7	7
Bricks and Pottery	9	9	10	12	12
Sugar Mills	12	8	8	10	8
Meat and Bacon	9	10	9	12	13
Dairy Products	3	4	6	6	7
Margarine and Edible Oils	..	2	3	3	4
Miscellaneous	6	5	6	3	3
TOTAL	**1 703**	**1 539**	**1 441**	**1 943**	**2 681**

TABLE 13

CENTRAL QUEENSLAND COAL CONSUMPTION

Years Ended June 30, 1981-1985 ('000 Tonnes)

CONSUMER GROUP	1981	1982	1983	1984	1985
Electricity	2 992	3 483	4 570	4 822	4 789
Alumina Refining	1 177	1 025	916	1 174	1 127
Cement Works	40	73	122	121	118
Meat and Bacon	1	7	4	6	7
Sugar Mills	2	3	1	1	1
Bricks and Pottery	2	6	5	4	5
Ships' Bunkers	..	..	28	184	158
Miscellaneous	4	3	3	3	6
TOTAL	**4 218**	**4 600**	**5 649**	**6 315**	**6 211**

TABLE 14

NORTH QUEENSLAND COAL CONSUMPTION

Years Ended June 30, 1981-1985 ('000 Tonnes)

CONSUMER GROUP	1981	1982	1983	1984	1985
Electricity	527	570	616	678	707
Lead Smelting	84	89	89	85	87
Nickel Refining	..	87	219	178	225
Cement Works	49	57	53	54	60
Coke Works	66	53	66	67	62
Meat and Bacon	3	5	5	2	2
Sugar Mills	6	7	3	4	1
Bricks and Pottery	..	..	1	1	..
Miscellaneous	..	1	1	1	2
	735	**869**	**1 053**	**1 070**	**1 146**

TABLE 15
INTERSTATE SALES AND OVERSEAS EXPORTS
Years Ended June 30, 1965-1985 ('000 Tonnes)

YEAR	Interstate Sales	Overseas Exports	TOTAL
1965	..	1 186	1 186
1966	..	1 741	1 741
1967	..	1 741	1 741
1968	..	2 369	2 369
1969	3	4 103	4 106
1970	7	5 742	5 749
1971	177	6 975	7 152
1972	91	9 200	9 291
1973	214	14 679	14 893
1974	207	15 642	15 849
1975	197	17 591	17 788
1976	435	16 388	16 823
1977	499	18 965	19 464
1978	383	20 118	20 501
1979	383	18 836	19 219
1980	579	21 296	21 875
1981	497	23 727	24 224
1982	128	24 862	24 990
1983	91	26 405	26 496
1984	15	33 095	33 110
1985	18	45 504	45 522

TABLE 16

EXPORTS TO OVERSEAS COUNTRIES

Years Ended June 30, 1965-1985 ('000 Tonnes)

YEAR	Japan	Italy	United Kingdom	Brazil	Spain	*Belgium	*Netherlands	France
1965	1 186	..	..	..	..	..	..	..
1966	1 731	..	..	..	..	..	..	..
1967	1 736	..	..	..	..	..	..	..
1968	2 366	..	..	..	..	..	..	..
1969	4 103	..	..	..	..	..	..	..
1970	5 706	26	..	..	..	..	..	..
1971	6 937	..	22	16	..	..	..	..
1972	8 328	326	..	..	98	68	284	..
1973	12 446	656	127	..	75	362	467	119
1974	13 083	1 027	133	..	..	286	561	232
1975	14 179	1 408	217	..	..	312	626	516
1976	13 426	828	451	..	324	145	348	739
1977	14 895	1 109	385	..	332	316	652	832
1978	14 297	1 253	432	41	521	224	945	1 384
1979	12 909	1 030	750	123	559	276	631	1 073
1980	15 157	1 265	781	52	527	268	480	1 048
1981	17 066	1 524	566	97	571	269	395	906
1982	17 226	1 197	863	..	624	155	466	1 100
1983	17 776	1 336	921	322	594	221	477	1 151
1984	19 872	2 187	761	483	1 135	263	1 050	1 821
1985	24 595	2 309	733	997	1 160	190	3 132	2 636

* Often transhipped from these destinations to other countries.

Taiwan	Romania	Korea	Egypt	Iran	Turkey	Hong Kong	Other Countries	TOTAL	YEAR
..	..	..	..	..	..	..	..	1 186	1965
..	..	..	..	..	..	..	10	1 741	1966
..	..	..	..	..	..	..	5	1 741	1967
..	..	..	..	..	..	..	3	2 369	1968
..	..	..	..	..	..	..	..	4 103	1969
..	..	..	..	..	..	..	10	5 742	1970
..	..	..	..	..	..	..	..	6 975	1971
..	..	..	..	..	..	..	96	9 200	1972
..	..	..	..	..	..	..	427	14 679	1973
..	..	..	..	..	..	..	320	15 642	1974
..	..	..	..	..	..	..	333	17 591	1975
16	..	..	..	..	..	..	111	16 388	1976
62	52	60	..	..	..	..	270	18 965	1977
188	577	135	..	..	..	..	121	20 118	1978
307	251	469	..	..	..	..	458	18 836	1979
381	234	550	116	..	..	..	436	21 295	1980
346	405	835	296	..	..	..	451	23 727	1981
630	246	1 224	387	..	..	..	744	24 862	1982
1 009	152	1 466	433	33	40	..	474	26 405	1983
1 372	588	1 532	260	398	240	705	428	33 095	1984
1 773	1 040	1 905	264	336	430	641	3 363*	45 504	1985

*Summary — Other Countries

Denmark	841	Indonesia	280	Malaysia	62
India	551	P.R. China	194	Switzerland	27
Philippines	407	Chile	98	U.S.A. (Hawaii)	22
Algeria	340	F.R. Germany	86	Fiji	17
Greece	299	Sweden	71	Burma	4
		Austria	64		

TABLE 17

OVERSEAS EXPORTS BY MINES

Years Ended June 30, 1965-1985 ('000 Tonnes)

YEAR	Kianga-Moura	Black-water	Collins-ville	South Black-water	Blair Athol	Goonyella	Peak Downs	Saraji	Harrow Creek	Gregory
1965	1 158	..	..	..	..	..	..	..	..	..
1966	1 721	2	..	..	..	..	..	..	..	..
1967	1 719	..	13	..	..	..	..	..	..	..
1968	1 897	430	20	..	..	..	..	..	..	..
1969	2 708	1 315	47	12	..	..	..	..	..	..
1970	3 037	2 652	38	..	10	..	..	..	..	..
1971	3 184	3 240	..	547	..	..	..	..	..	..
1972	2 740	2 670	100	1 091	24	2 574	..	..	..	
1973	3 216	3 287	101	1 109	7	4 642	2 317	..	..	..
1974	2 998	3 336	60	1 010	5	3 887	4 346	..	..	..
1975	2 244	3 478	57	967	..	4 023	4 994	1 822	..	..
1976	1 979	2 815	33	621	5	3 279	4 356	3 300	..	..
1977	2 370	3 102	16	691	..	3 862	4 183	4 741	..	..
1978	2 099	2 953	20	898	..	4 308	5 144	4 696	..	..
1979	2 246	3 043	10	1 056	6	3 804	4 028	4 465	162	..
1980	2 146	3 111	6	1 234	..	4 370	4 263	4 484	254	148
1981	2 200	2 799	308	1 613	19	3 914	3 923	3 491	248	1 453
1982	2 381	2 593	161	1 467	23	4 283	3 435	2 765	147	1 967
1983	2 182	2 350	23	1 536	53	4 338	3 543	3 702	174	2 186
1984	2 233	3 081	68	1 629	504	4 436	3 830	3 973	236	1 959
1985	1 739	2 942	784	1 717	3 437	4 083	3 969	4 485	183	2 856

Norwich Park	New Whitwood	German Creek	Oaky Creek	Curragh	Newlands	Riverside	Other	TOTAL	YEAR
..	..	..	..	..	..	..	28	1 186	1965
..	..	..	..	..	..	..	18	1 741	1966
..	..	..	..	..	..	..	9	1 741	1967
..	..	..	..	..	..	..	22	2 369	1968
..	..	..	..	..	..	..	21	4 103	1969
..	..	..	..	..	..	..	5	5 742	1970
..	..	..	..	..	..	..	4	6 975	1971
..	..	..	..	..	..	..	..	9 199	1972
..	..	..	..	..	..	..	..	14 679	1973
..	..	..	..	..	..	..	..	15 642	1974
..	..	..	..	..	..	..	6	17 591	1975
..	..	..	..	..	..	..	..	16 388	1976
..	..	..	..	..	..	..	..	18 965	1977
..	..	..	..	..	..	..	..	20 118	1978
..	..	..	..	..	..	..	16	18 836	1979
1 131	9	..	..	..	..	..	140	21 296	1980
3 376	167	..	..	..	..	..	216	23 727	1981
4 453	256	349	..	..	..	..	582	24 862	1982
2 751	429	2 015	278	..	..	..	845	26 405	1983
2 854	304	2 525	2 106	361	412	1 673	911	33 095	1984
2 966	595	2 832	2 712	1 859	3 577	3 126	1 642*	45 504	1985

* Summary — Other	
Cook	609
Amberley	360
Yarrabee	252
New Hope	178
Rhondda	131
Westfalen	103
Oakleigh	9

TABLE 18

OVERSEAS EXPORTS — COKING AND STEAMING COAL

Years Ended June 30, 1970-1985 ('000 Tonnes)

YEAR	Coking	Steaming	TOTAL
1970	5 727	15	5 742
1971	6 971	4	6 975
1972	9 175	25	9 200
1973	14 672	7	14 679
1974	15 637	5	15 642
1975	17 582	9	17 591
1976	16 380	8	16 388
1977	18 963	2	18 965
1978	20 098	20	20 118
1979	18 634	202	18 836
1980	20 955	341	21 296
1981	22 586	1 141	23 727
1982	23 559	1 303	24 862
1983	24 829	1 576	26 405
1984	29 622	3 473	33 095
1985	34 382	11 122	45 504

TABLE 19
OVERSEAS AND INTERSTATE SHIPMENTS — PORTS

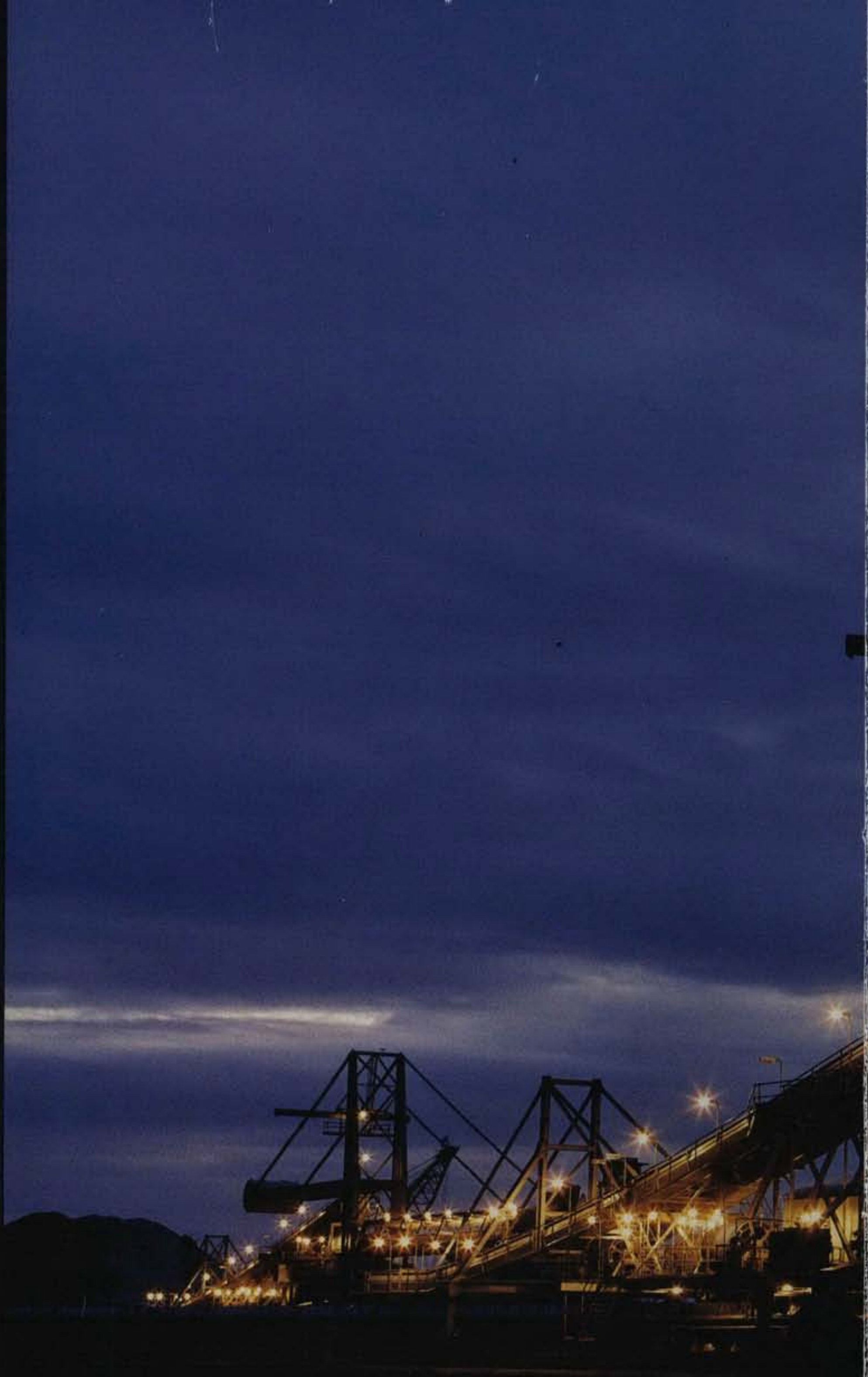
Years Ended June 30, 1970-1985 ('000 Tonnes)

YEAR	Brisbane	Gladstone	Hay Point	Dalrymple Bay	Bowen	Abbot Point
1970	..	5 705	..	..	37	..
1971	4	7 138	..	..	..	..
1972	..	6 600	2 574	..	100	..
1973	..	7 677	7 098	..	101	..
1974	..	7 502	8 265	..	60	..
1975	..	6 871	10 838	..	57	..
1976	..	5 682	11 084	..	33	..
1977	..	6 489	12 941	..	16	..
1978	..	6 314	14 147	..	20	..
1979	16	6 716	12 460	..	10	..
1980	33	7 064	14 751	..	6	..
1981	383	8 438	15 077	..	308	..
1982	510	9 109	15 082	..	161	..
1983	787	11 087	14 508	..	23	..
1984	804	11 982	15 655	4 174	..	480
1985	1 376	12 825	15 686	11 258	..	4 361

Barging export coal to Fisherman Islands.

TABLE 20
INTERSTATE SALES BY MINES
Years Ended June 30, 1970-1985 ('000 Tonnes)

YEAR	Oakleigh	Black-water	South Black-water	Moura	Leich-hardt	Goon-yella	Cook	Saraji	Gregory	Norwich Park	Other	TOTAL	YEAR
1970	7	..	..	..	..	..	..	..	..	..	..	7	1970
1971	10	126	41	..	..	..	..	..	..	..	..	177	1971
1972	16	23	..	25	27	..	..	..	..	..	..	91	1972
1973	16	59	..	..	..	138	..	..	..	..	1	214	1973
1974	21	83	..	..	64	32	5	..	..	..	1	206	1974
1975	20	100	..	..	45	..	30	..	..	..	2	197	1975
1976	20	30	25	..	55	..	153	148	..	..	4	435	1976
1977	18	..	..	..	48	73	279	81	..	..	..	499	1977
1978	17	..	..	..	39	..	324	..	..	..	3	383	1978
1979	17	..	..	..	13	..	353	..	..	..	1	384	1979
1980	17	..	..	..	6	78	278	..	26	171	3	579	1980
1981	17	55	..	..	12	..	286	..	..	125	2	497	1981
1982	27	..	..	..	4	..	95	..	..	..	2	128	1982
1983	21	..	..	..	..	..	..	..	69	..	1	91	1983
1984	12	..	..	..	..	..	..	..	..	..	3	15	1984
1985	10	..	..	..	..	..	..	..	..	..	8	18	1985



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COAL WORKERS' PNEUOMCONIOSIS SELECT COMMITTEE

QUESTION TAKEN ON NOTICE No.3

on 14 October 2016

On the issue of the X-rays, Ms Cronin mentioned that the coal workers are required to have a health check and a particular number within that are required to have an X-ray

QUESTION:

Is there a broad-brush percentage? Is that 10, 15 or 20 per cent of coal workers? How many coal workers have had such an X-ray over the last 12 months or last 10 years, whatever the case may be? Do we have those particular figures? Do we have an indication of what the results have been? I am asking for a broad brush, not dealing with individual circumstances, with regards to X-rays?[1]

ANSWER:

The number of coal workers who have had health assessments and chest x-rays as part of their health assessments is indicated in the tables below.

For the period 1 October 2015 to 23 October 2016:

	No of workers examined	No of workers with x-ray	percentage with x-ray
All coal workers	5,177	2,434	47%
Underground coal workers	2,004	1,938	97%

For the period 1 October 2006 to 23 October 2016:

	No of workers examined	No of workers with x-ray	percentage with x-ray
All coal workers	77,008	27,464	36%
Underground coal workers	22,774	22,041	97%

[1] Public briefing transcript, Brisbane, 14 October 2016, pp 7

COAL WORKERS' PNEUMOCONIOSIS SELECT COMMITTEE

QUESTION TAKEN ON NOTICE No.4

on 14 October 2016

All of these missing years, as I see them—lost in time:

QUESTION: Where are these documents stored and has the DG or any of your staff seen these records sitting there perhaps wondering what they are? Do you know what they are? Do you know where they are now? Have you seen them? Have any of your staff seen them boxed up or in whatever way they are stored?[1]

ANSWER:
The Coal Mine Workers' Health Assessment (CMWHA) records are held by or on behalf of the Department of Natural Resources and Mines in four (4) locations - see Attachment A: Records table.

The total number of CMWHA records held by the department for the period commencing January 1983 up to and including 14 October 2016 is estimated to be 395,478. This total number of CMWHA records relates to an estimated 135,382 workers over the 33 year period.

The records that the department holds that make up this total number include:

- Complete CMWHA forms including, if applicable, an x-ray image and/or x-ray report, a spirometry report, and an audiometry report. The current CMWHA form is seven (7) pages long;
- X-ray/s and/or an x-ray report/s *(for example, the department may receive the record directly from a medical specialist other than the Nominated Medical Adviser (NMA). This record will be matched up with the record of the person to which it relates)*;
- A review of a medical assessment, conducted by the NMA between 5 yearly assessments – this may just consist of section 4 of the entire 7 page assessment form, x-ray image, x-ray report, spirometry report, audiometry report; and
- Queensland Coal Board (QCB) Health Records.

The department has previously stated that there is a backlog of records that have not been entered into its database. These records which have not been entered span a period of approximately 10 years.

Despite this backlog, any records that are not in the department's database are arranged in such a way that they can be located and retrieved upon request.

[1] Public briefing transcript, Brisbane, 14 October 2016, pp 9

Attachment A

COAL WORKERS' PNEUMOCONIOSIS SELECT COMMITTEE

QUESTION TAKEN ON NOTICE No.4

on 14 October 2016

Eagle Farm

Date range – Early 1983 - late 1990's (historical records)

X-rays and medicals – 16 552

Recall - Geebung & Acacia Ridge

Date range – Early 1983 – 2012

X-rays and medicals – 160 204

Redbank

Date range – 2006 – 2016

X-rays and medicals – 24063

- Entered and digitally scanned paper copies - to be sent to Recall for permanent storage– 5371
- Health assessments that were submitted electronically (stored on server) – 2533

Currently being processed:

- CMWHA forms received since May 2016 – 1159
- Reviews of medical assessments (NMA reviews assessments between 5 yearly assessment) – approximately 15 000

New completed CMWHA Forms from NMAs are sent to Redbank for processing. Once processed these assessments are sent to Recall for permanent storage.

Stafford

Date range – 1983 – 2016

X-rays and medicals – approximately 194 659

- Not scanned or entered into database – approximately 60 000
- Scanned but not entered into database – 5096
- Data electronically entered but total record not scanned – 80 489
- Data electronically entered and total record scanned – 49 074

COAL WORKERS’ PNEUOMCONIOSIS SELECT COMMITTEE

QUESTION TAKEN ON NOTICE No.5

on 14 October 2016

QUESTION:

Is any panellist here today specifically aware if the union representatives of coal workers or others had raised concerns prior to the diagnosis of the case in 2015 about potential problems with regard to black lung disease? Had concerns been raised previously? We know that there are always safety concerns and issues over dust, but I am referring specifically to concerns around black lung disease. Are you aware of it?[1]

ANSWER:

Respirable dust and coal dust generally is an ever-present hazard in the operation of coal mines. The issue has frequently been raised in the course of the Mines Inspectorate’s regular work. However, the panellists present at the public briefing on 14 October 2016 are not aware of any specific concerns about coal workers’ pneumoconiosis being raised with the department prior to the first case that was confirmed in May 2015.

[1] Public briefing transcript, Brisbane, 14 October 2016, pp 12

COAL WORKERS' PNEUOMCONIOSIS SELECT COMMITTEE

QUESTION TAKEN ON NOTICE No.6

on 14 October 2016

But, again, coming back to the Rathus report, the Rathus report recommended that there be chest x-rays at intervals of not less than five years.

QUESTION: Can you please find out in your exploration of the archives and the documents, wherever they may exist, what actually came of that recommendation?

ANSWER:

In 1993 the Coal Industry Employees' Health Scheme Order 1993 (Attachment A: CIEHS Order) was made, establishing a new health scheme administered by the Queensland Coal Board (QCB).

The order included a requirement that underground workers undergo a chest x-ray at least every 5 years.

This requirement was not carried over in the same terms to the health scheme that was established under the *Coal Mining Safety and Health Regulation 2001*.

Rather, whether or not a worker was to have a chest x-ray was to be determined following a risk assessment concerning the worker's exposure to dust.

In July 2016 the approved form for health assessments was amended to stipulate that all underground workers require a chest x-ray as part of their health assessment.

[1355]

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. CCCII] FRIDAY, 19 MARCH, 1993 [No. 61

Coal Industry (Control) Act 1948

COAL INDUSTRY EMPLOYEES' HEALTH SCHEME ORDER 1993

TABLE OF PROVISIONS

PART 3—HEALTH ASSESSMENTS AND CHEST X-RAYS

PART 4—LEAVE OF ABSENCE AND FINANCIAL PROVISIONS FOR EXAMINATIONS

PART 5—OWNERSHIP, STORAGE, CONFIDENTIALITY AND RELEASE OF RECORDS

PART 6—RECIPROCITY

PART 7—EXTENSION OF TIME FOR COMPLIANCE WITH REQUIREMENTS OF THIS ORDER

PART 1—PRELIMINARY

Short Title

1. This Order may be cited as the *Coal Industry Employees' Health Scheme Order 1993.*

Commencement

2. This Order commences on a date to be notified in the Gazette.

Interpretation

3. In this Order—

"Board" means the Queensland Coal Board;

"employee" means a person whose principal place of employment is a mine, and whose employer is respondent to either the Coal Mining Industry (Production Engineering) Interim Consent Award, September 1990 or the Coal Mining Industry (Supervision and Administration) Interim Consent Award, 1990 Queensland, or any award or awards or agreements in substitution thereof;

"entrant" means a person offered employment where the principal place of employment will be a mine and whose employer will be respondent to either the Coal Mining Industry (Production Engineering) Interim Consent Award, September 1990 or the Coal Mining Industry (Supervision and Administration) Interim Consent Award, 1990 Queensland, or any award or awards or agreements in substitution thereof;

"examining medical officer" means a medical practitioner or health professional instructed by a Nominated Medical Adviser to undertake health assessment, or some aspect of the health assessment, of employees or entrants in accordance with this Order;

"manager" means a person registered as a manager pursuant to the *Coal Mining Act 1925*;

"mine" means any opening in the earth used or intended to be used for the extraction of coal, and includes any areas or materials adjacent to and belonging to a mine and used or intended to be used in connection with producing, treating, or dealing with coal;

"Nominated Medical Adviser" means a medical practitioner registered in Queensland—

(a) who has been nominated by a manager and approved by the Board; and

(b) whose approval by the Board has not expired or been revoked;

in accordance with this Order; and

"the former Order" means the Coal Miners' Health Scheme Order made by the Board on 8 December 1982 and published in the Gazette on 11 December 1982 at pages 1659-1675.

Revocation of previous Order

4. The former Order is revoked.

Object of Order

5. The object of this Order is to provide for the health assessment of entrants to the Queensland coal mining industry and for the regular health assessment of all employees in the Queensland coal mining industry.

Sunset Clause

6. This Order has effect for only seven years from the date of its commencement.

Forms

7. Forms to be used in this Order are the Forms approved by the Board.

PART 2—NOMINATED MEDICAL ADVISER

Recommendation

8. A manager must recommend to the Board the appointment of one or more Nominated Medical Adviser/s to undertake or authorise health assessment of entrants to, or employees of, the mine for which the manager is responsible.

Approval

9.(1) The Board, acting on appropriate advice, is to determine the suitability of a recommended Nominated Medical Adviser, and is to notify in writing the manager and the recommended Nominated Medical Adviser, whether or not the recommended Nominated Medical Adviser has been approved by the Board.

(2) A Nominated Medical Adviser may be approved to undertake or authorise health assessment in respect of more than one mine.

Currency of Approval

10.(1) An approval of a Nominated Medical Adviser notified in accordance with subsection 9(1) is to remain current for a period of two years from the date of the notification.

(2) A manager may recommend to the Board the renewal of the approval of a Nominated Medical Adviser.

(3) The Board may revoke an approval of a Nominated Medical Adviser notified in accordance with subsection 9(1), if the Board is satisfied, because of:

(a) proved misbehaviour; or

(b) proved incompetence in the performance of the work required of a Nominated Medical Adviser; or

(c) physical or mental infirmity; or

(d) a material change in circumstances which has resulted in a Nominated Medical Adviser no longer satisfying the requirements for appointment as a Nominated Medical Adviser specified in section 11;

that a Nominated Medical Adviser is not capable of properly performing the duties of the position, or is otherwise not a fit and proper person to undertake the duties of the position.

Requirements for Appointment as Nominated Medical Adviser

11. A Nominated Medical Adviser must have:

(a) a sound knowledge of the Coal Industry Employees' Health Scheme;

(b) an awareness of relevant legislation relating to safety and health in the coal industry;

(c) a sound knowledge of the operations, activities and tasks performed and the environment at the relevant mine;

(d) a willingness to provide advice on appropriate duties to be undertaken by an employee in discussions with employer and employee representatives;

(e) an interest in occupational health and health maintenance programs; and

(f) suitable equipment and facilities.

PART 3—HEALTH ASSESSMENTS AND CHEST X-RAYS

Health Assessment of Entrant

12. Before an entrant commences duty, the manager or person acting on the express authority of the manager must instruct the Nominated Medical Adviser to undertake or authorise a health assessment of the entrant in accordance with Form A.

Health Assessment of Employee

13.(1) The manager or person acting on the express authority of the manager must instruct each employee of the mine for which the manager is responsible to attend for a health assessment in accordance with this Order.

(2) An employee:

(a) whose duties involved working in an underground mine in the past five years; or

(b) whose duties involved working in an environment which, in the opinion of the Nominated Medical Adviser, is likely to involve such levels of exposure to dust that a chest x-ray is warranted;

must attend for a health assessment in accordance with this Order within two years of the commencement of this Order if that employee has not been medically examined in accordance with the former Order in the five years prior to the commencement of this Order, and thereafter at intervals of not more than five years.

(3) An employee other than one referred to in subsection (2) must be medically examined within five years of the commencement of this Order, and thereafter at intervals of not more than five years.

(4) The manager must submit to the Board, within 12 months of the commencement of this Order, a structured program for the medical examination of employees referred to in subsections (2) and (3).

(5) A health assessment required by this section is to be undertaken in accordance with Form B.

(6) Nothing in this Order shall prevent more regular health assessments of employees where agreement to such assessments has been reached by employer and employee representatives at enterprise level.

Chest X-ray of Entrant

14.(1) An entrant:

(a) whose proposed duties involve working in an underground mine; or

(b) whose proposed duties involve working in an environment which, in the opinion of the Nominated Medical Adviser, is likely to involve such levels of exposure to dust that a chest x-ray is warranted; or

(c) whose occupational or medical history or clinical findings are such that the Nominated Medical Adviser considers that a chest x-ray is warranted;

must undergo a chest x-ray to provide medical evidence of the lung condition of the entrant.

(2) The chest x-ray referred to in subsection (1) is to be conducted prior to the commencement of the entrant's employment if practicable, but must be conducted within three months of the commencement of the entrant's employment.

(3) A Nominated Medical Adviser may exempt an entrant from compliance with this section if the entrant provides the Nominated Medical Adviser with an acceptable x-ray and report dated within two years prior to the commencement of the entrant's employment.

Chest X-ray of Employee

15.(1) An employee:

(a) whose duties involve working in an underground mine; or

(b) whose duties involve working in an environment which, in the opinion of the Nominated Medical Adviser, is likely to involve such levels of exposure to dust that regular chest x-rays of the employee are warranted; or

(c) whose occupational or medical history or clinical findings are such that the Nominated Medical Adviser considers that regular chest x-rays of the employee are warranted;

must undergo a chest x-ray to provide medical evidence of the lung condition of the employee within five years of the commencement of this Order, and thereafter at intervals of not more than five years.

(2) Where an employee of a kind referred to in subsection (1) has not undergone a chest x- ray in accordance with the former Order in the five years prior to the commencement of this Order, that employee must undergo a chest x-ray examination of the kind referred to in subsection (1) within two years of the commencement of this Order, and thereafter at intervals of not more than five years.

Additional Health Assessment or Chest X-ray

16.(1) An employee may at any time submit to a manager a request to undergo a health assessment, a partial health assessment in respect of a specific problem or a chest x- ray, in accordance with this Order, together with information and reasons in support of the request, and if the manager considers the request to be reasonable, the manager is to authorise a health assessment, a partial health assessment in respect of a specific problem or a chest x-ray (as the case may be), in accordance with this Order.

(2) A manager may at any time, for reasonable cause notified in writing to the employee concerned, require an employee to undergo a health assessment, a partial health assessment in respect of a specific problem or a chest x-ray, in accordance with this Order.

Advice of Results of Examinations

17. Results of health assessment and chest x-ray examinations which relate to the fitness of an entrant or employee for specified work duties, must be provided to the entrant or employee if requested and the relevant manager in accordance with the instructions and requirements of Form A.1 (in the case of entrants) and Form B.1 (in the case of the employees).

Employment Restrictions

18. Where the Nominated Medical Adviser concludes that an entrant or an employee is suffering from a condition which will prevent or inhibit performance of work duties, the following provisions apply:

(a) the Nominated Medical Adviser must, if the entrant or employee so requests, liaise with the personal physician of the entrant or employee with a view to the correction, if possible, of the medical conditions which prevent or inhibit performance of work duties;

(b) in respect of an employee, the Nominated Medical Adviser must inform the relevant manager of the restriction and of any consequent risk to that employee or other employees; and

(c) the manager, on being notified of the restriction, must consult with the employee; or if the employee so requests:

(i) the employee's nominated representative; or

(ii) both the employee and the employee's nominated representative;

and must examine on-site employment or retraining options which may be available to and suitable for the employee, having due regard to any restrictions indicated as necessary by the Nominated Medical Adviser.

PART 4—LEAVE OF ABSENCE AND FINANCIAL PROVISIONS FOR EXAMINATIONS

Leave to Attend Examinations

19.(1) An employee must be granted all reasonable leave of absence to attend health assessment or chest x-ray examinations required by this Order.

(2) If working time is lost through an employee's attendance for health assessment or chest x- ray examinations required by this Order, the employee's attendance at those examinations is to be regarded as equivalent to time worked.

Payment for Time Involved in Attending Examinations

20.(1) An employee is entitled to payment for all agreed time involved in the employee complying with this Order.

(2) If any time of the kind referred to in subsection (1) occurs during a period that the employee is not rostered to work, then payment is to be at single time up to a maximum of one shift.

Costs Involved in Attending Examinations

21. All agreed costs incurred by an entrant or employee in attending for health assessment or chest x-ray examinations in compliance with this Order must be paid by the employer or prospective employer (as the case may be), of that entrant or employee.

Cost of Examinations

22.(1) All health assessment and chest x-ray examination expenses incurred by an entrant or employee complying with this Order must be paid by the employer or prospective employer (as the case may be), of that entrant or employee.

(2) Health assessment and chest x-ray examination expenses referred to in subsection (1) do not include the costs of any special investigations conducted on referral from the examining medical officer, or the costs of treatment of any medical condition discovered as a result of health assessment or chest x- ray examinations.

PART 5—OWNERSHIP, STORAGE, CONFIDENTIALITY AND RELEASE OF RECORDS

Ownership

23. All medical records obtained pursuant to this Order are at all times to remain the property of the Board, but are to be stored in accordance with section 24.

Storage

24.(1) Original medical records (other than original chest x-ray films) obtained pursuant to this Order are to be retained by the relevant Nominated Medical Adviser.

(2) A Nominated Medical Adviser must forward the following records to the Board within 14 days of the conduct of a health assessment or chest x-ray required by this Order:

(a) a legible copy of the medical records retained by the Nominated Medical Adviser in accordance with subsection (1); and

(b) original chest x-ray films after examination.

(3) Where a Nominated Medical Adviser ceases to perform the duties of that function, all original medical records retained by the Nominated Medical Adviser in accordance with subsection (1) are to be transferred to the custody of:

(a) an approved Nominated Medical Adviser as notified by the Board; or

(b) the Board, pending approval of a replacement Nominated Medical Adviser.

(4) Where an employee transfers to another mining operation, the Nominated Medical Adviser in respect of that employee, must forward all original medical records relating to that employee to the Nominated Medical Adviser for the employing mine.

Confidentiality

25. All medical information obtained under this Order must be treated in the utmost confidence at all times.

Release of Records

26.(1) Medical information held by the Board is to be released in the following circumstances:

(a) where a medical practitioner or hospital submits to the Board a request in writing for specific medical information on an employee, accompanied by the employee's written authority for the release of the information; or

(b) where a medical practitioner satisfies the Board of the medical validity of a request for specific medical information on an employee; or

(c) for epidemiological studies which are acceptable to the Board and when the identity of individual employees is not revealed.

(2) A Nominated Medical Adviser may release medical information relating to an employee to another medical practitioner involved in the health management of that employee.

(3) Medical information on an employee held by the Board or a Nominated Medical Adviser may be released to any other party on the written authority of the employee concerned.

PART 6—RECIPROCITY

Reciprocity within Queensland

27. A manager may waive a health assessment or chest x-ray required by this Order, other than a health assessment required by section 13 or a chest x-ray required by section 15, in circumstances where:

(a) an employee transfers from one mine to another within the State of Queensland and undertakes duties for which that employee is appropriately medically classified; or

(b) a former employee, having left the coal mining industry for a period of not more than two years, re-enters the industry and undertakes duties for which that employee is appropriately medically classified.

Reciprocity between Queensland and New South Wales

28. A manager may waive a health assessment required by section 12 or a chest x-ray required by section 14 where an entrant produces evidence of current compliance with the medical requirements of the Joint Coal Board in respect of duties performed by the entrant in New South Wales, which correspond to the duties to be undertaken by the entrant in Queensland.

PART 7—EXTENSION OF TIME FOR COMPLIANCE WITH REQUIREMENTS OF THIS ORDER

Discretion of Board to Extend Time

29. Where in this Order a time is specified to complete a certain requirement of this Order and just cause in writing is shown to the Board why that requirement cannot be completed in the specified time, then the Board may grant an extension of time for the completion of the requirement.

ENDNOTES

1. Made by the Queensland Coal Board on 15th March, 1993.
2. Published in the Gazette on 19th March, 1993.
3. Not required to be laid before the Legislative Assembly.
4. The administering agency is the Queensland Coal Board.

COAL WORKERS' PNEUMOCONIOSIS SELECT COMMITTEE

QUESTION TAKEN ON NOTICE No. 7

Update on Implementation of Monash Review Recommendations

Page 15

asked on 14 October 2016

QUESTION:

Are you able to issue a report on what has been done to date in relation to all of the Monash and Senate recommendations?

ANSWER:

Monash recommendations

On 13 July 2016, the final report of the Monash review was released, which found significant structural failings within the respiratory component of the Coal Mine Workers' Health Scheme (the Scheme). The review was undertaken by the Centre of Occupational and Environmental Health at Monash University in collaboration with the School of Public Health at the University of Illinois in Chicago.

The department supports all of Monash University's recommendations for improving the respiratory component of the Scheme.

To facilitate implementation, the department has identified five key focus areas within the 18 recommendations. These are chest x-rays (CXRs), spirometry, medical assessments and practitioners, electronic records management and surveillance.

Chest x-rays

The final report of the Monash review identified concerns regarding the quality, reading and reporting of x-rays.

The following changes were made to the health assessment form:

- a requirement that chest x-ray examinations be performed in accordance with the International Labour Organization (ILO) *Guidelines for the Use of the ILO International Classification of Radiographs of Pneumoconioses* (the ILO guideline)
- greater guidance to nominated medical advisers about who can take and read x-rays
- the format in which the results should be reported
- a stipulation that the x-ray referral is to clearly state that its purpose is for examination of coal workers' pneumoconiosis (CWP).

Furthermore, complementary amendments to the *Coal Mining Safety and Health Regulation 2001*, which will commence on 1 January 2017, will require x-ray examinations to be performed in accordance with the ILO guideline.

In addition, in order to address shortcomings identified in the final report, a dual-screening system is now in place. Chest x-rays are first being read by an Australian radiologist to the ILO classification and then read for a second time by a National Institute for Occupational Safety and Health (NIOSH) accredited reader at the

University of Illinois in the United States. As of 11 October 2016, 1129 x-rays under this system have been digitally transferred to the USA.

The US-based dual reading is intended as a short term measure that will be in place until a Queensland dual-screening and adjudication process is established.

The department is currently working to develop and implement a Queensland-based dual reading x-ray screening program. Consultation has occurred with Queensland Health and the operators of existing screening schemes, such as BreastScreen Queensland, Coal Services New South Wales, and NIOSH.

A consultation paper on chest x-ray screening has been released for targeted consultation. This paper provides a comparison of screening programs and sets out proposed features and a delivery model for a new screening program for the Scheme (Attachment A).

Spirometry

The final report also identified concerns with spirometry equipment, training, and the quality and interpretation of spirometry.

From 27 July 2016, changes were made to the health assessment form to clarify that copies of spirometer reports are to be provided to the department; and to require spirometry to be undertaken by appropriately trained operators to the standard outlined in the relevant Queensland Health Spirometry (Adult) Guideline.

In accordance with the recommendations, the department is currently working with the Thoracic Society of Australia and New Zealand to identify options for an accreditation program for those seeking to undertake spirograms under the Scheme.

It is anticipated that a discussion paper will be released for consultation with stakeholders by the end of 2016, covering matters such as training, maintenance and care of spirometry equipment, and clinical audit as part of a practice-based accreditation program.

Medical Assessments and Practitioners

The final report made a number of recommendations in relation to the respiratory health assessments and the doctors who undertake the respiratory assessments under the Scheme.

As a first step in implementing these recommendations, the department has been actively working to ensure coal mine workers, mine operators, unions and medical professionals involved in the industry are informed about the disease.

Materials have been distributed to workers on mine sites to help build an awareness of the disease (Attachments B.1-B.4). This was supported by an advertising campaign in regional newspapers throughout Queensland’s coal mining areas during June and July 2016.

Materials were also distributed via professional medical peak bodies and key health industry stakeholders (Attachment C). Queensland Health facilitated the distribution of information about the disease to health professionals through its medical practitioner network (Attachment D).

In addition, changes to health assessments were also made on 29 September 2016 through amendments to the *Coal Mining Safety and Health Regulation 2001* (the Regulation). These amendments will commence on 1 January 2017. These changes, to promote consistency and good industry practice, include:

- requiring pre-employment health assessments to include respiratory function and chest x-ray examinations
- requiring respiratory function and chest x-ray examinations at least once every 5 years for current workers who work underground or have worked underground; and at least once every 10 years for aboveground coal mine workers
- requiring respiratory function examinations to include a comparative assessment with previous functions results where available
- requiring all medical examinations be performed by a person qualified and competent to conduct the examination.

The amendments also provide for a person retiring as a coal mine worker to request an assessment if they have not had an assessment in the three years preceding retirement.

It is anticipated that improved programs for spirometry and x-rays will further inform the implementation of the recommendations around medical assessments and practitioners.

The department has also engaged with medical colleges and experienced nominated medical advisers to build our understanding of the Scheme and to develop an understanding of occupational and respiratory medicine; radiology; spirometry; practice protocols; information technology; privacy issues; and quality assurance. The department has also engaged with regulators and providers of comparable screening programs.

A consultation paper on issues related to medical practitioners and assessments is currently under development. It is intended that this paper will canvas a number of issues such as the role of doctors, training, minimum qualifications and experience, and on-going clinical audit.

<u>Electronic Records Management</u>

The final report recommended the introduction of an electronic data entry and data storage system, for the benefit of both the doctors undertaking respiratory assessments and the department.

Preliminary work has been undertaken to scope the requirements for such an electronic records management system. Improved programs for x-rays, spirometry and health assessments will inform the development of this new electronic system.

Although further development of the management system is dependent on key policy decisions, the principles underpinning the design of the system will include: the management of all health data and images in a digital environment; inclusion of all coal workers’ records; direct access by medical professionals and coal workers on request; best practice security and privacy standards; availability of data for industry wide surveillance; and a unique identifier for each worker.

<u>Surveillance</u>

The final report recommended that DNRM conduct ongoing individual and group surveillance of heath data collected under the scheme.

Preliminary work has commenced to identify the operation of such surveillance programs in other jurisdictions. The design of an electronic records management system noted above will include in its scope the ability for ongoing individual and group health surveillance of data collected under the Scheme.

In addition, amendments to the *Coal Mining Safety and Health Regulation 2001* will commence on 1 January 2017 to prescribe 'coal workers' pneumoconiosis' and other diseases as occupational diseases for the purpose of notification under section 198(6) of the *Coal Mining Safety and Health Act 1999*. This will assist in promoting a greater understanding of the occurrence of the disease in Queensland.

<u>Other recommendations</u>

The final Monash report recommended the establishment of an implementation group, to ensure the necessary changes are implemented in a timely manner.

The department will continue to consult with the existing Coal Mining Safety and Health Advisory Committee (CMSHAC) as a key stakeholder in relation to the implementation of the recommendations. The Committee, which includes employer, union, and departmental representatives, makes recommendations and provides advice to the Minister in relation to the safety and health of coal mine workers. The department will also continue to engage with relevant medical bodies, and medical practitioners, as required.

<u>Senate recommendations</u>

The Monash recommendations were made subsequent to recommendations made by the Senate Select Committee on Health's recommendations in relation to coal workers' pneumoconiosis.

Some of the Senate recommendations, particularly those relating to nominated medical advisers, are effectively being addressed through implementation of the Monash recommendations.

Other Senate recommendations are caught by the government's key action area of prevention, announced on 13 July 2016, which includes "stricter dust management and publishing dust levels regularly".

Some changes have been implemented through the amendments made to the Regulation which will commence on 1 January 2017.

These changes will require coal mining companies to:

- regularly report dust monitoring results to the Mines Inspectorate – for underground longwall and development operations, at least every 3 months
- advise inspectors every time dust concentrations exceed prescribed levels.

CMSHAC is finalising development of recognised standards for dust control and dust monitoring for the Minister's consideration.

The department envisages that a tripartite standing dust committee will review dust data and advise the Minister – through CMSHAC – as to the effectiveness of respirable dust management.

In preparation for commencement of the regulation amendments, the department is developing a respirable dust database to enable surveillance and reporting.

It is envisaged that monitoring results will be displayed on the department's website to provide transparency of reporting, requested by the Minister.

Dust data is published annually. The department continues to engage with stakeholder groups and CMSHAC to identify further options.

The Senate select committee also recommended that certain measures be taken at a national level. Safe Work Australia is currently evaluating workplace exposure standards for more than 600 airborne contaminants – including respirable coal dust - to ensure worker health and safety in Australia is comparable with latest evidence and international best practice. DNRM is fully supportive of this process and is working with Safe Work Australia to support their ongoing review of national standards for airborne contaminants such as coal dust. The Queensland government has engaged in discussions and will work with other jurisdictions in relation to these recommendations.

Attachment A

Chest X-ray screening for the Coal Mine Workers' Health Scheme

Next steps in planning reform

Consultation paper

V0.4 – 24 October 2016

Queensland Government

This publication has been compiled by Coal Mine Workers' Health Scheme of Minerals and Energy Resources Division, Department of Natural Resources and Mines.

Contents

Purpose

The purpose of this paper is to seek advice and feedback for an improved chest X-ray screening program for Queensland's coal mine workers to ensure early detection of coal mine dust lung diseases (CMDLDs) such as coal workers' pneumoconiosis (CWP).

Your feedback will be used to assist the Department of Natural Resources and Mines (DNRM) to develop a preferred option that will be presented to the Coal Mining Safety and Advisory Committee (CMSHAC) and the Queensland Government for consideration.

Summary

The Coal Mine Workers' Health Scheme (CMWHS) includes an X-ray screening program for coal mine workers. Similar screening programs — BreastScreen Queensland, the Coal Workers' Health Surveillance program in the United States and NSW Coal Services — have been analysed to compare features and determine what learnings can be applied in developing an improved X-ray screening program for Queensland coal mine workers.

This analysis suggests that a dual reading system by a small cohort of medical practitioners is optimal and would be consistent with the recommendations set out in the Monash review of the respiratory component of the CMWHS. It also identifies the importance of technical specifications and guidelines, along with quality assurance in ensuring consistency and proficiency.

It is proposed that a new Queensland X-ray screening program could be delivered by the private sector through a competitive tender process for service requirements set by government. It is envisaged that X-rays would be dual read to the ILO International Classification of Radiographs of Pneumoconioses (Classification) by radiologists who have successfully completed an ILO training program. Government would engage an independent external auditor to periodically review the quality of chest X-rays provided by the service provider.

Monash review

Published on 12 July 2016, the Monash review of the respiratory component of the Queensland Coal Mine Workers' Health Scheme (the Scheme) identified significant issues with the chest X-ray screening component.

Assisting Monash University in the review, the University of Illinois at Chicago (UIC), assessed chest X-rays from 248 coal mine workers with more than 10 years of underground experience and identified:

- 18 cases of possible simple CWP that required further investigation
- Of these, 15 original X-ray reports by radiologists showed that only two of the original reports identified features that could be interpreted as CWP (three of the original reports were unavailable)
- In neither of the two possible cases did the Nominated Medical Adviser (NMA) record a finding of possible CWP, nor was any recommendation made regarding fitness for work from a respiratory point of view
- No miner had large opacities suggestive of complicated pneumoconiosis or progressive massive fibrosis (PMF)
- A higher than acceptable portion of X-ray images had quality issues which could affect the accurate detection of small opacities characteristic of CWP. For example, 20 per cent had issues resulting from poor positioning, poor contrast and excessive edge enhancement and 15 per cent had issues related to digital processing.

As at 12 October 2016, two of the 18 possible cases identified by the Monash review have been confirmed with CWP, nine have been cleared, and six are progressively undergoing further testing in consultation with their medical practitioners. Despite continuing efforts, one worker has not yet been located.

Review recommendations

In regard to the chest X-ray component of the Scheme, the final Monash report recommended:

- Chest X-rays should be performed by appropriately trained staff (i.e. qualified radiographers) and read to the Classification
- Additional training and evaluation should be provided in the use of the ILO Classification for radiologists and respiratory physicians who seek to classify chest X-rays – e.g. NIOSH B Reader program
- X-rays should be read by a selected group of medical practitioners and by at least two separate readers (a dual or two-reader process)
- Radiology clinics should be provided with technical guidelines detailing specifications for imaging equipment, software, image acquisition and display and quality control systems
- Ongoing clinical auditing or X-ray screening
- Ensure feedback is provided to coal mine workers on screening outcomes
- Improve the acquisition and archiving of digital X-rays by DNRM to facilitate surveillance.

"Addressing CWP is an absolute priority for this government including implementing all of the recommendations from the independent Monash University review…"

Dr Anthony Lynham
Minister for State Development and
Minister for Natural Resources and Mines

Government's immediate response

Since the release of the Monash review, DNRM has taken several immediate and interim steps to safeguard worker health while further work is undertaken to reform the Scheme.

- 17 of the 18 workers identified as having potential pneumoconiosis in the Monash review report have been contacted and these workers are progressively undergoing further testing in consultation with their medical practitioners. DNRM is still attempting to locate the 18th worker.

- On 27 July 2016, an interim dual-screening process was introduced. All chest X-rays taken under the Scheme are first read by an Australian radiologist to the ILO Classification and then assessed by NIOSH approved readers at the UIC.

- All new X-rays taken under the Scheme must be in a digital format – DNRM no longer accepts analogue X-ray films. NMAs must also clearly identify when they refer workers for an X-ray that it is for screening under the Scheme and radiologists must report on a prescribed ILO reporting form.

- Amendments to the Coal Mining Safety and Health Regulation 2001, approved by the Governor-in-Council to commence on 1 January 2017, will further provide that:

  - new coal mine workers will undergo a health assessment inclusive of respiratory function and chest X-ray examinations on entry into the coal mining industry

  - respiratory function and chest X-ray examinations for underground coal mine workers (and former underground workers working aboveground) will occur at least once every five years

  - respiratory function and chest X-ray examinations for aboveground workers will occur at least once every 10 years

  - respiratory function examinations undertaken as part of periodic health assessments will include a comparative assessment with previous respiratory function results where available

  - all medical examinations will be performed by a person qualified and competent to conduct the examination

  - X-ray examinations will be performed in accordance with the Classification.

Comparison of screening programs

DNRM has consulted with practitioners in other screening programs to determine what aspects may be optimal to adopt for a new chest X-ray screening program.

BreastScreen Queensland	National Institute for Occupational Safety and Health NIOSH	CS Coal Services
Two reader system with a third adjudicator	Two reader system and up to three levels of adjudication	Dual read if first read finds abnormality
Pool of BreastScreen trained readers	Only 12 readers to ensure quality	Small pool of readers
Nationally accredited program, quality control and assurance model and independent audit every four years	Quality assurance program	Internal and external audits
Free every two years	Screens offered at least every five years	Screens at least every six years
250,000 screens in 2015-16	Screens 4,000 active and former miners per annum	10,000 medicals in 2014-15
X-rays taken in over 200 locations	X-rays taken at NIOSH certified facilities	X-rays taken at Coal Services facilities
Mobile service	Mobile service	Mobile service (but not for X-rays)
X-rays sent to a central hub and distributed to readers	X-rays sent to a central hub and distributed to readers	X-rays read by small number of contracted readers

BreastScreen Queensland

BreastScreen Queensland (BSQ) is part of a national program, providing access to free screening and assessment for breast cancer. Most BSQ facilities are either in hospitals or community health facilities.

BSQ operates in a 'hub and spoke model'. X-rays taken in BSQ facilities throughout Queensland are sent digitally to a central 'hub' where they are 'batched' into groups for distribution. Images are then distributed and read twice. One read must be completed by a radiologist and the second can be read by a suitably trained medical officer. A radiologist conducts a third read to adjudicate if the first two readings differ.

All BSQ staff, including radiographers and radiologists, are directly employed or contracted either by the Department of Health or Hospital and Health Services. All staff are trained by BSQ for the screening program and are subject to quality control systems.

Rigorous quality control and quality assurance against national accreditation standards is in place. Additionally, BSQ report regularly against these standards and an independent accreditation audit of their services is completed every four years.

NIOSH Coal Workers' Health Surveillance Program (CWHSP) is operated by the Respiratory Health Division of NIOSH. NIOSH is part of the Centers for Disease Control and Prevention (CDC) in the US Department of Health and Human Services.

Workers and contractors working for either underground or surface mines are offered chest X-rays, spirometry, symptom assessment and a health questionnaire. The program mainly targets active miners, but former miners may participate if they so desire. Under the program, operators are required to offer screening services to all workers but the exam is not mandatory.

In a process similar to the BSQ program, a 'hub and spoke model' includes a limited number of readers for the industry nationally. NIOSH certifies facilities that offer X-ray and/or spirometry, based upon equipment, certifications of technicians and a review of X-rays.

All X-rays taken are interpreted by a specially selected panel of B Readers. This panel is a subgroup of licensed physicians who have successfully passed an examination certifying their proficiency in the classification of X-rays according to the ILO Classification system. NIOSH selects those physicians who have the highest scores on the exam as well as a history of consistent readings.

Coal Services New South Wales is jointly owned by the NSW Minerals Council and the Construction, Forestry, Mining and Energy Union (CFMEU). It performs several statutory functions delegated by the NSW Minister for Industry, Resources and Energy including those relating to occupational health.

While enforcement powers remain with the state government, delegated statutory functions include the provision of workers compensation, occupational health and rehabilitation services, collection of statistics, provision of mines rescue emergency services and training to the NSW coal industry. Coal Services also provides dust monitoring for NSW coal mines.

All coal mine workers in NSW must have a pre-placement medical assessment, including chest X-ray, when commencing work in the industry or changing employers and subsequent periodic medical assessments every three years.

A chest X-ray is completed every six years for those with high risk of dust exposure, but this may be more frequent depending on the individual's circumstances. Coal Services employs its own team of radiographers to take chest X-rays and doctors to conduct medical assessments. A small pool of radiologists are used with particular experience in identifying dust disease.

Contracted radiologists do not dual read for the purposes of the screening program, but dual reading is employed if the initial report identifies any abnormality, whether that be dust related or otherwise.

Key observations and learnings

- the programs maintain a smaller cohort of medical practitioners involved in the screening process, in particular the reading of X-rays
- services are delivered regionally, particularly the taking of X-rays before being sent for reading through a central ‘hub and spoke’ type model
- both BSQ and the NIOSH programs provide dual reading with adjudication if the first two reads differ
- higher volume and frequency of reads is associated with maintaining proficiency – X-rays in some programs are grouped into ‘batches’ for the reader to assess on a weekly basis
- quality is maintained by ensuring practitioners have appropriate training, formal requirements and standards are set, performance is evaluated and procedures and equipment audited
- government has a role in ensuring quality outcomes either through delivery of services itself (BSQ and NIOSH) or delegating the role (Coal Services NSW).

Annex A provides further details on the key features of these screening programs and the learnings and observations made.

A new chest X-ray screening program for CMWHS

Stakeholders are encouraged to review the following proposed features and provide feedback. These features are based upon current regulatory requirements, analysis of similar screening programs and Monash review recommendations.

For example, the frequency of chest X-rays is based on recent amendments to the Coal Mining Safety and Health Regulation 2001.

Final preferred options will be developed based on feedback received and could result in further regulatory changes to support the best outcomes for coal mine workers.

#	Proposed features
1	**Chest X-ray recipients and frequency**
1.1	All new coal mine workers (other than low risk) on entry to the coal mining industry.[1]
1.2	At least once every five years for underground workers and former underground workers working aboveground. [1]
1.3	At least once every 10 years for aboveground workers. [1]
1.4	Voluntary on retirement if the miner has worked in the industry for more than three years and has not already had a chest X-ray in the past three years. [1]
1.5	The current scheme does not apply to retired or former workers. A new program could include screens for retired or former coal mine workers residing in Queensland at a period aligned with 1.2 & 1.3 above. Costs for this type of service would need to be determined.
2	**How chest X-rays are taken**
2.1	Imaging, or the taking of X-rays, could occur regionally and near the workforce, but considerations should be given to a reduced number of approved centres to ensure the required image quality is delivered. Consideration could also be given to a mobile service.
2.2	Chest X-rays taken in a digital format by qualified radiographers.
2.3	Technical aspects of taking X-rays (e.g. equipment types and settings) to be in accordance with Australian requirements and the *NIOSH Guideline – Application of Digital Radiography for the Detection and Classification of Pneumoconiosis.*
3	**X-ray readings**
3.1	X-rays sent from radiographers to a central hub for distribution to readers via an appropriate Picture Archiving and Communication System (PACS).
3.2	All readers are qualified radiologists who have successfully completed an ILO training program (e.g. the NIOSH B Reader program) (Recommendation 11.2 of the Monash report).
3.3	Chest X-rays independently dual read, with a possible third read for adjudication purposes.

[1] Mandatory as at 1 January 2017 through changes to the Coal Mining Safety and Health Regulation 2001.

#	Proposed features
3.4	All X-rays read and reported in accordance with the *Guideline for the use of the ILO International Classification of Radiographs for Pneumoconiosis*. [1]
3.5	Examinations include comparative assessment with previous results where available.
3.6	Technical aspects of reading X-rays (e.g. image display) to be in accordance with Australian requirements and the *NIOSH Guideline – Application of Digital Radiography for the Detection and Classification of Pneumoconiosis.*
3.7	Given the number of X-rays that may be taken and read under the Queensland Scheme (estimated at 800 X-rays per month) – the assessment of X-rays should be limited to a small group of readers. Based on an average of 20,000 reads per year (assuming each X-ray is read twice with a five per cent adjudication rate), this small group of readers could comprise of about five radiologists. This allows for independent reading by two radiologists, and a third if adjudication is required with some flexibility and redundancy. Each reader would be assessing approximately 4,000 X-rays per year which is above the minimum amount suggested by BreastScreen Queensland to maintain proficiency (2,000 per year). This would mean each reader would read a batch of 80 X-rays per week.
4	**Reporting results and maintaining records**
4.1	A report of the screening outcome including a copy of the X-ray provided to the NMA for consideration and discussion with the worker.
4.2	A standardised letter provides advice of the outcome of the test to the worker. This advice should include general information and be designed in accordance with best practice 'no harm' screening protocols (similar to those used by BreastScreen) to ensure that a workers wellbeing is not impacted by the screening process.
4.3	Service standard of five to seven working days from date X-ray is taken before notification (allowing for adjudication if required).
4.4	If a potential case is identified, a computed tomography (CT) scan or other diagnostic procedure is undertaken before a diagnosis is given to provide greater assurance.
	A copy of X-rays and assessment reports retained by the screening program for future reference (and submitted to DNRM by the NMA).
5	**Quality assurance**
5.1	Internal auditing of procedure, practices and equipment including evaluation of image quality and read accuracy. Similar to the BreastScreen process, readers to be provided regular feedback on performance in correctly identifying anomalies.
5.2	Periodic external auditing of training, procedure, practices, equipment and evaluation of read volumes and accuracy.

Proposed delivery model

Stakeholders are encouraged to review the following proposed delivery model and provide feedback.

In Queensland the regulation of the Scheme lies with the DNRM and medical assessments are conducted by the private sector through the NMA. DNRM has traditionally had very little involvement in prescribing how X-rays are taken and read.

The department does not currently have the capacity or propose to build the capacity to deliver health services. Rather it is proposed the department partner with a private sector service provider to deliver an X-ray screening program that government would require industry to use.

Under this model, government would specify the requirements and standards under which the service would be provided and then ensure its objectives are being met on a periodic basis. Specifically, it is proposed that:

- a competitive tender would be conducted to identify the provider based on defined criteria that reflect the identified principles and requirements as discussed in the possible features section of this discussion paper
- the provider would take and read all worker chest X-rays under the Scheme
- employers and NMAs will continue to arrange for X-rays directly with the provider, including payment of charges to the service provider
- the provider would take and read all chest X-rays for retired workers – with a an appropriate administrative and funding model to be developed
- for quality assurance, DNRM will engage an independent external auditor to undertake an audit and evaluation of the provider after two years and periodically thereafter
- DNRM would review the contractual arrangements with the provider on completion of external audits and as a result either re-engage the provider (subject to any changes) or re-open the service to tender
- NMAs will continue to ensure that electronic X-ray images and reports are provided to DNRM. Alternate arrangements may apply in the longer term based on any future electronic data and records management solutions.

Summary of the proposed features and delivery model

- X-rays taken by qualified radiologists who have successfully completed an ILO training program
- X-ray rooms comply with NIOSH guidelines
- X-rays read to the Classification
- All X-rays are dual read with an option for a third adjudication if necessary
- System supports both current and retired workers
- Independent reviews to check quality of chest X-rays
- DNRM maintains worker records

Next steps

The department is seeking feedback on this paper, including the delivery model, proposed features and any additional issues that will need to be considered.

Feedback will be consolidated and provided to the CMSHAC for consideration. It is anticipated that a proposed final solution will be presented to government by late 2016.

Submissions close:	**5:00pm, 16 November 2016**
Email:	cwpfeedback@dnrm.qld.gov.au
Post:	Coal Mine Workers' Health Scheme Project Team Minerals and Energy Resources Division Department of Natural Resources and Mines PO Box 15216 City East QLD 4002
Phone:	+61 7 3199 7967

BreastScreen Queensland

BreastScreen Queensland (BSQ) is part of the National BreastScreen Australia program. BSQ provides access to free screening and assessment for the early detection of breast cancer.

Queensland Health operates a ‘hub and spoke model’ for BSQ. Most BSQ facilities are either in hospital or community health facilities and a small number are located in shopping centres.

Under the model, X-rays are taken at over 200 locations throughout Queensland including by a mobile service. They are then sent electronically to a central ‘hub’ where they are distributed for reading and adjudication to readers who may be located across a number of BSQ facilities.

All BSQ staff are directly employed or contracted either by the Department of Health or Hospital and Health Services. Staff are trained by BSQ for the screening program and are subject to rigorous quality control systems. Only BSQ radiographers take images for the screening program at BSQ facilities.

BSQ reading process requires a minimum of two independent readers under the following process:

First two 'blind' reads are taken by a radiologisit; the second by a qualified medical officer

If the first two readers’ outcomes differ, a third read is undertaken by a radiologist “adjudicator"

The adjudicator knows the results of the prior reads and decides the final outcome

Each reader is given a “batch” or “board” of 100 reads

BSQ do not confirm a diagnosis at the time of screening. Women with abnormalities are referred for further testing and assessment with relevant medical practitioners. There is a standard selection of letters that the system automatically generates to individuals and primary physicians where the screening outcome is normal.

The hub and spoke model of operation is delivered through an integrated software solution. This uses a client information register together with a PACS. Based on certain criteria, the system automatically compiles batches for each reader and it can store images received from commercial X-ray providers (such as Queensland X-ray) for comparison reading.

BSQ also has a fleet of nine 13-16 tonne GVM[2] vans, including a four wheel drive (4WD) truck to access remote areas in Far North Queensland. Each van offers mammographic screening in a designated room and combined waiting/reception area. With the exception of the 4WD mobile, all mobile vans include a separate amenity room which may be utilised as a clinical room if required.

[2] Gross Vehicle Mass (GVM) – the maximum weight the vehicle is legally allowed to operate. Includes kerb weight and payload.

Build costs for each van were between $500,000 and $650,000. The fleet has an annual (vehicle-related) maintenance bill of $420,000. In addition, the digital mammography unit cost approximately $250,000, with maintenance costs of $15,000 - $20,000 per annum.

Each van is operated by at least two staff – either two radiographers or a radiographer and an administration officer. A third staff member can be accommodated, for example a nurse, for clinical examinations at some sites.

Mobile vans are relocated from site-to-site by appropriately licenced contractors or Health and Hospital Services operational staff. Site design is important, for example sites must be equipped with 3-phase power and must be level to accommodate X-ray equipment.

Key observations

Program component	Observations and learnings
Number of reads	A minimum of two reads; provides for an adjudicator.
Operating model	Hub and spoke with X-rays taken in regional centres and sent to a hub for batching and distributing to readers.
Volume of reads	Readers undertake a minimum of 2,000 reads per annum to maintain an appropriate level of competency and skill.
Frequency of reads	Batch processing is necessary – quantity is linked to the quality of reading. BSQ team suggests a minimum number of X-rays should be in a batch and that given the estimated volume, might need to batch read weekly, or twice weekly.
Quality control and assurance	Specific training and ongoing evaluation of staff is needed coupled with certification of facilities and periodic auditing.
Technical standards	Prescriptive policies around equipment, contrast, exposure, positioning of imagery required. X-ray reading room has a standard around lighting, resolution of screens and how the imagery is read and compared.
Data integrity	Unique identifier to manage individuals' records. Queensland Health generate their own unique identifier. Using the Medicare number has the advantage of enabling future links to 'My Health' systems that will allow access to other health records and databases.
Results handling	Consideration given to identifying clear clinical pathways, particularly if the screening program detects or identifies another health issue that requires medical attention. Diagnostic treatment and further tests are not part of the screening program, but there is a duty of care to advise the individual's primary physician if something is seen that warrants further attention.

NIOSH Coal Workers' Health Surveillance Program

The Coal Workers' Health Surveillance Program (CWHSP) was established in 1970 and is operated by the Respiratory Health Division of NIOSH. NIOSH is part of the Centers for Disease Control and Prevention (CDC) in the US Department of Health and Human Services. With more than 1,300 employees from a diverse set of fields (including epidemiology, medicine, nursing, industrial hygiene, safety, psychology, chemistry, statistics, economics, and many branches of engineering), NIOSH works closely with the Occupational Safety and Health Administration (OSHA) and the Mine Safety and Health Administration in the US Department of Labor to protect American workers and miners.

The CWHSP provides workers and contractors of underground and surface coal mines a chest X-ray, spirometry, symptom assessment and a health questionnaire. The program mainly targets active miners, but former miners may participate if they so desire. Under the program, mine operators are required to offer screening services to all workers at least every five years but the examination is not mandatory.

Similar to the BSQ program, CWHSP operates as a 'hub and spoke model' and a limited number of readers for the industry nationally. NIOSH certifies facilities that offer X-ray and/or spirometry, based upon equipment, certifications of technicians and a review of chest X-rays. As part of the enhanced program that was introduced in 2005, a mobile unit travels to community and mine sites and provides medical examinations including digital chest X-rays.

All chest X-rays taken as part of the program are interpreted by a specially selected panel of B Readers. B Reader is the proficiency given to physicians who have successfully passed an examination certifying their competence in assessing X-rays according to the ILO Classification system (there are about 200-300 B Readers in the US). NIOSH selects only those physicians for the CWHSP who have the highest scores on the exam as well as a history of consistent readings (currently there are 12 B Readers on the select panel).

Proficiency is obtained through a training program that includes an initial examination which requires classification of 125 images. The physician must then take a re-certification examination which requires classification of 60 images every four years. NIOSH, in conjunction with the American College of Radiology, has provided this training.

While the CWHSP operates a two reader process like BSQ, the adjudication process differs. If there is disagreement between the initial two readers, the X-ray is sent for adjudication by as many as three more readers before a final determination is made. Due to the design of the program, they do not apply the process that more senior readers undertake adjudication as all panel members are considered senior and highly skilled.

CWHSP readers undertake several hundred reads per annum, not thousands like BSQ. More than 4,000 active miners per year over the last five years have been screened, and a small number, 300 per year, of former miners. Reading is not required to be done in batches - readers are given a list of individuals to review, and will as a general principle, clear the list in a single sitting as a matter of practicality.

NIOSH sends a letter to the miner directly informing them of the final determination using the ILO Classification based on the review of the chest X-ray. While additional testing is not mandatory, the program does provide a diagnosis through the US Department of Labor wherein the chest imaging findings are correlated with the miner's exposure history and other medical testing which may include advanced imaging such as CT scanning.

The readings of the CWHSP panel B-Readers are reviewed statistically to see if any one reader is consistently identifying more or less cases of the disease than the other readers. If this is determined to be the case the reader may be removed from the panel. There is also a specific quality assurance program that has recently been implemented to review readings of PMF. In this case, if a reader is consistently reading PMF, or no PMF where the majority of other readers find the contrary, that reader is informed and given feedback. If the readings remain consistently different than the norm, that reader's B-Reading certification may be revoked.

Analogue images are stored at the Respiratory Health Division of NIOSH, in Morgantown, West Virginia. The original films have been stored, with images that date from the beginning of the program. There is an initiative being developed to clean and scan those analogue images. Digital images are stored indefinitely. Those images can be requested by the miner at any time. A CD will be produced with the diagnostic quality DICOM file and sent to the miner. Previous images are available electronically for the panel physicians to review. This is done in cases where an abnormality is identified.

Key observations

Program component	Observations and learnings
Operating model	Hub and spoke with X-rays taken in regional centres and sent to a hub for batching and distributing to readers.
Number of reads	A minimum of two reads and they provide for an adjudicator.
Volume of reads	Readers should undertake as many reads as possible. Volume of reads in a Queensland based screening program is likely to be more comparable to the CWHSP than BSQ. Therefore number of readers should be limited.
Frequency of reads	While the CWHSP do not formalise a 'batch' process, practically this is being conducted.
Quality control and assurance	Specific training and ongoing evaluation of staff is needed coupled with certification of facilities and periodic auditing.

Program component	Observations and learnings
Technical standards	The CWHSP is based on the *NIOSH Guideline – Application of Digital Radiography for the Detection and Classification of Pneumoconiosis*. This guideline has been suggested by the Monash review as appropriate requirements for radiology clinics as it details necessary qualifications, imaging equipment and software, image acquisition, documentation, image display and quality control. As a rough guide, the specialist monitors required for reading are around US$30,000 a pair to purchase.

Coal Services New South Wales

Coal Services is jointly owned by the NSW Minerals Council and the CFMEU. It has been delegated a number of statutory functions by the NSW Minister for Industry, Resources and Energy including those relating to occupational health. However, it does not possess enforcement powers – with any recommended enforcement action being referred to the Department of Industry, Resources and Energy for review.

Coal Services has statutory functions, as directed by the *Coal Industry Act 2001* (NSW). These functions include, but are not limited to, the provision of workers compensation, occupational health and rehabilitation services, the collection of statistics and the provision of mines rescue emergency services and training to the NSW coal industry. Coal Services also provides dust monitoring for the NSW coal industry through its Occupational Hygiene team.

In addition to occupational medical services, Coal Services through Coal Services Health (CS Health) provides an industry wide occupational health surveillance program. It also offers other services to industry including functional capacity evaluations, drug and alcohol screening, immunisations and occupational rehabilitation and treatment.

CS Health, and the previous Joint Coal Board, have been providing periodic medical assessments to the NSW coal industry since 1947. These assessments for coal workers were made compulsory in NSW in 2011 under NSW Coal Order 41. Under the scheme, all coal mine workers in NSW must have a pre-placement medical assessment, including a chest X-ray, when commencing work in the industry or changing employers, and a subsequent periodic medical assessment at least every three years. Order 41 requires a chest X-ray be completed every six years for those with high risk of dust exposure, but this may be more frequent depending on the individual's circumstances.

Of note, Coal Services is currently considering, in consultation with the Thoracic Society of Australia and New Zealand, amending this timeframe to require chest X-rays every three years for those with high risk of dust exposure or other medical conditions likely to increase the risk of developing a dust related lung disease.

CS Health provide health services and perform medical assessments from its offices in Lithgow, Mudgee, Singleton, Speers Point and Woonona, and also provide a mobile service to mining sites. In the period 2014-15, 6,615 periodic health surveillance medicals were performed (and 3,300 pre-placement medicals).

CS Health works with employers who have the primary responsibility for scheduling their workers medicals. They do assist some employers by special agreement in scheduling their workers medicals, but this is the exception rather than the rule. CS Health conduct chest X-rays at two of its facilities (Lithgow and Singleton), and other CS Health offices use a small number of local providers.

CS Health employs its own team of radiographers to take chest X-rays and doctors to conduct medical assessments. CS Health radiographers are accredited by the Australian Health Practitioner Regulation Agency and are members of the Australian Institute of Radiography. Their facilities and radiographers are all licensed by the relevant state body.

A small pool of radiologists with particular experience in identifying CMDLDs are contracted to assess X-rays. CS Health contracted radiologists do not dual read for the purposes of the screening program, but dual reading is employed if the initial report identifies any abnormality, whether that be dust related or otherwise. Any abnormal conditions identified are further investigated and may include a referral for a high resolution CT scan or to a respiratory physician.

Workers are notified of the results of the medical at the time of assessment. If any further investigation is required then this is discussed with the workers and the necessary referrals made. Order 41 allows for de-identified medical results to be made available to employers. If a specific condition is discovered that places a worker at risk then consent is sought from the worker to discuss this matter with their employer. CS Health Doctors would then work with the individual and the employer in further assessing the condition and organising the appropriate investigations.

CS Health ensures that medical services are conducted in accordance with any relevant standards and any relevant NSW Health Department guidelines. CS Health conducts its own internal audit program, the results of which are reported to the CS Health General Manager. In addition to this, Coal Services Internal Audit Department conduct regular audits, the results of which are reported directly to the Coal Services MD/CEO and the Coal Services Board of Directors. In 2016, CS Health has undertaken two independent external audits of its health surveillance program.

Coal Services has a fleet of three mobile health units – MHUs (trucks and trailers) that undertake assessments at 23 coal mines sites in NSW. While these mobile units do not include X-ray facilities, each offers examinations for medical history consultation by Registered Nurse and / or Medical Officer; audiometry; spirometry; eyesight; cholesterol; physical examination as determined by NSW Coal Order 41 general health education by Registered Nurse and/or Medical Officer.

Immunisation clinics, drug and alcohol screening clinics, and PPE fit testing are also offered, as well as operating at community events to raise awareness around coal mine workers health issues, general health issues as well as providing a limited range of complementary health services.

Each mobile unit offers at least one examination room, own amenities, air conditioning and is equipped to provide onsite health surveillance and pre-placement medical assessments. Initial truck purchase, custom trailer construction and refurbishment costs were approximately $280,000. This does not include annual expenses to maintain the medical equipment in the MHU’s, nor the annual expenses associated with providing the mobile health service to Industry. It does also not include periodic refits.

Key observations

Program component	Observations and learnings
Operating model	X-rays taken and read by a small number of practitioners in a limited number of facilities.
Number of reads	No dual readings unless abnormalities detected.
Data integrity	CS Health issues an individual unique customer identification number to new coal workers and this number remains with a worker throughout their career, allowing their records to follow them.
Quality control and assurance	CS Health contracted radiologists are aware of the ILO classification but there is no specific training provided nor is a specific ILO reporting form used. As part of its procurement processes, appropriate qualifications of radiologists contracted are verified. CS Health is planning on moving to X-ray reporting to the ILO Standard, by Radiologists on the Royal Australian and New Zealand College of Radiologists approved register during October of 2016. Operations are reviewed by internal and external audit process.

Acronyms used in this paper

4WD	Four Wheel Drive
B Reader	Physician certified by NIOSH
BSQ	BreastScreen Queensland
CDC	Centers for Disease Control and Prevention
CFMEU	Construction, Forestry, Mining and Energy Union
CMDLD	Coal Mine Dust Lung Disease
CMSHAC	Coal Mining Safety and Health Advisory Committee
CMWHS	Coal Mine Workers' Health Scheme
CWHSP	Coal Workers' Health Surveillance Program
CWP	Coal Workers' Pneumoconiosis
CT	Computed Tomography
DICOM	Digital Imaging and Communications in Medicine
DNRM	Department of Natural Resources and Mines
GVM	Gross Vehicle Mass
MHU	Mobile Health Unit
NMA	Nominated Medical Adviser
NIOSH	National Institute for Occupational Safety and Health
NSW	New South Wales
OSHA	Occupational Safety and Health Administration
PACS	Picture Archiving and Communication System
PPE	Personal Protective Equipment
UIC	University of Illinois at Chicago
ILO	International Labour Office
US	United States

ATTACHMENT B.1

Department of Natural Resources and Mines

Coal Mine Workers' Health

The Queensland Government is improving the medical screening system for coal mine dust lung disease~~s~~.

Coal workers' pneumoconiosis is a chronic respiratory lung condition.

Prevention and regular health checks for mine workers is a vital part of screening and dust management programs.

How is your respiratory health?

Talk to your doctor about your work history and get a referral to a respiratory specialist if you have any health concerns.

Find out more, call **13 QGOV (13 74 68)** or
email **minesafetyandhealth@dnrm.qld.gov.au**
Visit **www.dnrm.qld.gov.au**

Queensland Government

ATTACHMENT B.2

Department of Natural Resources and Mines

Coal Mine Workers' Health

The Queensland Government is improving the medical screening system for coal mine dust lung diseases as part of a detailed review of the Coal Mine Workers' Health Scheme.

Coal workers' pneumoconiosis is a chronic respiratory lung condition.

That's why prevention and regular health checks for mine workers is a vital part of screening and dust management programs.

Queensland Government

How is your respiratory health?

If you are a coal mine worker or have been in the past, visit your General Practitioner for a respiratory health check.

Talk to your doctor about your work history and get a referral to a respiratory specialist if you have any health concerns.

Find out more, call **13 QGOV (13 74 68)**
or email **minesafetyandhealth@dnrm.qld.gov.au**
Visit **www.dnrm.qld.gov.au**

Queensland Government

Coal workers’ pneumoconiosis (black lung): the facts

What is coal workers’ pneumoconiosis?

Coal workers’ pneumoconiosis, also known as black lung disease, is a chronic occupational lung disease caused by breathing in dust from coal, graphite or carbon over a long period of time. If a worker is consistently exposed to high concentrations of coal dust over several years, the dust collects in the alveoli (air sacs) of the lungs causing a reaction that results in scarring of lung tissue, reducing the elasticity of the lung. If enough scar tissue forms, lung function can be seriously reduced. Coal workers’ pneumoconiosis has a long latency period, commonly 10 years or more between first exposure and identification of the disease. Coal workers’ pneumoconiosis is not contagious.

There are two types of coal worker’s pneumoconiosis:

- simple (early stage) coal worker’s pneumoconiosis; and
- complicated coal workers’ pneumoconiosis (also known as progressive massive fibrosis (PMF)).

Simple (early stage) coal workers’ pneumoconiosis

The disease can manifest in different ways in individuals, depending on the composition of the dust, duration of exposure and individual factors. The early stage of the disease is described as simple coal workers’ pneumoconiosis, where a small amount of scar tissue appears on a chest X-ray as round, thickened areas called nodules. A chest X-ray identifies the size and number of the nodules. This helps determine how advanced the disease is. In the early stages, it may be difficult to differentiate small nodules from other lung diseases, or even other normal structures in the lungs such as blood vessels. Workers with early stage coal workers’ pneumoconiosis may not experience any symptoms.

Complicated coal workers’ pneumoconiosis (progressive massive fibrosis)

Progression to complicated pneumoconiosis (progressive massive fibrosis) may occur in some workers if they remain exposed to high concentrations of coal dust over a long period of time. Smoking and other lung conditions can contribute to the disease progressing. In complicated coal workers’ pneumoconiosis there are large masses of dense fibrosis (scar tissue) in the lungs. Workers with complicated coal workers’ pneumoconiosis will have significantly decreased lung function, and the condition can be fatal.

What are the symptoms?

Simple (early stage) coal workers’ pneumoconiosis

- There may be no symptoms
- Shortness of breath
- Chronic cough

Complicated coal workers’ pneumoconiosis

- Shortness of breath
- Chronic cough
- Black sputum
- Lung dysfunction
- Pulmonary hypertension
- Heart problems

How is it diagnosed?

The symptoms of coal workers’ pneumoconiosis are similar to those of other lung diseases, which can make it difficult to detect. Coal workers’ pneumoconiosis is initially detected by a chest X-ray and by testing lung function (spirometry test). CT scans and/or lung biopsies are usually required to confirm a diagnosis.

What is the ILO standard for reading chest X-rays?

The International Labour Organization (ILO) Classification of Radiographs of Pneumoconioses is the accepted international standard to describe and code abnormalities in chest X-rays that indicate pneumoconiosis. The system includes guidelines and a set of 22 X-ray images. The radiologist compares the patient’s X-ray with the 22 X-ray images in the set which show different abnormalities (sizes and shapes of nodules) in patients with pneumoconiosis. The radiologist uses these plates to describe the extent and features of pneumoconiosis in the patient.

What is the treatment?

There is no specific treatment for coal workers’ pneumoconiosis aside from treating the symptoms. The scarring of the lungs cannot be reversed. Workers diagnosed with the disease should avoid further exposure to high concentrations of coal dust.

What should I do if I am diagnosed?

If a worker is diagnosed with early stage coal workers’ pneumoconiosis, the individual will need to work in an environment away from coal dust and have their respiratory health monitored on an ongoing basis by a specialist physician. As smoking can contribute to the condition, it is strongly advised that the individual stops smoking.

How do I prevent it?

Coal workers’ pneumoconiosis is prevented by limiting exposure to high levels of coal dust. This requires control of the level of dust the miner is exposed to and, when required, the use of personal protective equipment to prevent inhalation of dusts.

More information
Call 07 3818 5424
Email HSU@dnrm.qld.gov.au
Visit www.qld.gov.au

ATTACHMENT B.4

Coal Mine Workers' Health Scheme

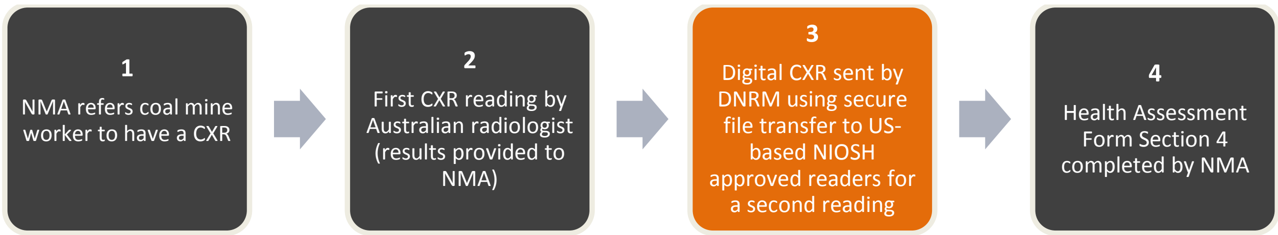
New chest X-ray process

The Coal Mine Workers' Health Scheme protects the health of Queensland coal mine workers by ensuring periodic health assessments are conducted. The health assessments can include a range of tests including a chest X-ray (CXR) to detect lung diseases such as coal workers' pneumoconiosis (CWP).

Early detection of coal mine dust lung disease is essential. A miner with the first stages of CWP may have no symptoms, but they should not continue to work in a dusty environment. Accordingly, early detection through an effective screening program is critical to protecting the workforce.

In a key change to improve early detection, CXRs are now examined to the International Labor Organisation (ILO) Standard International Classification of Radiographs of Pneumoconioses by at least two medical experts - first by an Australian radiologist and then by US-based National Institute of Occupational Safety and Health (NIOSH) approved readers. This is an interim measure until a Queensland-based dual screening program is developed.

New two-reader process:



The second reading takes up to 10 working days

Will both readings be read to the ILO standard?
Yes. In a key change, Australian radiologists will report in the format recognised by the ILO, which provides a rigorous process for reporting on the presence of the disease, and if it is present, describing its stage. A new ILO classification form has been provided to Australian radiologists who conduct the CXR examination.

What happens if the CXR readers provide different results?
The two-reader process allows for adjudication which is common for these types of dust diseases. If either or both of the readers finds a possible detection of CWP it is recommended that the NMA (in consultation with the individual) refer the coal mine worker for a high resolution CT scan.

Which organisation provides the second CXR reading?
The Department of Natural Resources and Mines (DNRM) has contracted the University of Illinois at Chicago (UIC) to assess all new CXRs taken under the health scheme. The UIC's School of Public Health was instrumental in delivering the CXR review as part of Monash review, which was published on 13 July 2016.

Can coal mine operators deal with the UIC directly?
Yes. During the interim period companies may continue to contract with the UIC for the first CXR reading. That reading must be undertaken by NIOSH approved readers under the ILO classification scheme and the health assessment process must be completed as per the current guidelines.

More information
Call 07 3818 5424
Email HSU@dnrm.qld.gov.au
Visit www.qld.gov.au

Department of Natural Resources and Mines, 2016

ATTACHMENT C

Email to key medical stakeholders

30 June 2016

Dear XXX

As you may know, the Department of Natural Resources and Mines has commenced work on a targeted awareness and information campaign to encourage current and former coal mine workers to get regular health checks and consult their General Practitioner if they have concerns about their respiratory health.

The goal is to increase awareness of coal mine dust lung disease, for both mine workers and medical professionals. I welcome any suggestions you may have to achieve this objective.

As a first step, we have asked coal mine operators, site senior executives, union leaders and site safety and health representatives to help disseminate general awareness information at mine sites and via communication networks already in place to connect with coal mine workers.

I would appreciate your assistance in sharing this information material through your professional networks so medical practitioners are aware of it and alert to patients seeking general advice or who may have concerns about their work history in coal mining or the results of previous medical assessments.

Print material will be displayed at prominent locations at mine sites and used as part of safety and health briefings for mine workers and contractors. Support available to medical practitioners for assessing or advising patients with concerns about coal mine dust lung diseases is also a key focus, so please consider opportunities to utilise the web links and digital graphics in your publications. We can also provide tailored graphics for individual websites and publications – please contact Ms Jo Clark on (07) 3199 8255 for assistance.

You can access the following selection of campaign material from the department's media centre:

- **A2 Poster** – a low resolution PDF for electronic distribution and a high resolution PDF for print
- **A5 Postcard** – a low resolution PDF for electronic distribution and a high resolution PDF for print
- **Digital graphics** – standard landscape and rectangle size graphics for use as web adverts and in online publications with direct links towww.business.qld.gov.au/industry/mining/safety-health/mining-safety-health/medicals/coal-board-medical/pneumoconiosis-screening.

If you would like more information about this or other reform initiatives underway as part of the review of the Coal Workers' Health Scheme please contact me.

Thank you for your cooperation and assistance.

Kind regards,

Lana Bartholomew
Project Executive **|** Coal Mine Workers' Health Scheme **|** Minerals and Energy Resources
Department of Natural Resources and Mines

T 07 3199 8294 **|** **M** 0467 772 510

E lana.bartholomew@dnrm.qld.gov.au **|** **W** www.dnrm.qld.gov.au

Level 12 **|** 61 Mary Street **|** Brisbane Qld 4000

Distributed to key stakeholders at:

- Chief Health Officer - Queensland Health
- President - RANZCR
- President - TSANZ
- Executive Director, Health Protection Branch, Prevention Division Queensland Health
- Executive Director, Medical Services and Clinical Dean, Mackay Hospital and Health Service
- University of Queensland
- Monash University
- Sonic Health Plus
- St Vincent's Health Australia
- DNRM's Occupational Physician
- Royal Australian College of General Practitioners
- Australian Medical Association
- Australian Medical Association, Queensland President
- Royal Australian College of GPs
- General Practitioners Alliance
- Reps from AMA, RACGP, Rural Doctors Assoc, College of Rural/Remote
- Royal Australian College of Physicians
- Australasian Faculty of Occupational and Environmental Medicine
- CS Health, Coal Services Pty Ltd

ATTACHMENT D

MONASH Centre for Occupational and Environmental Health

UIC SCHOOL OF PUBLIC HEALTH
UNIVERSITY OF ILLINOIS AT CHICAGO

Coal Mine Dust Lung Disease – Fact sheet for GPs

Since May 2015, there have been six confirmed cases of coal workers' pneumoconiosis (CWP), one form of coal mine dust lung disease (CMDLD), reported among former and current Queensland coal mine workers, and the outcome of at least two suspected cases is still pending. The Queensland Department of Natural Resources and Mines (QDNRM) has commissioned an independent review of the respiratory component of the coal mine workers' health scheme, including an interim strategy to detect and manage further CMDLD cases. This fact sheet contains information for General Practitioners about CMDLD, to assist in the assessment and management of such cases. Due to the high media interest in this issue, many coal miners in Queensland are likely to be worried about their respiratory health and seek advice from their GP.

Summary

- Coal miners occupationally-exposed to respirable coal mine dust over several years are at risk of developing coal mine dust lung disease, which includes CWP, emphysema, chronic bronchitis, and lung function impairment.
- CMDLD should also be considered in former coal miners, such as retirees and ex-industry employees, who present with significant respiratory symptoms. These diseases develop gradually, usually after at least 10 years of exposure, however in sensitive miners or in cases of intense exposure symptoms may occur sooner.
- Typical symptoms of CMDLD include cough, sputum production, and shortness of breath, however individuals with early disease may be asymptomatic but may have detectable chest x-ray or spirometry findings.
- Early detection of coal mine dust lung disease is based on chest imaging and lung function testing, usually with plain chest radiography and spirometry, along with careful evaluation of respiratory symptoms.
- Individuals who are or have been coal mine workers and are suspected of having CWP should be referred to a Respiratory and/or Occupational physician for further assessment. Links to lists of such physicians can be found at https://www.business.qld.gov.au/industry/mining/safety-health/mining-safety-health/medicals/coal-board-medical/pneumoconiosis-screening

About Coal Mine Dust Lung Disease

Coal mine dust lung disease (CMDLD) is the broad term for diseases caused by coal mine dust exposure, and comprises a group of occupational lung diseases that result from the cumulative inhalation of respirable coal mine dust over several years. Coal miners are at risk of developing these diseases, which include pneumoconioses (coal workers' pneumoconiosis, silicosis, and mixed dust pneumoconiosis). Pneumoconiosis is a disease of the lung parenchyma caused by deposition of dust particles, and the reaction of lung tissue to the dust. Emphysema, chronic bronchitis, lung function impairment, and diffuse dust-related fibrosis are other manifestations of the disease.

Coal workers' pneumoconiosis, the form of disease identified by chest imaging, can be further classified by severity: simple CWP which may be category 1, 2, or 3 reflecting increasing profusion of scars seen on chest imaging. The more severe stage of the disease known as complicated CWP or progressive massive fibrosis (PMF) is diagnosed when a scar is greater than one cm in diameter. The likelihood of CWP development is directly related to the intensity and duration of exposure to coal mine dust. The disease typically occurs after at least 10 years of exposure, and the risk of disease persists after exposure has ceased.

Under the current Queensland Coal Mine Workers' Health Scheme, all coal mine workers are required to undergo a medical assessment prior to the start of their employment at a coal mine, and then at least once every five years during their employment. Employees identified as at risk from dust exposure, in particular underground coal miners are also required to undertake chest x-rays as part of their health assessments. Given the long latency between exposure and disease occurrence, the population at risk extends to previous employees including retired coal miners and coal miners who have transferred to other industries.
Coal workers' pneumoconiosis was thought to have been eradicated from Australia, with no new cases having been reported for many years. In light of the recent CWP cases increased vigilance is required among treating doctors, in particular GPs, to identify individuals with early stages of CWP.

Symptoms
Individuals with early-stage coal workers' pneumoconiosis are often asymptomatic, however typical symptoms of CWP (and other CMDLD) include cough, sputum production, wheezing, and shortness of breath. Progressive massive fibrosis is a debilitating and life-threatening condition, and individuals may present with more severe symptoms. Emphysema, chronic bronchitis and lung function impairment are well described adverse health outcomes of coal mine dust exposure and have the same presentation seen when caused by tobacco smoke exposure. The toxicity of tobacco smoke and coal mine dust are roughly equal in potency, and result in an additive effect.

Investigations
Detection of coal mine dust lung disease requires identification of relevant occupational exposure history and evaluation of respiratory symptoms, as well as chest imaging and lung function testing, which usually includes plain chest radiograph and spirometry. Chest imaging is interpreted using International Labour Office (ILO) criteria. Coal workers' pneumoconiosis is a more complex disease to diagnose, and suspected cases should be referred to specialist Respiratory or Occupational physicians for assessment and management. All confirmed cases of CWP should be reported to the Queensland Department of Natural Resources and Mines by treating specialists.

There is currently no effective treatment for coal workers' pneumoconiosis, and emphasis is therefore on early detection of asymptomatic or early-stage disease, and advice to avoid further exposure to coal mine dust and other respiratory hazards including smoking cessation.

Further information

The Queensland Department of Natural Resources and Mines has compiled a list of Respiratory physicians who can be contacted for further assessment of potential cases of CWP. A list of radiology clinics reporting chest x-rays to the ILO classification has also been compiled. These lists can be accessed on the Department's webpage, and will be regularly updated. See https://www.business.qld.gov.au/industry/mining/safety-health/mining-safety-health/medicals/coal-board-medical/pneumoconiosis-screening

Reference

Petsonk EL, Rose C, Cohen R. Coal Mine Dust Lung Disease – New Lessons from an Old Exposure. *Am J Respir Crit Care Med* 2013;187(11):1178-85

COAL WORKERS' PNEUMOCONIOSIS SELECT COMMITTEE

QUESTION TAKEN ON NOTICE No. 8

Program Development with Thoracic Society

Pages 16

asked on 14 October 2016

QUESTION:

Is the departmental physician involved in Queensland Health's work in attempting to re-educate or better educate other nominated medical advisers about how to properly assess and diagnose black lung disease?

Please provide detail on the competency program being worked on with the Thoracic Society of Australia and New Zealand and Australian College of General Practitioners.

ANSWER:

The Monash review identified significant structural failings within the respiratory component of the Coal Mine Workers' Health Scheme (the Scheme). One set of recommendations was around respiratory function examinations, particularly around spirometry equipment, training, and the quality and interpretation of spirometry.

The recommendations specifically provided that spirometry should be conducted only at respiratory laboratories accredited by the Thoracic Society of Australia and New Zealand (TSANZ).

The department is currently working with the TSANZ to identify practical options for an accreditation program for those seeking to undertake spirometry under the Scheme.

Currently in Queensland there are 10 TSANZ accredited laboratories – 9 in south-east Queensland and 1 in Cairns. In working with the TSANZ and the Australian College of General Practitioners to develop an accreditation program, the department is committed to ensuring that every coal worker is able to access regular lung function testing through spirometry.

It is anticipated that a discussion paper canvassing a range of issues regarding spirometry will be released for targeted consultation by late 2016.

In response to the Monash report, the department is working on a range of reforms to improve the screening program. This includes the development of a range of tools to assist medical practitioners.

To date, the department has distributed materials to raise awareness of the coal workers' pneumoconiosis to medical peak bodies and key health industry stakeholders (Attachment A). Queensland Health also facilitated the distribution of information about the disease to general practitioners through its medical distribution channels (Attachment B).

The department's Occupational Physician provides regular advice to nominated medical advisers and also engages with nominated medical advisers, respiratory physicians and other medical professionals involved in the care of coal mine workers in relation to individual queries they may raise.

ATTACHMENT A
Email to key medical stakeholders

30 June 2016

Dear XXX

As you may know, the Department of Natural Resources and Mines has commenced work on a targeted awareness and information campaign to encourage current and former coal mine workers to get regular health checks and consult their General Practitioner if they have concerns about their respiratory health.

The goal is to increase awareness of coal mine dust lung disease, for both mine workers and medical professionals. I welcome any suggestions you may have to achieve this objective.

As a first step, we have asked coal mine operators, site senior executives, union leaders and site safety and health representatives to help disseminate general awareness information at mine sites and via communication networks already in place to connect with coal mine workers.

I would appreciate your assistance in sharing this information material through your professional networks so medical practitioners are aware of it and alert to patients seeking general advice or who may have concerns about their work history in coal mining or the results of previous medical assessments.

Print material will be displayed at prominent locations at mine sites and used as part of safety and health briefings for mine workers and contractors. Support available to medical practitioners for assessing or advising patients with concerns about coal mine dust lung diseases is also a key focus, so please consider opportunities to utilise the web links and digital graphics in your publications. We can also provide tailored graphics for individual websites and publications – please contact Ms Jo Clark on (07) 3199 8255 for assistance.

You can access the following selection of campaign material from the department's media centre:

- **A2 Poster** – a low resolution PDF for electronic distribution and a high resolution PDF for print
- **A5 Postcard** – a low resolution PDF for electronic distribution and a high resolution PDF for print
- **Digital graphics** – standard landscape and rectangle size graphics for use as web adverts and in online publications with direct links towww.business.qld.gov.au/industry/mining/safety-health/mining-safety-health/medicals/coal-board-medical/pneumoconiosis-screening.

If you would like more information about this or other reform initiatives underway as part of the review of the Coal Workers' Health Scheme please contact me.

Thank you for your cooperation and assistance.

Kind regards,
Lana Bartholomew
Project Executive | Coal Mine Workers' Health Scheme | Minerals and Energy Resources
Department of Natural Resources and Mines

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E lana.bartholomew@dnrm.qld.gov.au **|** **W** www.dnrm.qld.gov.au

Level 12 **|** 61 Mary Street **|** Brisbane Qld 4000

Distributed to key stakeholders at:

- Chief Health Officer - Queensland Health
- President - RANZCR
- President - TSANZ
- Executive Director, Health Protection Branch, Prevention Division Queensland Health
- Executive Director, Medical Services and Clinical Dean, Mackay Hospital and Health Service
- University of Queensland
- Monash University
- Sonic Health Plus
- St Vincent's Health Australia
- DNRM's Occupational Physician
- Royal Australian College of General Practitioners
- Australian Medical Association
- Australian Medical Association, Queensland President
- Royal Australian College of GPs
- General Practitioners Alliance
- Reps from AMA, RACGP, Rural Doctors Assoc, College of Rural/Remote
- Royal Australian College of Physicians
- Australasian Faculty of Occupational and Environmental Medicine
- CS Health, Coal Services Pty Ltd

ATTACHMENT B

MONASH Centre for Occupational and Environmental Health

UIC SCHOOL OF PUBLIC HEALTH UNIVERSITY OF ILLINOIS AT CHICAGO

Coal Mine Dust Lung Disease – Fact sheet for GPs

Since May 2015, there have been six confirmed cases of coal workers' pneumoconiosis (CWP), one form of coal mine dust lung disease (CMDLD), reported among former and current Queensland coal mine workers, and the outcome of at least two suspected cases is still pending. The Queensland Department of Natural Resources and Mines (QDNRM) has commissioned an independent review of the respiratory component of the coal mine workers' health scheme, including an interim strategy to detect and manage further CMDLD cases. This fact sheet contains information for General Practitioners about CMDLD, to assist in the assessment and management of such cases. Due to the high media interest in this issue, many coal miners in Queensland are likely to be worried about their respiratory health and seek advice from their GP.

Summary

- Coal miners occupationally-exposed to respirable coal mine dust over several years are at risk of developing coal mine dust lung disease, which includes CWP, emphysema, chronic bronchitis, and lung function impairment.
- CMDLD should also be considered in former coal miners, such as retirees and ex-industry employees, who present with significant respiratory symptoms. These diseases develop gradually, usually after at least 10 years of exposure, however in sensitive miners or in cases of intense exposure symptoms may occur sooner.
- Typical symptoms of CMDLD include cough, sputum production, and shortness of breath, however individuals with early disease may be asymptomatic but may have detectable chest x-ray or spirometry findings.
- Early detection of coal mine dust lung disease is based on chest imaging and lung function testing, usually with plain chest radiography and spirometry, along with careful evaluation of respiratory symptoms.
- Individuals who are or have been coal mine workers and are suspected of having CWP should be referred to a Respiratory and/or Occupational physician for further assessment. Links to lists of such physicians can be found at https://www.business.qld.gov.au/industry/mining/safety-health/mining-safety-health/medicals/coal-board-medical/pneumoconiosis-screening

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Under the current Queensland Coal Mine Workers' Health Scheme, all coal mine workers are required to undergo a medical assessment prior to the start of their employment at a coal mine, and then at least once every five years during their employment. Employees identified as at risk from dust exposure, in particular underground coal miners are also required to undertake chest x-rays as part of their health assessments. Given the long latency between exposure and disease occurrence, the population at risk extends to previous employees including retired coal miners and coal miners who have transferred to other industries.
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Reference

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COAL WORKERS' PNEUMOCONIOSIS SELECT COMMITTEE

QUESTION TAKEN ON NOTICE No. 9

14 October 2016

QUESTION: As at the present time and over the past decade or more, has there been any standard or guidance note issued to industry expressly addressing coalmine dust and identifying it as a hazard for which mine operators have obligations to prevent?[1]

ANSWER:

In the process of mining coal, dust is a hazard which cannot be eliminated but can and must be monitored and controlled to acceptable levels.

Current legislation identifies dust as a hazard and imposes express obligations on operators to keep workers' exposure to respirable dust at an acceptable level (see s89 of the *Coal Mining Safety and Health Regulation 2001*).

Operators must ensure that their safety and health management systems provide for ways of achieving certain prescribed requirements regarding dust in the regulation.

Section 89 of the regulations prescribes parameters to which exposure must be managed, and the standard to be applied in taking measurements.

The Coal Mining Safety and Health Advisory Committee (CMSHAC) is finalising development of recognised standards for dust control and dust monitoring for the Minister's consideration. Recognised standards state ways of achieving an acceptable level of risk. Operators must follow the ways stated in a recognised standard or may adopt other methods only if they can achieve a better standard of risk than that in the recognised standard.

The inspectorate has not issued any guidance notes specifically concerned with dust management.

[1] Public briefing transcript, Brisbane, 14 October 2016, pp 19

COAL WORKERS' PNEUMOCONIOSIS SELECT COMMITTEE

QUESTION TAKEN ON NOTICE No. 10

on 14 October 2016

QUESTION: Has the department ever prosecuted a mine for excess dust?[1]

ANSWER:

No. The Inspectorate has taken compliance action in respect of dust levels in coal mines. Since 2013, 8 mines have been issued with 1 or more directives in relation to dust monitoring or dust management.

In determining what enforcement action should be taken in a particular case, the Inspectorate has developed an enforcement and compliance process, comprising successive steps.

This process outlined below is considered to be a more effective compliance process than prosecution as it requires the mine to immediately direct its efforts to solving the problem. Prosecutions can take years and do not directly result in issues at the mine being addressed. The compliance process outlined below does not preclude prosecution at any time.

Step 1 A site inspection is conducted and a mine record entry (MRE) made. A directive may be issued requiring the mine to supply information to the Inspectorate.

Step 2 If, from the information supplied under the directive, the inspector determines it appropriate, a further directive may be issued requiring the mine to develop a plan to rectify any issues identified, by a stated due date.

Step 3 Level 3 compliance meeting: if compliance has not been achieved by the due date, the mine Site Senior Executive (SSE) will be required to attend a Level 3 compliance meeting with the District Inspector. The SSE must present data and reasons why compliance has not been achieved. The SSE must show how compliance will be achieved and apply for an extension of the directive.

If an extension is granted, conditions may be placed on the mine, including increased monitoring frequency and regular updates to the District Inspector. This will include review of exposure data and progress of key milestones.

Step 4: Level 4 compliance meeting: if compliance has not been achieved by the extension date, the SSE and an operator's representative must meet with the Chief Inspector. The SSE must provide a commitment to the Chief Inspector to achieve compliance by an agreed date. The Chief Inspector will outline to the options available to the Inspectorate if compliance is not achieved by the due date.

[1] Public briefing transcript, Brisbane, 14 October 2016, pp 19

Step 5: Actions that the Inspectorate may take if non-compliance include:
Option 1: directive to reduce shearer speed
Option 2: directive to reduce exposure time and hours cutting (until compliance demonstrated)
Option 3: directive to stop production until appropriate actions are implemented.

COAL WORKERS' PNEUMOCONIOSIS SELECT COMMITTEE

QUESTION TAKEN ON NOTICE No.11

on 14 October 2016

QUESTION: Has the department ever gone to the stage of collecting evidence and going to crown law or your own legal advisers in relation to excess dust in coalmines?[1]

ANSWER:

Yes. The option of prosecution has been discussed amongst the range of compliance options available to the Inspectorate.

[1] Public briefing transcript, Brisbane, 14 October 2016, pp 19

COAL WORKERS' PNEUMOCONIOSIS SELECT COMMITTEE

QUESTION TAKEN ON NOTICE No.12

on 14 October 2016

QUESTION: Has the department ever gone to the stage of collecting evidence and going to crown law or your own legal advisers in relation to excess dust in coalmines? In relation to taking it as far as a prosecution?[1]

ANSWER:

Yes. The option of prosecution has been discussed amongst the range of compliance options available to the Inspectorate.

[1] Public briefing transcript, Brisbane, 14 October 2016, pp 19 & 20

COAL WORKERS' PNEUMOCONIOSIS SELECT COMMITTEE

ADDITIONAL REQUEST No.2

on 14 October 2016

REQUEST: I would ask you to please come back before the committee with all the details in relation to every single miner that was diagnosed with pneumoconiosis from the Rathus report. I would like a detailed report as to whether or not those miners were followed up, how they were followed up and also the outcome of that. [1]

ANSWER:

See response to question on notice 2.

Further details of those workers mentioned in the Rathus and Abrahams report as having been diagnosed with coal workers' pneumoconiosis concern the private medical history of those workers.

This information is confidential and cannot be disclosed to anyone other than the worker to whom it relates or to another person with the worker's consent.

Consistent with these obligations of confidentiality, when the Queensland Coal Board was dissolved and transferred its functions and records to the then Department of Mines and Energy it did not provide a list of the names of coal workers identified as having pneumoconiosis in the Rathus and Abrahams review.

As referenced in the Rathus and Abrahams report the x-rays of individuals which indicated abnormalities were forwarded by the Queensland Coal Board to the health department for follow up. This was required by the 1982 order which established the health screening program on which the Rathus and Abrahams report was based.

All files relating of the Queensland Coal Board are held in archives and are retrievable by searching the name of the worker.

[1] Public briefing transcript, Brisbane, 14 October 2016, pp 3

COAL WORKERS' PNEUMOCONIOSIS SELECT COMMITTEE

ADDITIONAL REQUEST No.3

on 14 October 2016

Guidance notes, finally, are developed by the Mines Inspectorate to help operators meet their safety and health obligations, and there are currently nine guidance notes for coalmining safety and health.

REQUEST: The committee requests a copy of these guidance notes.[1]

ANSWER:

Copies of all current guidance notes for coal mines are attached:

- QGN7: Reporting Serious Accidents and High Potential Incidents to an Inspector of Mines or an Industry Safety and Health Representative
- QGN9: Reviewing the effectiveness of safety and health management systems
- QGN10: Handling explosives (surface and quarry)
- QGN11: Handling explosives (underground)
- QGN15: Emergency preparedness for small mines and quarries
- QGN16: Fatigue risk management
- QGN20: Management of oxides of nitrogen in open cut blasting
- QGN22: Management of noise in mines
- QGN24: Guidance for coal mines to develop and implement a management structure

[1] Public briefing transcript, Brisbane, 14 October 2016, pp 5

COAL WORKERS' PNEUMOCONIOSIS SELECT COMMITTEE

ADDITIONAL REQUEST No.5

on 14 October 2016

If the committee would also like a copy of the approved form over the fullness of time, we are also able to provide that to you if you would like to receive it.

REQUEST: The committee requests a copy of the approved form.[1]

ANSWER:
The forms for the period 1 January 1983 up to and including 14 October 2016 are attached.

[1] Public briefing transcript, Brisbane, 14 October 2016, pp 5

Review of Respiratory Component of the Coal Mine Workers' Health Scheme for the Queensland Department of Natural Resources and Mines

Final Report

Monash Centre for Occupational and Environmental Health

School of Public Health & Preventive Medicine

Faculty of Medicine, Nursing and Health Sciences

Monash University

In collaboration with

School of Public Health

University of Illinois at Chicago

12th July 2016

Review team

Department of Epidemiology & Preventive Medicine, Monash University

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Dr Mina Roberts, MBChB, MPH, GDipOEH

Alfred Hospital, Melbourne

Professor Bruce Thompson FANZSRS PhD. Head Physiology Service, Dept of Allergy, Immunology & Respiratory Medicine, School of Biological Sciences, Monash University

University of Illinois at Chicago

Professor Robert Cohen MD, FCCP, B-Reader. Clinical Professor of Environmental and Occupational Health Sciences, University of Illinois at Chicago School of Public Health

Assistant Professor Leonard Go MD

Kirsten Almberg PhD, MS

Kathleen Deponte, MD, B-Reader. Radiologist, Diagnostic Imaging Associates, Norton, Virginia

Acknowledgements

The review team acknowledges the assistance provided by the Reference Group, NSW Coal Services, Safe Work Australia, Queensland Treasury Office of Industrial Relations (for Q-COMP), Australian Institute of Health and Welfare, Dr David Rees and Dr David Fishwick.

Erratum (30 August 2016)

On page 68 of the original version of this report, it was stated that Safe Work Australia (SWA) found 237 accepted WC claims for respiratory diseases such as silicosis and pneumoconiosis (due to coal dust, asbestos, silica or other causes) and this included 3 WC claims for CWP, two from NSW and the other from WA. Since this report was released, SWA has notified the review team that the numbers they supplied had some small errors. The correct figures are 236 accepted WC claims for respiratory diseases such as silicosis and pneumoconiosis (due to coal dust or other causes). The one WA CWP claim was a coding error, so this claim has been removed from the total. In addition, the two remaining CWP claims were from Victoria, not NSW. These corrections have been made on page 68.

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Overview

Background

As of December 2015, when this review was being developed, six confirmed cases of coal workers' pneumoconiosis (CWP) had been identified by the Queensland Department of Natural Resources and Mines (DNRM) over a period of about seven months among coal miners in Queensland. An additional case was later notified in May 2016, making a total of seven confirmed CWP cases which could be included in this review. An 8th case was reported on 28 June 2016, but it was too late for any further details to be included in this final report.

Prior to this, the Queensland Coal Mine Workers' Health Scheme had not identified any new cases for many years and CWP was thought to have been eradicated in Queensland. Following the discovery of the initial cases, a review of the design and operation of the respiratory component of the scheme was commissioned by DNRM. A review team from Monash University and the University of Illinois at Chicago was engaged to conduct the review. This multidisciplinary review team included expertise in occupational medicine, respiratory medicine, occupational hygiene, epidemiology, radiology and respiratory science.

The aims of the review were to:

A Determine whether the respiratory component of the health assessment performed under the Queensland Coal Mine Workers' Health Scheme is adequately designed and implemented, to most effectively detect the early stages of coal mine dust lung disease (CMDLD) among Queensland coal mine workers, estimating the extent and providing feedback and, if not,

B Recommend necessary changes to correct deficiencies identified under Aim A, recommend measures to follow up cases that may have been missed as a result of these deficiencies, and identify what additional capacity is needed in Queensland to improve this scheme.

In undertaking this review, the review team accessed and reviewed data and documents from a wide range of sources, including the content of the health assessment form, the information kit given to Nominated Medical Advisers (NMAs), a sample of completed health assessment forms, a sample of spirograms, a sample of chest x-rays (CXRs) and associated radiologists' reports collected under the scheme. We examined the qualifications and geographical spread of the listed NMAs and surveyed them about their spirometry equipment, its calibration, and the technician training. We visited underground and open-cut mines and a coal handling and preparation plant (CHPP) in Queensland and spoke to DNRM, employer and Construction Forestry Mining and Electrical Union (CFMEU) stakeholders. We reviewed relevant literature and spoke to individuals involved in other similar schemes in Australia and overseas and identified other potential sources of information on CWP.

The following aspects of the scheme were identified for inclusion in the review:

1. Purpose of the respiratory component of the current scheme
2. The overall process of the current scheme
3. The scheme health assessments of the confirmed CWP cases
4. The Coal Mine Workers' Health Scheme health assessment form
5. Risk from dust exposure for the purpose of a CXR
6. Nominated Medical Advisers
7. CXR quality and reading
8. Spirometry quality and reading
9. Health assessment form data handling and storage
10. Interstate and overseas health surveillance schemes for coal miners
11. Queensland medical capacity
12. Other sources of data about the extent of CWP
13. Research framework for a survey of CMDLD prevalence among coal miners

Main findings and recommendations

This chapter outlines the main findings relating to limitations of the scheme and recommendations to make improvements, as well as documenting the relevant chapter of the review for each. We have included some supplementary detail, to correct the deficiencies identified with the current Coal Mine Workers' Health Scheme. These findings and recommendations are drawn from chapters 4-15 of this report, which contain further supporting evidence and discussion relating to these limitations and recommendations.

Chapter 4: Purpose of the respiratory component of the current scheme

- After discussion with stakeholders and reviewing the relevant documentation, it is clear that the focus of the respiratory component of the scheme is on fitness for work rather than the detection and management of early CMDLD.
- The respiratory component of the scheme is not being used for group health surveillance to monitor trends in CMDLD, and this is compounded by the exclusion of former and retired coal miners from the scheme.

Recommendation 1

The main purpose of the respiratory component of the scheme should explicitly focus on the early detection of CMDLD among current and former coal mine workers.

1.1. The purpose of the respiratory component of the scheme should be clearly stated as being to:
   - 1.1.1. Provide mandatory respiratory health screening to detect early CMDLD in coal mine workers.
   - 1.1.2. Offer participation in the scheme to former coal mine workers.
   - 1.1.3. Ensure appropriate referral for follow-up, diagnosis and management, including appropriate reductions in further exposure to dust, for coal mine workers with respiratory abnormalities indicating CMDLD.
   - 1.1.4. Collect, analyse and report group surveillance data to monitor trends in CMDLD, and to inform Government, industry and trade union reviews of dust exposure levels and occupational exposure limits for coal mines.

1.2. The purpose of the scheme should be clarified to employers, coal mine workers, doctors and other stakeholders. The roles and responsibilities of the stakeholders (the DNRM, employers unions and mine workers) under the scheme should be defined.

1.3. An information pack about CMDLD and how these conditions are identified and diagnosed should be developed for workers.

Chapter 5: Overall process of the current scheme

There are clear deficiencies with several processes and components of the current scheme, such as: the registration and training of NMAs; the role of Examining Medical Officers (EMOs); decisions about who is "at risk from dust exposure" and thus requires a CXR; the reading and reporting of CXRs; the conduct of spirometry; and the processing of health assessment forms by the DNRM, and these are expanded upon in other sections of the review.

Other notable limitations of the current scheme's overall process include:

- The lack of a clear follow up and clinical referral pathway for investigation, diagnosis and management of coal mine workers and former coal miners with respiratory abnormalities consistent with CMDLD detected during scheme health assessments.
- The lack of clear process to advise mines to review dust exposure levels if respiratory abnormalities are identified.
- The absence of an established mechanism whereby a diagnosis of CMDLD identified under the scheme is formally reported to DNRM.
- The potential for preclinical changes in respiratory health over serial assessments to be overlooked as previous health records are not readily available to NMAs.

Recommendation 2
Clinical guidelines for follow-up investigation and referral to an appropriately trained respiratory or other relevant specialist of suspected CMDLD cases identified among current and former coal miner workers should be developed and incorporated into the scheme.

Recommendation 3
DNRM should require the reporting of detected cases of CWP and other CMDLDs in current and former coal miners identified by the scheme.

Chapter 6: Confirmed CWP cases

We examined the Health Scheme records for the confirmed CWP cases to identify where the scheme had failed to identify and/or act on early respiratory abnormalities indicative of CMDLD.

- There was poor documentation and inconsistent follow-up of abnormal results which were not always recognised by the NMAs, and workers with indications of early CMDLD were still deemed fit to work underground with no restrictions on further coal mine dust exposure.
- Where abnormal spirometry results were thought suggestive of chronic obstructive airways disease, this was attributed to tobacco smoking rather than coal mine dust exposure.
- CXRs referral slips were often not specified as being for coal mine worker screening purposes and the CXRs were not reported using the International Labour Organization (ILO) classification and, for at least two cases, early CXR changes were not identified.

Chapter 7: Heath assessment form

We reviewed the content and design of the respiratory component of the seven page health assessment form and assessed the completeness of a sample of 91 submitted forms.

- The current form lacks a comprehensive respiratory medical history and respiratory symptom questionnaire.
- There is no specific section where information from respiratory medical history and symptoms, respiratory physical examination, spirometry and CXRs are consolidated.
- An earlier version of the health assessment form included a CXR reporting section consistent with the ILO classification, but this was removed many years ago.

- There is no specific section where the final conclusion about the presence or absence of CMDLD is recorded, and if present, the implications for mitigating further coal mine dust exposure.
- Section 1 (the employer's section) was poorly completed, with generic similar exposure groups (SEGs) provided in only a few health assessment forms and company SEGs not provided in any of the forms examined.

Recommendation 4
There should be a separate respiratory section of the health assessment form which includes all respiratory components, including the radiology report using the ILO format and the spirogram tracings and results.

Recommendation 5
The form should include a comprehensive respiratory medical history and respiratory symptom questionnaire.
The new health assessment form should include:
5.1 A detailed respiratory symptom questionnaire and past medical history.
5.2 Revised and expanded questions about smoking history to better identify current/former/never smokers and cumulative smoking exposure (pack-years).
5.3 Occupational history which allows identification of job categories or industries where high coal dust and/or mixed dust exposure is likely to occur.
5.4 A specific reference to the absence or presence of symptoms/signs and CXR or spirometry changes consistent with CMDLD, the follow-up required and frequency of subsequent health assessments.
5.5 Determination of any restrictions on work capacity for individuals with CMDLD, including ability to use respiratory protective equipment (RPE).

Chapter 8: Risk from dust exposure for the purposes of requiring a surveillance CXR

We visited an underground and an open-cut coal mine and a CHPP, and interviewed mine company and Union representatives to understand the development and application of SEGs. While the review team recognises that SEGs have an important role to play in dust monitoring and control and in risk assessment, their use in informing decisions about whether a CXR is required for mine workers was the focus for this review.

- The criteria to determine jobs "at risk from dust exposure" and thus which coal mine workers should have a CXR are not explicit in the Regulations, and the DNRM do not specify which generic SEG categories fulfil these conditions.
- "At risk from dust exposure" is meant to be applied to workers in underground coal mines, open-cut coal mines and CHPPs, but this criterion is most clearly recognised and applied to workers in underground mines.
- The SEGs approach does not adequately account for mobile workers, for example contractors employed in a range of jobs across various mines, who can transition between different SEGs and lower and higher dust exposure jobs.
- The current SEG does not consider dust exposure from previous jobs in other SEGs, which are important to consider when considering the risk of CMDLD.
- While useful for coal dust exposure monitoring and control, the SEGs approach is too complex and has not been used extensively to decide which individual mine workers require a CXR.

Recommendation 6
The criteria to determine workers "at risk from dust exposure" should be based on past and current employment in underground coal mines and designated work categories in open-cut coal mines and CHPPs.

6.1 The criteria to determine job categories "at risk from dust exposure" should be standardized across the Queensland coal mining industry.

6.2 All job categories involving underground work in underground mines, and designated jobs in open-cut mines (e.g. blasting, drilling, rock screening) and CHPPs (e.g. some production and laboratory workers) should require a CXR.

6.3 For workers currently not involved in such jobs, but who have had significant dust exposure in past jobs, the approved medical practitioner undertaking the health assessment should decide whether a CXR is required, and whether the frequency should be more often than five years, based on discussion with the mine worker, including a full occupational history of exposure to coal dust. This is particularly important for former mine workers.

6.4 The criteria to determine dust exposure job categories should be reviewed and/or revised regularly to reflect changes in level of risk, for example due to changes in coal mining technology.

<u>Chapter 9: NMA registration and training</u>

We examined the qualifications and geographical coverage of NMAs currently listed with DNRM, and reviewed the information kit provided to newly-registered NMAs.

- There are too many NMAs performing health assessments to allow for adequate initial training, maintenance of skills, and quality control. Performing enough assessments to maintain skills is a potential problem with so many listed NMAs.
- There is inadequate formal initial and continuing training for NMAs regarding purpose of the scheme and the criteria used to diagnose CMDLD.
- EMOs have no formal recognition under the current scheme but they often perform health assessments, nominally under the supervision of an NMA. This results in an even larger pool of medical providers and further impacts quality control.

Recommendation 7
There should be a much smaller pool of approved doctors undertaking the respiratory component of health assessments under the scheme, taking into account geographical considerations and other workforce needs.

Recommendation 8
Doctors should undergo a formal training program, including visits to mine sites, prior to being approved by the DNRM, to ensure they reach a suitable standard of competence and have the necessary experience to undertake respiratory health assessments under the scheme.

8.1 The minimum qualifications and experience for doctors who are to undertake respiratory health assessments under the scheme should be established.

8.2 While doctors seeking to be appointed to perform respiratory health assessments should have already reached a certain level of competence in the necessary knowledge and skills set out below, a formal induction and ongoing training and audit program for these doctors should be developed to ensure initial and ongoing competence for the specific requirements of the early detection of CMDLD:

8.2.1 Information about the primary purpose of the respiratory component of the scheme, in particular health protection, prevention and early detection of CMDLD and the importance of undertaking such assessments in an independent way.
8.2.2 Information about the spectrum of diseases included in CMDLD.
8.2.3 Information about coal and silica dust exposure, and other respiratory hazards associated with the Queensland coal mining industry.
8.2.4 A visit to a coal mine(s), with a focus on inspecting jobs deemed "at risk from dust exposure".
8.2.5 Conduct and interpretation of quality spirometry.
8.2.6 Instruction in how to consider coal dust exposure for the purposes of deciding which miners require a CXR.
8.2.7 Instruction in the ILO CXR classification of pneumoconiosis to enable them to interpret such reports from the radiologists.
8.2.8 Instructions about how to complete each section of the respiratory component of the modified health assessment form.
8.2.9 Clinical guidelines for follow-up and appropriate referral of CMDLD cases or other respiratory abnormalities.
8.2.10 Instructions to explain the outcome of health assessments, including follow-up with treating doctors and specialists and workplace restrictions on dust exposure for those with indications of CMDLD.

8.3 An experienced Medical Officer should be responsible for the ongoing training and audit of doctors approved to undertake respiratory health assessments under the scheme.

Recommendation 9
The approval of doctors to undertake the respiratory health assessments for the early detection of CMDLD under the scheme should become the sole responsibility of the DNRM.

Recommendation 10
Doctors approved to undertake respiratory health assessments should have a different designation from 'NMA', which should reflect their specific responsibility for respiratory health assessments under the new scheme.

<u>Chapter 10: Chest x-ray review</u>
A sample of 258 digital CXRs from coal miners with at least 10 years of experience in coal mine work was assessed independently by two B-Readers.

- Twenty percent of the CXRs had quality issues, which could affect the accurate detection of the small opacities characteristic of pneumoconiosis.
- The quality issues include poor positioning cutting off portions of the chest, covering up the chest with the scapula or shoulder blades, poor contrast and excessive edge enhancement.
- The quality issues noted above may result in false positive classifications for pneumoconiosis.
- Of the 248 classifiable CXRs reviewed, 18 were considered to have opacities consistent with simple pneumoconiosis.

- Review of the original radiology reports for the 18 positive cases found only two which identified abnormalities consistent with pneumoconiosis, 13 were reported as no abnormalities, and three reports were missing.
- Follow up by the NMA was not done in the two cases where the original radiologist had identified changes on the CXR.

Recommendation 11

Chest x-rays should be performed by appropriately trained staff to a suitable standard of quality and performed and interpreted according to the current ILO classification by radiologists and other medical specialists classifying CXRs for the scheme.

11.1 Require additional training in the use of the ILO classification for radiologists or respiratory physicians classifying CXRs for the Coal Mine Workers' Health Scheme.

11.2 Develop a program to evaluate those radiologists or respiratory physicians who seek to classify CXRs for pneumoconiosis to demonstrate adequate performance. Examples of programs that provide such an evaluation are the US NIOSH B-Reader and the Asian Air Pneumo programs.

11.3 In order to maintain the highest quality, ILO classifications of CXRs for the DNRM should be performed by a selected group of medical practitioners, separate from the clinical interpretation provided by the local radiologist.

11.4 Due to variability in reading CXRs, utilise a protocol involving at least two independent classifications to confirm agreement about the presence or absence of radiological features of pneumoconiosis, similar to the protocol used in this study.

11.5 Provide guidelines to radiology clinics performing CXRs for the Coal Mine Workers' Health Scheme detailing the appropriate qualification of personnel, imaging equipment and software, image acquisition, documentation, image display, and quality control systems. An example of such a guideline to be found at http://www.cdc.gov/niosh/docs/2011-198/

11.6 Develop ongoing clinical audit of CXRs and classifications to ensure quality.

11.7 Provide appropriate feedback to coal mine workers so that they have access to the information in the radiologist and NMA reports.

11.8 Improve the acquisition and archiving of digital CXRs by Queensland DNRM to facilitate disease surveillance efforts.

Chapter 11: Spirometry review

We audited spirometry equipment and training using an online survey which was completed by around one-third (74) of NMAs on the current Health Surveillance Unit (HSU) list. We also assessed the quality and reading of a sample of 256 spirometry tests completed under the current scheme.

a. Spirometry equipment and training:
   - Less than 50% of spirometry currently performed is undertaken by sufficiently trained and experienced staff.
   - Overall, quality control and quality assurance of spirometry testing is inadequate for more than 50% of sites.

b. Spirometry quality and interpretation:

- Forty percent of spirograms reviewed could not be interpreted as they were not performed to American Thoracic Society/European Respiratory Society (ATS/ERS) standards.
- Only 43% (110/256) of the spirometry results evaluated had been accurately interpreted and reported by NMAs.
- Of the 30 spirograms assessed as abnormal by the reviewers, only two had been accurately identified in the NMA reports.

Recommendation 12

Spirometry should be conducted by appropriately trained staff and performed and interpreted according to current ATS/ERS standards.

12.1 Spirometry should be conducted at respiratory laboratories accredited by Thoracic Society of Australia and New Zealand (TSANZ) or similar bodies and for other medical facilities seeking to undertake spirograms under the scheme, accreditation specific to spirometry should be required.

12.2 Spirometry scientists or technicians who conduct tests for the new scheme should undergo initial training and participate in periodic refresher courses provided by an approved organisation.

12.3 Spirometry testing must take part in a quality control program consistent with current ATS/ERS standards and the quality of spirometry tests should be audited regularly as part of the overall auditing within the scheme.

<u>Chapter 12: Health assessment form data handling and storage</u>

We reviewed DNRM's data handling and storage procedures, including accessibility of previous health assessments.

- The transfer of health assessments between the DNRM and NMAs by ordinary mail is inefficient, and the use of hard copy forms and test results is outmoded compared with modern electronic data entry and storage methods.

- The HSU performs an administrative check of the health assessment forms for missing information, but there is no medical review or audit of the collected health data.

- The storage of health records as both scanned and hard copy across a number of sites hampers access to previous records by DNRM staff and NMAs.

- There is a large backlog of about 100,000 health assessments still awaiting entry into the DNRM database, which further hampers accessibility of these records. However, steps are in place to process health assessments for underground coal mine workers by the end of 2016, and to clear the remaining backlog by the following year.

Recommendation 13

DNRM should transition to an electronic system of data entry and storage, whereby doctors undertaking these respiratory assessments enter the data for their assessment and can access previously collected data for the mine worker and to facilitate auditing.

13.1 DNRM should institute electronic data entry and data storage, with suitable consent and security arrangements and the facility to link all records for individual mine workers, and enable access to previous records by doctors undertaking the respiratory health assessments.

13.2 A regular audit function of the collected medical information should be introduced to monitor quality with regular feedback to the doctors performing respiratory health assessments under the scheme.

Recommendation 14

All coal mine workers, including contractors, subcontractors and labour hire employees, who meet the revised criteria for being "at risk from dust exposure" should be registered in the DNRM database on entry into the industry for the purposes of ongoing medical surveillance.

Recommendation 15

DNRM should conduct ongoing individual and group surveillance of health data collected under the scheme, to detect early CMDLD and analyse trends to disseminate to employers, unions and coal mine workers.

Recommendation 16

Coal mine workers should have exit respiratory health assessments regardless of whether they leave the industry due to ill-health, retirement or other reasons.

16.1 Due to the latent period for developing CMDLD, health surveillance under the scheme should include current and former coal mine workers, including retirees, as this would provide a more accurate depiction of industry-wide disease trends.

Recommendation 17

An implementation group, including representatives of stakeholders and relevant medical bodies, should be established to ensure that the necessary changes to correct the identified deficiencies with the respiratory component of the current scheme are implemented in a timely manner.

Recommendation 18

There should be a further review of the revised respiratory component of the scheme within 3 years to ensure that it is designed and performing according to best practice.

<u>Chapter 13: Interstate and overseas health surveillance schemes for miners</u>

We reviewed health surveillance systems for mine workers in other Australian states and overseas, to determine components which could be incorporated to improve Queensland's current scheme. The following points were common to the surveillance programs:

- The objectives and purpose of the scheme, in particular identification and monitoring of respiratory disease, are explicit.
- There are designated high dust exposure jobs and a clearly stated frequency of health assessments and CXRs for workers in these (and other lower risk) job categories.
- Health assessments, including spirometry and CXR interpretation and reporting are administered by trained medical and nursing staff.
- Data collection is electronic to facilitate data collation, analysis and reporting of group surveillance data.
- Medical staff are required to explain the outcome of (adverse) health assessments to workers, with suggested referral pathways to treating doctors and specialists.

Chapter 14: Queensland medical capacity

We identified the specialist medical expertise and resources currently available in Queensland to contribute to the performance of high quality health assessments for the early detection of CMDLD.

- There are three relevant Australian specialist medical organisations (Royal Australian and New Zealand College of Radiologists, Thoracic Society of Australia and New Zealand and the Australasian Faculty of Occupational and Environmental Medicine of the Royal Australasian College of Physicians) with the interest and capacity to assist with health assessments under an improved scheme, however this expertise has not been adequately harnessed.
- While some training and up-skilling is needed due to limited recent experience with CMDLD, these organisations can contribute to training, accreditation of CXR and spirometry testing and clinical audit, development of clinical guidelines, and nominating members to provide specialist opinion to miners with suspected CMDLD.

Chapter 15: Other sources of data about the extent of CWP

We identified routinely collected health data to gauge the extent of CWP among Queensland coal miners, from Queensland hospital records and workers' national and state-based compensation data.

- Four probable and seven possible CWP cases in older, probably retired coal mine workers were identified by Queensland Health after cross-checking public hospital records from the last 20 years with Queensland Coal Mine Workers' Health Scheme records.
- Six accepted workers' compensation (WC) claims for CWP were found through a search of the Queensland compensation database from 2005/06 to current, including four accepted claims in 2015/16. There are also a further 6 cases pending.
- These data sources have limitations and do not provide accurate information about the prevalence of CWP or other CMDLD.

Chapter 16: Research framework for a survey of CMDLD prevalence among coal miners

The current review was not intended to provide an estimate of CWP or other CMDLD among Queensland coal miner workers and the information from existing data sources are also incomplete. Therefore, the extent of CMDLD in current and retired Queensland coal miners remains unknown. As a result, the review team designed a research framework which could better estimate the prevalence of CMDLD in Queensland coal miners.

Overall conclusions

This review of the respiratory component of the Coal Mine Workers' Health Scheme has revealed major system failures at virtually all levels of the design and operation of the respiratory component of the current health assessment scheme, but has also identified ways to modify the current scheme to make it more effective in undertaking medical screening for CMDLD in the future.

The measures identified in the review to address the system failures include:

- A more clearly articulated purpose of the scheme.
- A smaller number of doctors approved by the DNRM to undertake respiratory health assessments under the scheme.
- A greater focus on the credentials and experience of these doctors.
- Introducing initial and ongoing training about CMDLD for doctors seeking approval to undertake respiratory health assessments under the scheme.
- Developing clinical guidelines to inform diagnosis and management of CMDLD identified through the scheme.
- More standardised and consistently applied criteria to determine workers "at risk from dust exposure" for deciding which coal mine workers require a CXR.
- A more complete and better designed respiratory component of the health assessment form with data collected online and better access to the findings from the worker's previous health assessments.
- Better standard of CXR referral, interpretation and reporting using the ILO criteria.
- Better standards of spirometry testing and interpretation.
- A process of clinical audit of collected health data, including spirometry and CXR.
- Greater accessibility of previous job history and health assessment records to inform subsequent assessments of coal mine workers, resulting in a greater ability to monitor changes in respiratory health at an individual level over time.
- Inclusion of former mine workers, including retired mine workers, in whom CMDLD is most likely to be seen.
- The development of robust industry-wide health surveillance data to assist in informing coal mine dust exposure control measures, including review of occupational exposure levels.
- A research framework to provide more robust estimates of the prevalence of CMDLD in Queensland coal mine workers.

These (and other) deficiencies with the respiratory component of the current scheme itself have been confounded by the widespread belief that CWP had been eliminated in Queensland and is of historical interest only leading to complacency about the risks of CMDLD. Where there is a lack of belief that CMDLD can occur among coal mine workers, then it is no surprise that there is a lack of rigour applied to detect such diseases.

Therefore, a major overhaul of the design and operation of the respiratory component of the current Coal Mine Workers' Health Scheme is necessary. As previous attempts by the DNRM to improve aspects of the respiratory component of the scheme did not result in required changes, it will be important for an oversight group to be formed to drive the implementation of the recommendations of this review and in a timely manner.

It is also important to acknowledge the loss of confidence among coal mine workers (and their families) in the scheme's ability to effectively monitor their respiratory health, especially since the recently diagnosed CWP cases have been identified. Understandably, this has resulted in uncertainty about the validity of clearances received about their respiratory health after previous respiratory health assessments. The review team encourages all workers who are concerned about their respiratory health to consult their local doctor in the first instance. Where a CXR or spirogram examined in this report suggests the possible presence of CMDLD, the authors will inform DNRM of the finding so that the appropriate medical practitioner(s) can be informed.

More broadly, the findings of this review, the failures identified and the recommendations to improve the scheme have implications beyond the coal mining industry in Queensland. The coal mining industry in other Australian states, and other industries where (hazardous) respirable dust exposure, such as silica, occurs should also take note of our findings. Respiratory surveillance for their workers should be assessed and, where existing health assessment schemes are in place, these should be reviewed to ensure that their design, implementation and audit are best practice.

The review team would like to conclude by restating that medical screening and surveillance is not a substitute for effective dust control, which should be the first line of action in protecting coal mine workers from CMDLD. This is particularly important since this group of diseases can progress even after dust exposure has ceased. Regular respiratory health assessments are an adjunct to dust control and can inform preventive programs, but only if such medical screening is effectively designed, implemented and monitored.

1. Introduction

1.1 Background

Coal Mine Dust Lung Disease[1] (CMDLD) comprises a group of occupational lung diseases that result from the cumulative inhalation of respirable coal mine dust. Coal mine dust includes: carbon, quartz and silicates, and it is thought that interactions between these dusts leads to a range of pathological changes in the lungs which result in CMDLD.[2]

Coal miners are at risk of developing these diseases, which include the classic fibrotic lung diseases of CWP, mixed dust pneumoconiosis and silicosis, as well as chronic bronchitis, emphysema and diffuse dust-related fibrosis. Progressive massive fibrosis (PMF) is also on the spectrum CMDLD, and is the most severe form of CWP. Early detection of each of these diseases is based on different diagnostic criteria and testing. For example, CXRs primarily detect the small opacities of early CWP, while spirometry can identify early declines in lung function and better assists in the early diagnosis of chronic obstructive pulmonary disease (specifically emphysema), than CXR.

Detection of small opacities, especially those indicative of early lung disease requires careful examination of a high quality CXR. There are established guidelines to read CXRs for changes indicative of CWP, published by the International Labour Organization (ILO). The use of the ILO guidelines results in systematic and reproducible CXR reading so that screening and surveillance can be carried out.[3]

All Queensland coal mine workers are required under the *Coal Mining Safety and Health Act 1999* (Queensland), and Part 6 of Division 2 of the *Coal Mining Safety and Health Regulation 2001*, to undergo a Coal Mine Workers' Health Scheme (the scheme) medical assessment prior to the start of their employment at a coal mine, and then at least once every five years during their employment. The scheme commenced in 1983 when all current coal miners were required to participate in a one-off CXR survey, although participation was voluntary for retired miners. This study revealed cases of pneumoconiosis and other respiratory abnormalities,[4] and prompted the second Health Order.

Under the second of the Health Orders issued, all new entrants to the coal mining industry were required to undergo CXR and lung function tests to satisfy a pre-employment medical standard. A further Order was issued by the Queensland Coal Board in 1993 that provided for both pre-employment and ongoing health surveillance periodically every five years. In addition, a CXR was required only when the employer advised that the coal mine worker was "at risk from dust exposure".

The focus on respiratory diseases continued after the Queensland Coal Board was abolished in 1997, and at least until the Coal Mining Safety and Health Regulation (2001) came into force. Although the current Regulations stipulate periodic monitoring of workers' level of risk, this relates broadly to the variety of hazards encountered in coal mines.

The parts of the current health assessment relevant to the early detection of CMDLD include a medical history, physical examination, spirometry to assess lung function and a posterior-anterior CXR.

Health assessment under the scheme is the responsibility of NMAs, who are required to complete a "Report on Health Assessment" (the report) at the completion of the assessment. The actual health assessment may be performed by the NMA or an EMO, however only the NMA may complete and sign off on the report. The report is provided to the coal mine worker and the employer, and the full health assessment form, CXR films and CXR reports are also forwarded to HSU at DNRM.

As of December 2015, when this review was proposed, six confirmed cases of CWP had been identified within seven months among coal miners in Queensland, and an additional case was notified in May 2016. An 8th case was reported on 28 June 2016, but this case was identified too late for further details to be included in this review. Prior to this, no new cases had been identified despite the ongoing coal miners' health assessment scheme, and CWP was thought to have been eradicated decades ago. A review of the design and operation of the respiratory component of the scheme was therefore commissioned.

1.2 Coal mining in Queensland

There were 54 coal mines in Queensland in 2013-2014, including 41 open-cut and 13 underground mines.[5] In addition there were 31 coal handling and preparation plants (CHPPs), some of which serve multiple mines. According to data from the DNRM, there were approximately 5,000 underground coal miners in Queensland at the end of 2015. Table 1 presents the number of miners in each mine, and which mines are regarded as "gassy". Gassy mines are dewatered to expedite gas extraction, for example of methane, leading to drier and more friable coal, and hence likely higher dust levels.

Table 1: Estimated number of mine workers in Queensland underground mines, in 2015 (Data source: DNRM)

Mine	No. of miners	Gassy Mine?	Operational Status
Aquila	0	No	Non-operational (care and maintenance)
Broadmeadow	683	Yes	Operating Long Wall
Carborough	314	Yes	Operating Long Wall
Cook	362	No	Redevelopment - Long Wall not yet operating
Crinum	223	No	Non-operational (care and maintenance)
Eagle Downs	5	No	New development (care and maintenance)
Ensham	209	No	Operating Place Change
Grasstree	639	Yes	Operating Long Wall
Grosvenor	249	Yes	New development - Long Wall not yet operating
Kestrel	536	No	Operating Long Wall
Moranbah North	649	Yes	Operating Long Wall
Newlands	109	No	Operating Long Wall
North Goonyella	275	Yes	Operating Long Wall
Oaky No 1	248	Yes	Operating Long Wall
Oaky North	386	Yes	Operating Long Wall
Total	**4,887**		

The vast majority of Queensland coal is coking coal or thermal coal. These are classified as bituminous coals and typically contain between 76–90% fixed carbon, that is, high rank coal types. All of the underground mines in Queensland are bituminous coal mines mines.[6] Currently, there are no anthracite coal mines in Queensland, though three are considered semi-anthracite, one of which is currently on 'care and maintenance. All three of these mines are/were operated as open-cut mines. There is also an anthracite deposit in Nebo West, but the DNRM advised that there are no current plans to mine it.

In general, Queensland underground coal mines are thought to contain less than 5% silica, provided the mining horizon is within the seam, which can vary. On the other hand high silica exposure can occur with mining processes that involve driving drifts through stone, mining through rock intrusions, drilling or bolting into a stone roof during development and secondary support activities. Open cut mines remove overburden (overlying soil and rock) before reaching the coal seams, and there is a potential for silica exposure during this process.

Most Queensland underground coal mines are operating longwall mining. Longwall mining is thought to give rise to four times as much dust as continuous mining,[7] particularly when production rates (machine speeds) are high.[7, 8] In addition, bi-directional cutting can result in increased exposure to coal mine dust.[7]

1.3 Trends in coal workers' pneumoconiosis

The rates of fatalities and injuries among coal miners have diminished markedly in the USA[1] and UK[9] since the 1970s, however workers in the coal mining industry are more likely to suffer chronic lung disease than comparable non-mining heavy industry.[10] Using the USA as an example, data on occupational illnesses are substantially underreported in coal mining[11] (and other industries[12]), and hinders a targeted public health and industrial hygiene response.

CWP re-emerged in the USA in the late 1990s, though the occurrence of the disease was expected to continue to decline after the institution of modern dust control Regulations. The USA National Institute for Occupational Safety and Health (NIOSH) had reported a decline in prevalence of CWP from 6.5% in the 1970s to a low of 2.1% in the 1990s. However, CWP prevalence subsequently increased to 3.2% in the first decade of the 21st century. The rate of progressive massive fibrosis (PMF) in certain coal mining states in the USA has also recently increased to levels observed prior to the introduction of modern dust controls.[13] In addition, exposure to silica and silicates, e.g. from cutting rock beyond the coal seam and roof-bolting, has been implicated as a factor in rapidly progressive disease.[14]

High rates of CWP have been measured elsewhere. For example, coal miners in Chinese state-owned coal mines who commenced work in the 1970s had cumulative rates of CWP of between 4 to 17%.[2] In Colombia, the prevalence of CWP was recently reported as 36%.[2] A 1984 prevalence survey of CMDLD in Queensland identified 75 cases of pneumoconiosis or suspected pneumoconiosis among 7,784 current and 123 retired employees. [15]

Since the 1990s, Australia has had very few reported cases of CWP.[16] A 24-year mortality surveillance study[17] revealed that out of over 1,000 pneumoconiosis-related fatalities in Australia between 1979 and 2002, CWP accounted for fewer than 100 fatalities, with the largest decline occurring between 1988 and 1996. There were fewer than 5 WC claims per million employees for pneumoconioses (excluding asbestosis) from 2000-01 to 2007-08 and no claims from 2008-09 to 2010-11.[18]

This contrasts with the situation in the USA, where there has been little change since the late 1970s (See Figure 1). Joy et al[19] compared the differences observed between USA and Australian mines and miners, although most of the data were from New South Wales, not Queensland. They concluded that the much lower prevalence of CWP (defined as an ILO category of 1/0 or greater) among Australian miners was due to less exposure to quartz, and perhaps the thicker coal seams, larger numbers of employees (implying bigger operations with more investment for environmental monitoring and dust control), and more effective use of respiratory protection. This was despite occupational exposure limits for coal dust in Australia not keeping pace with reductions in such limits overseas (see section 1.4).

The recent cases of CWP identified in Queensland indicate that more recent information on prevalence and/or incidence of CWP is required and a research framework for this is included in chapter 16 of this report.

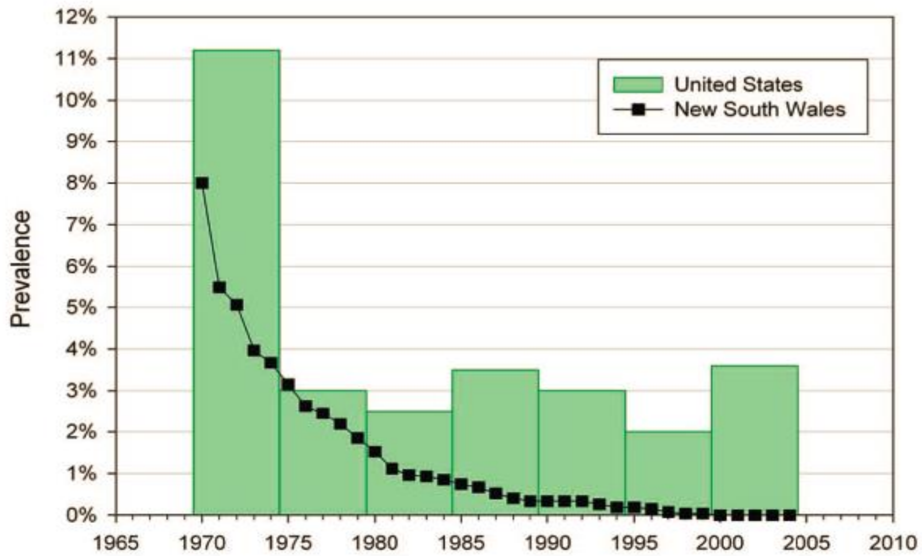

Figure 1: Prevalence of pneumoconiosis, ILO category 1/0 or greater among US underground coal miners and New South Wales[1] coal industry employees, by year [19]

[1]. Equivalent data from Queensland were not provided in this paper but CWP rates in Queensland were thought to be similar to those in NSW

1.4 Exposure limits and risk of pneumoconiosis

The current Australian workplace exposure standard for coal dust is 3 mg/m^3, and for crystalline silica which may also cause silicosis, another type of pulmonary fibrosis, the exposure limit is 0.1 mg/m^3.[20] Other countries have lower occupational exposure limits (OELs) for coal dust than does Australia.

Exposure limits for coal dust are measured as mean air concentrations over 8 hours (i.e. an 8-hour time weighted average (TWA)). If the shift is normally 12 hours for 5 days (i.e. longer than 40 hour per week) the mean exposure must be compared to a proportionally reduced limit (e.g. 8/12). This is because for coal dust and silica, increased risk is associated with cumulative exposure rather than exposure intensity. Consideration of extended shifts is discussed in Appendix C of a Queensland Government report 2010.[6]

The USA Mine Safety and Health Administration (MSHA) requires mine operators "to use the continuous personal dust monitor to monitor the exposures of underground coal miners in occupations exposed to the highest respirable coal mine dust concentrations".[21] Samples must be taken over the whole of a shift during normal production.

Number of samples is a critical issue to demonstrate compliance with exposure limits. This is also discussed in the above Appendix.[6] Exposure measurements typically show lognormal distribution with a tail at the high end of the exposure distribution. This means that if few samples are taken, they are likely to fall at the lower end of the distribution.[22]

More information on exposure limits and risk including a list of the available international exposure limits for coal dust and silica are provided in Appendix 1.

2. Aims of the review

A. To determine whether the respiratory component of the health assessment performed under the Queensland Coal Mine Workers' Health Scheme, is adequately designed and implemented to most effectively detect the early stages of coal mine dust lung diseases in Queensland coal mine workers, estimating the extent and providing feedback and, if not,

B. To recommend necessary changes to correct deficiencies identified under Aim A, recommend measures to follow up cases that may have been missed as a result of these deficiencies, and identify what additional capacity is needed in Queensland to improve this scheme.

The full scope of the review is included in Appendix 2.

3. Ethics approval and data security

Ethics approval for the review was granted by Monash University Human Research Ethics Committee, and the Institutional Review Board of the University of Illinois at Chicago.

The DNRM accessed and extracted data for the review from their Coal Mine Workers' Health Scheme records. Data were de-identified, copied and provided in electronic format, except for analogue CXR films which were provided in hard copy. De-identification included removal of the name, address, telephone number, day and month of birth (but not year of birth) for each worker.

The de-identified data were sent to Monash University via secure file transfer, and stored on a password-protected server. Access was limited to the review team. CXR data were sent to Professor Cohen by secure file transfer and courier, from Monash University and the DNRM.

4. Purpose of the respiratory component of the current scheme

The original coal mine workers' medical assessment scheme was put in place in response to a concern about pneumoconiosis and other respiratory abnormalities (see chapter 1.1). The current NMA information kit does not however clearly state that the purpose of the scheme includes early detection of CMDLD.

A 2010 report of a dust self-assessment survey of coal mines[6] acknowledged the "general confusion around the requirements for, and the content of health surveillance for Queensland coal mine workers." There was a lack of awareness about the purpose of the respiratory component of the scheme, in particular when spirometry and CXRs were required.

While historically, early detection of CWP and other CMDLD in individual miners has been a focus of the respiratory component of the scheme, the current emphasis is on fitness for work. Different parts of the respiratory component of the current scheme are embedded within the assessments of other body systems, and so there is potential for the integration of all of the respiratory health information and important patterns of early lung changes to be overlooked.

CMDLD may develop after some years of exposure to coal dust even if exposure stops. The dust remains in the lungs and CMDLD may only become apparent some years later.[9] The scheme is designed to assess current coal mine workers, so once workers retire or move to another industry, they are lost to the scheme. Cases of CMDLD that develop among former mine workers are unlikely to be identified. This omission further reduces the effectiveness of the scheme as a group surveillance program.

The main purposes of the respiratory component of the scheme, with respect to CMDLD, should be more clearly stated as being to:

1. Provide respiratory health screening to detect early CMDLD in coal mine workers.
2. Ensure appropriate referral for follow-up, diagnosis and management, including appropriate reductions in further exposure to dust, for coal mine workers with respiratory abnormalities.
3. Collect, analyse and report group surveillance data to monitor trends in CMDLD, and to inform Government, industry and trade union reviews of dust exposure levels and occupational exposure limits for coal mines.

The review team would like to emphasise that medical surveillance of CMDLD is only useful for secondary prevention and identifying where there may have been previous excessive exposure. Because of the long latency in the development of CMDLD, it is not a substitute for primary prevention, which should be in the form of coal mine dust monitoring and control.

5. Overall process of the current scheme

Having considered the purpose of the respiratory component and identified the lack of a focus on the early detection of CMDLD, the review team assessed the scheme's processes.

The information in this chapter is summarized from the Coal Mine Workers' Health Scheme – Information for Newly Appointed Nominated Medical Advisers (version 8, 24/02/15), which includes relevant sections of the Coal Mining Safety and Health Regulation (2001) (CMSHR). The flow chart in figure 2 depicts the overall process of the current scheme.

Current situation

The process and procedures of the Coal Mine Workers' Health Scheme begin when a potential, current or previous coal miner applies for work with an employer, which could be a coal mine operator or a contractor (step 1).

As specified under section 46 of the CMSHR, employers must ensure prospective coal mine workers undergo health assessments with their NMA prior to employment. Employers are expected to complete section 1 of the coal mine workers' health assessment form before workers attend NMA appointments (step 2). Section 1 is meant to inform the NMA about the potential hazards of the coal miner's proposed job and importantly should specify whether the worker is "at risk from dust exposure" and therefore requires a CXR.

In some instances however, companies advertise for workers, especially contractors and subcontractors with a current fit for work health assessment. As the miner's job category and location(s) will be unclear, section 1 about the relevant SEG and other potential hazards associated with the job cannot be completed.

The coal mine worker is required to complete section 2 of the health assessment form, to provide details about work history and past and current medical history (including respiratory symptoms) prior to attending their NMA appointment (step 3).

Section 3 of the form consists of the clinical findings, including the spirometry and CXR results (if a CXR was performed), and is completed by either the NMA or an EMO after s/he has reviewed sections 1 and 2 (step 4). Under section 46 of the CMSHR, health assessments can be carried out by an EMO other than the NMA, although assessments must be undertaken under the supervision of an NMA.

EMOs are not authorized to complete section 4 of the report. Instead, partially completed health assessments should be forwarded by the EMO to the NMA, who is meant to review sections 1 to 3 prior to completing section 4 and issuing the report to the employer and coal mine worker (step 5). The report essentially summarizes the health assessment and outlines a worker's fitness for work, including any restrictions. NMAs are expected to provide an explanation of the outcome of the medical examination to the worker and "where practical" secure the worker's signature on the report. It is also the NMA's role to specify the nature and duration of restrictions imposed on a worker's fitness and any required review. However, the instructions do not relate explicitly to CMDLD or other respiratory abnormalities.

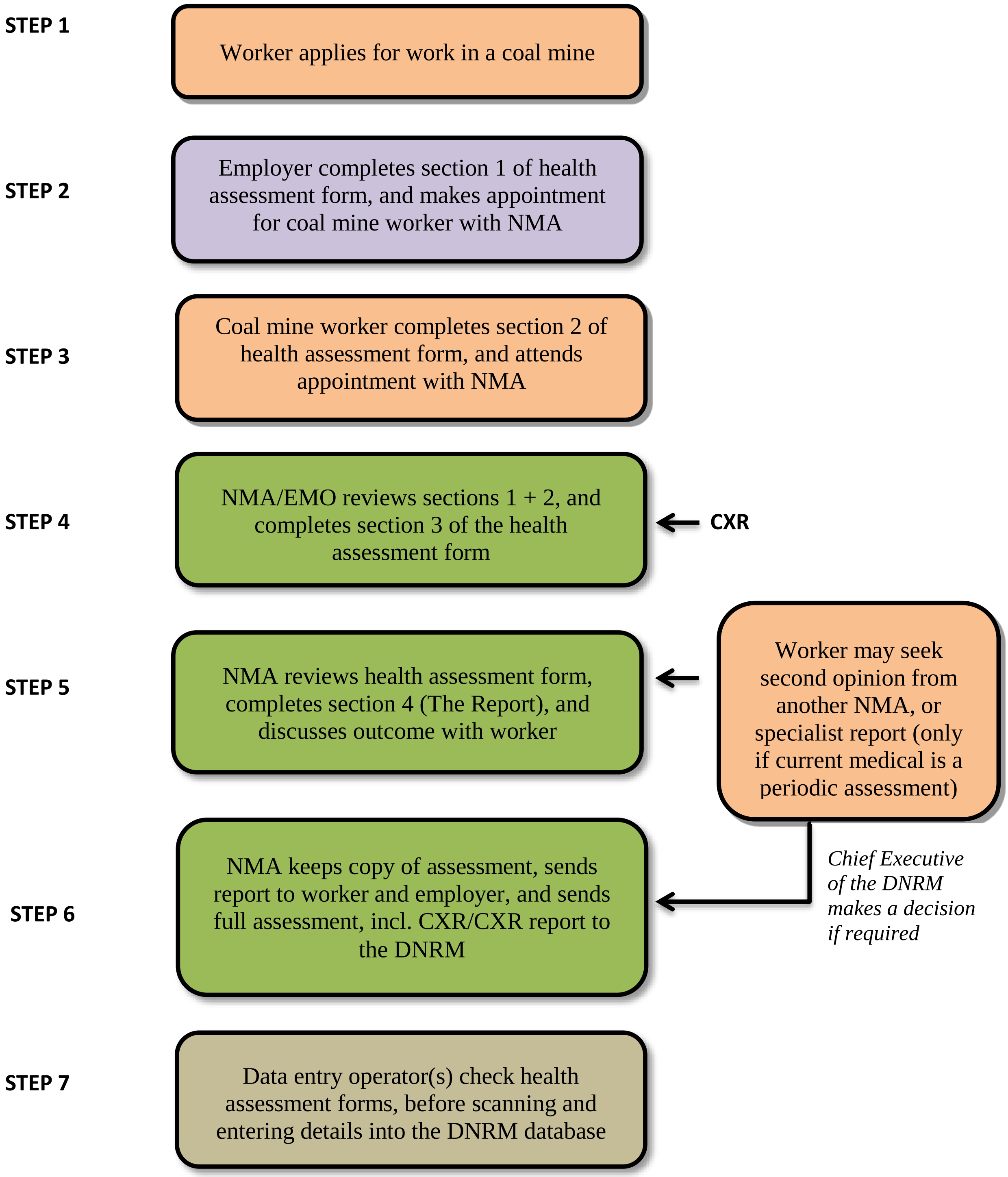

Figure 2: Flow chart of the process of the current Coal Mine Workers' Health Scheme

If the report indicates that a coal mine worker is unable to perform in their usual role without creating an unacceptable level of risk, the worker has a right under section 48 of the CMSHR to request an opportunity for a second opinion from another NMA or relevant specialist, although only if the medical is a periodic health assessment (step 5a). The original NMA is then expected to review their initial report in light of the findings in the second doctor's report and issue another report. Where differences between the reports are unresolved, the worker or employer notifies the chief executive of the DNRM, who will appoint a medical specialist to make a final decision based on a review of the conflicting reports and, if necessary, arrange a further assessment of the worker.

The health assessment records collected under the scheme are the property of the DNRM. NMAs are required to keep a copy of the health assessment data and completed forms and to send a copy of the full assessment, including original CXR films and reports (or copies of CD/DVD) and spirograms to HSU at DNRM (step 6).

Data entry operators in the HSU check health assessments for completeness, before entering the data into the DNRM database (step 7).

Section 46 of the CMSHR states that employers must ensure coal mine workers undergo health assessments periodically as decided by the NMA, but at least every 5 years.

Limitations

As found in our review of the purpose of the scheme in the previous section, the overall assessment process, including the respiratory component, is also aimed at establishing current fitness for work rather than the early detection and management of CMDLD.

There is no clear referral pathway for follow up of respiratory abnormalities detected during the health assessments, nor criteria for further investigation, diagnosis or management of CMDLD in instances where abnormal lung function (spirometry), CXR or other respiratory abnormalities are identified. Clinical guidelines for follow-up of respiratory abnormalities are needed, including involvement of a respiratory physician and/or other specialist with expertise in occupational lung disease, and determination of appropriate workplace restrictions aimed at preventing or reducing dust exposure. It is also important that the results of health assessments are explained to the workers, especially where abnormalities suggestive of CMDLD are detected.

A diagnosis of CMDLD may be made by a respiratory physician or other medical specialist after referral from the NMA, but this may require further investigations, such as a CT scan. However, there are currently no agreed standardised diagnostic criteria within the scheme for the various diseases within CMDLD and no established process in the Regulations by which coal mine workers found to have such disease is formally reported to the DNRM when identified under the scheme.

The SEG approach in section 1 of the form, which is currently required to determine whether a miner needs a CXR, does not account for contractors, subcontractors or labour-hire workers who may not be based at a specified mine or employed for a specific role. CXRs are not being undertaken by all coal mine workers who work underground,[6] but there is also the potential for duplication of health assessments and CXRs. In addition to the scheme assessments, we understand from stakeholders that many employers arrange their own pre-employment and periodic health assessments.

Under the current process, information from previous assessments is not promptly available to NMAs. Miners may have very small opacities and acceptable lung function at any one assessment and be viewed as fit for work. However, comparison across serial medical assessments is more likely to show the development of small, preclinical changes and declines in lung function. The current scheme also has no requirement for any follow-up health assessments focusing on the respiratory health of coal miners previously in a position "at risk from dust exposure" once they leave such a position. In addition, there is no mention of exit health assessments or on-going follow-up of coal mine workers who retire or leave the industry.

The current process does not prevent the submission of incomplete health assessments, as this is performed manually. An electronic system of data entry to a centralised secure database would reduce workload for HSU by removing step 7. Lack of completion of steps e.g. step 2 could be programed to prevent the submission of incomplete forms. Such a system would also enable the findings from previous health assessments to be accessed by NMAs directly from the DNRM data and compared with the current assessment, including in instances where a worker's previous health assessments have been completed by different NMAs.

The review of the health assessments at DNRM is purely administrative and involves no medical review or audit, and the DNRM database is currently not being utilised for group surveillance.

There is also no explicit process by which DNRM can ensure that the scheme as implemented remains fit for purpose as the industry changes, i.e. that it continues to meet its intended aims.

In order to utilise data from the respiratory component of the scheme for evaluation and monitoring of industry-wide trends, the necessary data fields should be identified and the database interrogated regularly for overall reporting purposes. If a case of CMDLD is identified, the DNRM Occupational Physician should be able to contact the employer's NMA to discuss and implement action to reduce exposure and try to prevent other cases occurring. However, under the current regulations, these discussions can only proceed with the consent of the individual worker.

6. Confirmed CWP cases

Having reviewed the purpose and processes of the scheme, we examined health records for the confirmed CWP cases to identify where the scheme had failed to identify and/or act on early respiratory abnormalities indicative of CMDLD. We received de-identified data of the seven individuals with confirmed CWP (as of May 2016), including a majority of completed health assessment forms and CXR reports, from the DNRM. The spirometry printouts performed under the scheme were not available, however lung function results were reported in the records.

The respiratory component of the health assessment forms was reviewed and the overall deficiencies are summarised below. The details of the individual cases are not included, to preserve confidentiality.

The review team was not provided with additional medical information gathered outside the scheme, so we were not always able to assess what prompted the (re-)assessments or investigations that led to the diagnosis of CWP in these cases.

Limitations

For most cases, there were abnormalities identified (respiratory symptoms, spirometry or CXR) during one or more of their health assessments. However, there was a lack of documentation and inconsistent processes about follow-up or referral when abnormal results were found. Furthermore, there were cases where workers were still reported as being fit to work underground with no recommendation for restrictions for respiratory conditions, e.g. to avoid exposure to dust.

Health assessments are required to be completed periodically at least every five years. Some earlier review appointments were organised to re-assess previously identified respiratory problems, but these were sometimes scheduled less frequently than the NMA indicated. In some cases, health assessments were conducted more frequently, but the reasons for this were not always made clear on the health assessment forms. This may be explained, in part, by the worker changing employer and requiring a new health assessment. This can result in more frequent CXRs than desirable.

The majority of the abnormal spirometry results found that the health assessments were considered to be suggestive of chronic obstructive airways disease, but these were often attributed to tobacco smoking rather than coal dust exposure. In addition, decline in lung function tests over serial health assessments were not taken into account by NMAs.

CXRs were not reported according to the ILO classification (see chapter 1.1), although for two cases where abnormalities on CXR were noted, the terminology used by the radiologist was consistent with this classification.

In some cases, diagnosis of CWP was made many years after retirement, this highlights another limitation of the current scheme, which is its exclusion of retired (and former) coal miners and lack of ongoing health surveillance for these groups.

7. Health assessment form

We reviewed the content and design of the respiratory component of the health assessment form (Appendix 3), which includes information about the worker's medical history, respiratory symptoms, job history and information provided by the employer about "at risk from dust exposure". We also assessed the completeness of a convenience sample of 91 forms, and explored possible reasons for incompleteness and/or poor quality.

7.1 Content and design

Current situation

The scheme's health assessment form is a seven page paper-based document. It is divided into four sections for completion by the employer, worker, EMO and NMA, respectively.

The employer's section consists of free text boxes to record the employer and mine name, the coal worker's position (including generic and company SEG) and six "yes/no" questions about exposure to various hazards.

The coal mine worker's section consists of over 40 questions grouped under five separate headings, including "yes/no" tick box options for a range of medical conditions and free text entry for the work history.

The EMO's section consists of over 50 questions grouped under eighteen separate headings, including "yes/no", "abnormal/normal", "absent/present" tick box options for medical history and clinical findings for the respiratory and other major body systems, and space for additional comments.

The NMA's section (section 4 – the report), consists of similar fields as the employer's section, the EMO's examination details and five tick box options to record the coal mine worker's fitness for duty and restrictions.

Limitations

The current structure of the health assessment form has the respiratory component scattered among the numerous questions and physical findings related to other body systems, which reduces the focus on the respiratory system.

The form is also lengthy, and could be shortened by the use of tick boxes, e.g. for previous occupational history provide a list of jobs (such as in Table 2), and duration of employment. This would allow rapid identification of jobs associated with development of CMDLD.

There are insufficient questions about previous respiratory conditions such as asthma, bronchitis, emphysema, tuberculosis, pneumoconiosis, lung surgery, lung infections, and allergies. The form does not have a complete respiratory symptom questionnaire, which should be a standard for health surveillance of workers exposed to hazardous substances that affect the lungs.

The 1995 National Occupational Health and Safety Commission (now Safe Work Australia) guidelines include a respiratory questionnaire and both the NSW and (previous) WA health assessment forms for mining employees include expanded respiratory sections, compared with the Queensland form. The six-page health assessment form used in the WA scheme focussed almost entirely on work history, respiratory symptoms, spirometry and CXR results.

The current Coal Mine Workers' Health Scheme assessment form has several ambiguously-phrased questions, e.g. Question 2.4e "Abnormal shortness of breath or wheezing?" asks about two symptoms in one question. The smoking history is also poorly worded, e.g. "Do you currently smoke, or have you ever smoked?", and doesn't allow for the differentiation of current and former smokers.

There are also several duplicate questions: Question 1a, "Dust exposure (x-ray needed?)" corresponds with questions 3.12, and question 1b, "underground work" corresponds with a question in the report (section 4), "Is the assessment for underground work?"

The lack of "N/A" tick box options also increase the likelihood of errors, as well as inconsistent interpretation and responses during form completion.

There is also no specific reference in section 4 to the absence or presence of symptoms/signs, or to spirometry or CXR changes consistent with CMDLD, or to the follow-up required and frequency of subsequent health assessment in section 4.

Prior to 2001, the ILO classification of each CXR was provided on the form, so that the frequency with which categories other than 0/0 were reported could be used as an early warning of CXR changes, and which could also be used for health monitoring.

During the review, the DNRM advised that NMAs have been issued with an amended form (dated 01/05/16) that includes additional instructions about: the category of coal mine workers who require a CXR; qualifications for individuals conducting spirometry and CXRs; and the standards for interpreting/reporting these tests including the use of the ILO classification.

7.2 Completion and quality

Current situation

The respiratory component of the current health assessment form was compared with the fields included in a sample of 91 records extracted from the DNRM database.

In general, this sample from the DNRM database captured most of the respiratory component. However, a number of important questions were often omitted, including:

- Section 2.2 - work history;
- Section 2.3 - health-related history, in particular whether a previous medical had been completed under the scheme and date of the last examination;
- Section 2.4 - past medical history, in particular asthma, bronchitis or other lung diseases and abnormal shortness of breath or wheezing;
- Section 3.12 - quality of CXR film and whether it was attached to the report;
- Section 3.18 - fitness for duty in relation to working under various conditions such as underground, in dusty conditions and while wearing RPE;
- Section 4 - NMA explained restriction or additional assessment for the worker.

In addition, other past medical history from section 2, such as tightness of chest and allergic reaction or reaction to chemicals or dust, are relevant to the respiratory system and therefore should be included in the DNRM database.

The information contained in the sample of 91 health assessment forms was also assessed for completeness and quality. Completeness was ascertained by the proportion of dataset fields that required an entry that were provided, for example worker's date of birth. Quality was determined by the proportion of fields that were internally consistent, for example the consistency of entries for duplicate questions.

Full quantitative results from the review of completeness and quality are presented in Appendix 4.

We found that the medical information was largely complete. However, some fields were consistently incomplete or poorly completed.

Limitations

The employer's section of the form was poorly completed. This may in part be due to workers being required to complete a health assessment prior to being employed. This is problematic in that the job may be unknown, particularly where contractors are involved, and so the appropriate decision about whether a CXR is needed cannot be made.

The SEG to which the coal worker's position was allocated was a required field from November 2010. The generic SEG was only provided in a minority (4/21) of medicals and company SEGs were not completed in any of the health assessments. Some employers reported that section 1 is usually completed by a human resources staff member or their NMA, in which case they are provided with a list of SEGs. In other companies, this is the role of the line manager. This creates a potential for miscommunication, as NMAs (or labour hire companies) may not consider themselves as the "employer" for the purposes of completing section one.

Other important fields that were poorly completed were questions about dust exposure and whether the assessment was for working underground.

Some of these questions overlapped or were duplicated. Question 1a, "Dust exposure (x-ray needed?)" corresponded with questions 3.12 "CXR undertaken". Although "y" was entered for question 3.12 in all 91 medicals, over one-third (38%) of entries for question 1a did not correspond, and had either "N" entered or were left blank. Question 1b, "underground work" corresponded with a question in the report (section 4), "Is the assessment for underground work?" Almost one-third (27%) of the responses in section 4 did not correspond with the responses for question 1b.

Another field from section 1 that was poorly completed was the name of the mine. Although all 91 medicals had this field completed, approximately one-third (36%) had quality limitations, with either "Unknown" or "Various mines" entered for this field. It is possible that the term "Unknown" is because these were workers seeking employment and "Various" was used where the worker is a contractor or labour hire employee.

The remaining notable quality issues related to the EMO's details in section 4, for which surnames alone were entered for fifty-seven out of fifty-nine medicals, and details of restrictions on work activities in section 4, from which it was not apparent whether the restrictions were required for CMDLD, as it is the current practice not to include any medical information in section 4.

In some cases the free text boxes throughout the form had been completed in illegible handwriting.

Targeted auditing, which could be conducted in several ways, would reduce the poor completion of the forms. For example, an audit of the first batch of health assessment forms completed by new NMA, and a random sample of assessment forms completed by more experienced NMAs. For example, with the (recently ceased) WA system, approvals to undertake mining employees health surveillance was revoked if an unacceptable number of poor quality forms were submitted.

8. Risk from dust exposure requiring a surveillance CXR

Current situation

When a coal mine worker is sent for a health assessment under the current scheme, the employer must specify whether the worker is "at risk from dust exposure" in section 1 of the assessment form. This indicates that a CXR is required as part of the miner's health assessment.

In order to better understand the criteria used to determine coal mine workers "at risk from dust exposure", the review team visited an open-cut and an underground coal mine and a CHPP in Queensland. We had further discussions with health and safety representatives from 11 companies (including 3 labour-hire contractors), and with representatives from the CFMEU.

<u>Who currently gets a CXR?</u>

A recent survey[23] revealed that although all coal mines conduct health surveillance, only 83% of underground mines include CXRs as part of the periodic coal mine workers' health assessments. The majority of open-cut miners were considered not "at risk from dust exposure", however, from a convenience sample of 5,997 DNRM health assessment records, about half of the CXRs were performed for open-cut miners (though the majority, 41 of 54 mines in Queensland, are open-cut).

In discussions, some mine companies identified open-cut jobs such as drilling and blasting, overburden drilling, rock screening and exploration drilling as "at risk from dust exposure", mainly due to exposure from silica rather than coal dust.

<u>Completion of SEGS on the health assessment form</u>

In order to help with the decision about whether a miner is in a dust-exposed job, employers have been required, since November 2010, to specify the relevant SEG in Section 1. Employers may use the DNRM generic SEGs or company SEGs. It is important that the specified SEG accurately reflects the likely dust exposure. Otherwise those who require a CXR may not receive one and those who do not require a CXR may have one unnecessarily.

In the sample of 91 completed health assessment forms examined (discussed in chapter 7.2), 21 were completed after 2010, i.e. when the SEGs were introduced. For these 21, we found that:

1. Generic SEGs were poorly completed, having been provided in only four forms
2. Company SEGs were not completed in any of the forms, so the review team was unable to identify any company SEGs

There were also inconsistent entries for duplicate questions in the health assessment form relating to "at risk from dust exposure" criteria, e.g. dust exposure/CXR needed and working underground.

SEGs were defined recently by the DNRM as follows:[24] "SEGs are groups of workers who have the same general exposure to risk, for example:

- the similarity and frequency of the tasks they perform
- the materials and processes with which they work
- the similarity of the way they perform those tasks"

Table 2: Mines inspectorate SEG listing (from the DNRM information sheet)[6]

Underground Coal Mines SEGs	Task descriptions
Longwall production	Employees and contractors: • Operating shearer, maingate, chocks • Undertaking roof support, hanging/changing cables and hoses • Performing belt retraction, operating driftrunner and LHD
Development production	Employees and contractors: • Operating continuous miner, driftrunner, shuttle car, LHD, ram car • Undertaking roof and rib bolting • Hanging hoses, handling cables, hanging vent tubes, performing belt extensions, hanging brattice
Underground maintenance	Employees and contractors: • Performing mechanical maintenance services underground • Performing electrical maintenance underground • Undertaking mechanical repairs and vehicle servicing underground
Outbye supplies	Employees and contractors delivering supplies to underground locations on LHDs
Longwall moves	Employees and contractors operating dozers, LHDs, drift runners performing face retraction and installation. Any employees and contractors involved in the face retraction/ installation including fitters, electricians and mine technicians
Outbye construction/ infrastructure	Employees and contractors: • Operating grader, drift runner, LHD • Changing hoses, cables, tyres, lights and pipe work • Hanging hoses, pipes and cables • Undertaking roof and rib bolting, shovelling, secondary support, concreting underground
VCD installers	Employees and contractors spraying stoppings and using jackhammer
ERZ controllers	Employees and contractors performing inspections and statutory duties
Surface maintenance	Employees and contractors servicing/maintaining vehicles in surface workshop
Control room operator	Employees and contractors involved in control room operations
Belt splicers	Employees and contractors performing belt maintenance, splicing and commissioning
Boilermakers (surface)	Employees and contractors involved in steel fabricating, welding, oxy cutting, air gouging—surface workshop and CHPP workshop
Administration	Administration officers; stores; management
Resin Workers	Employees and contractors undertaking resin injection and void filling activities throughout the underground workings. This includes the use of polyurethane resins (PUR) and phenolic resins.
Stone Driveage	Employees and contractors involved in mining through stone, faults and intrusions. Generally this is for the purpose of mine expansion or drift construction. This does not include development or longwall workers who from time to time encounter small areas of faulted ground or stone banding.
Open-cut Coal Mines SEGs	**Task descriptions**

Pre-strip and overburden removal	Employees and contractors working in pre-strip areas of the mine and operating equipment (e.g. haul trucks, loaders, dozers, graders and excavators)
Coal removal	Employees and contractors involved in the removal of product coal (e.g. digger/shovel, dump trucks)
Open cut inspection services	Employees and contractors performing inspection and monitoring tasks in the mining and excavation areas (e.g. OCE and shift supervisors)
Road maintenance	Employees and contractors involved in road maintenance operations including grader and water truck
Boilermaker	Employees and contractors involved in steel fabricating, welding, oxy cutting, air gouging—surface workshop and CHPP workshop
Field Maintenance	Employees and contractors undertaking electrical and mechanical maintenance activities in the mining areas.
Blast crew	Employees and contractors undertaking blasting and shot firing duties
Tech services	Employees and contractors performing mine planning and design (includes surveyors, geotechnical engineers)
Exploration drillers	Employees and contractors undertaking exploration drilling operations
Blast hole drillers	Employees and contractors undertaking blast hole drilling operations
Belt splicers	Employers and contractors performing belt maintenance, splicing and commissioning
Warehousing	Employees and contractors undertaking warehousing activities including forklift operation
Administration	Administration officers; stores; management
Workshop	Employees and contractors undertaking electrical and mechanical maintenance and services in the workshop
Service crew	Employees and contractors supplying fuel, grease and oil to mobile plant throughout the mine.
Tyre fitters	Employees and contractors performing tyre handling, tyre fitting and tyre repair duties.
CHPP SEGs	**Task descriptions**
CHPP production	Employees and contractors involved in control room operations, hosing, clearing blockages, shovelling, bobcat ,general maintenance and train loading out
CHPP maintenance	Employees and contractors undertaking electrical and mechanical maintenance throughout the plant and in the workshop
CHPP laboratory	Employees and contractors taking samples and processing samples in CHPP laboratory
CHPP dozer	Employees and contractors operating CHPP stockpile dozer
Belt splicers	Employers and contractors performing belt maintenance, splicing and commissioning

The DNRM document lists generic SEGs in underground mines, open-cut mines and in CHPPs [24] (see Table 2). These SEG categories were devised by the Safety in Mines Testing and Research Station (SIMTARS), based on measurements of coal mine dust. A 2010 Queensland Government report contains the results of a survey, conducted on behalf of the DNRM, which revealed that only 39% of mines had implemented dust monitoring programs, characterised dust exposure and established SEGs.

The 2010 report also indicated that 11% of mines did not carry out monitoring, a further 26% monitored annually or less frequently, 31% only monitored on the day shift and only 25% adjusted the TWA for extended shifts.[6]

The Queensland Government dust self-assessment feedback report (2010)[6] stated that 76% of coal mines identified respirable silica as a hazardous dust at their site, and 29% identified that respirable coal dust might be a problem. Some company representatives reported that exposure monitoring for these dusts (performed outside respiratory protective equipment) are used to define SEGs.

SEGs are clearly useful to guide decisions about dust exposure monitoring and where dust control measures should be applied and to track exposure changes over time or when new processes or equipment are introduced. Therefore, conclusions about the use of SEGs for the purposes of deciding on requirement for CXR should not impact on the use of SEGs for these other important dust monitoring and control functions.

Limitations

The criteria to determine jobs "at risk from dust exposure" are not explicit in the regulations. The DNRM also do not specify which generic SEG categories fulfil these conditions. All underground workers (probably 13 of 15 underground SEGs) are likely to experience dust exposure, but some above-ground workers at underground sites, some open-cut miners and some workers at CHPPs may also be at risk.

It is unclear who decides which SEGs qualify as "at risk from dust exposure". This may depend on measured exposure data, but the companies varied in their approach. For example, several mine companies had a formal trigger, where recorded dust exposure exceeded the OEL or half the shift adjusted OEL (see Table 3).

Table 3: Company XXX corporate standard control categories (SIMTARS report)

Category	Personal exposure level	Control Zone
A	Exposure exceeds the OEL	**Intervention**
B	Exposure between 50% and 100% of the OEL	**Control**
C	Exposure between 10% and 50% of the OEL	**Supervisory**

In addition, dust generation at the mine may depend on the strata and whether the mine has been degassed. The use of a variety of dust control technologies also leads to situations where dust exposure for similar job categories may vary from mine to mine and between different coalfaces within a mine.

NMAs rely on the information completed by employers (including completion of the SEG information) in section 1 of the form to guide the decision about whether a coal miner requires a CXR, but there is generally no guidance for NMAs about the application or implication of SEGs. Several company health and safety representatives agreed that the decision about who required a CXRs and how frequently, should be the NMA's rather than the employer's decision. They also agreed that NMAs should be supported with training about SEGs and job categories with potential for high dust exposure.

Furthermore, workers' complete employment history, not just the job at the current health assessment, should also be taken into account when deciding about the CXR, because the likelihood of developing CMDLD is determined by cumulative exposure to dust over the whole working lifetime. This is particularly relevant to contractors (such as general labourers), who are more likely to have been employed in a range of jobs across various mines, and therefore deployed to different SEGs. In other words, the occupational history should identify the duties and tasks that have been performed.

The use of SEGs to categorise dust exposure has some merit, but is complex to operationalise. Even after taking into account workers' transition between different SEGs, SEGs themselves may change due to changes in dust levels when production or control measures change, and contractors would not necessarily have access to a company's dust monitoring data.

The SEGs should take into account silica as well as coal dust, as the exposure limit for silica is much lower than that for coal dust, so is more easily breached.

Lastly, if SEGs are used to define "at risk from dust exposure" they should be revisited and updated regularly if there are changes in the mine anticipated to change the dust exposure of jobs in the SEGs, e.g. strata, production methods or rates, and dust control measures.

9. Nominated Medical Advisers

We reviewed the list of NMA currently registered with the HSU. We examined their qualifications and their geographical coverage, and the information kit provided to newly-registered NMAs. We also had discussions with mine company health and safety and CFMEU representatives about their NMA appointment process, and how coal mine workers are referred to NMAs.

Current situation

Nominated Medical Advisers – Total number, clinic type and qualifications

In total, there are 237 NMAs registered to conduct the coal workers' health assessments. The NMAs practise in over 140 clinics and are based in five different States (see Appendix 5 for further details). Some NMAs practice in more than one clinic. The number of NMAs expanded during the mining boom (after 2005), but prior to this there were approximately 40 NMAs.

General Practitioners (GPs) accounted for 62% of NMAs, while specialist Occupational Physicians constituted the smallest proportion at 12%. Non-specialists or medical practitioners with general registration accounted for the remaining 26% of NMAs.

There were two main types of clinics in which the coal mine workers' health assessments were conducted, GP clinics and Occupational Health Service clinics. However, there were more than twice as many GP clinics as Occupational Health Service clinics (97 vs. 43).

The majority (about 90%) of NMAs and clinics are in Queensland. Although the coal workers' health assessments are undertaken in 28 different Queensland regions, these activities were concentrated in five main regions: Brisbane/Brisbane City, Mackay, Sunshine Coast, Rockhampton and the Gold Coast (Table 4 and Figure 3). The majority of these sites are a considerable distance from the mines and likely to cater for fly-in fly-out (FIFO) workers.

Table 4: Main locations of NMAs in Queensland, in 2015

Region	**Occupational Physicians**	**General Practitioners**
Mackay	2	28
Rockhampton	2	14
Sunshine Coast	0	14
Brisbane/Brisbane City	10	33
Gold Coast	1	8
Total	**15**	**97**

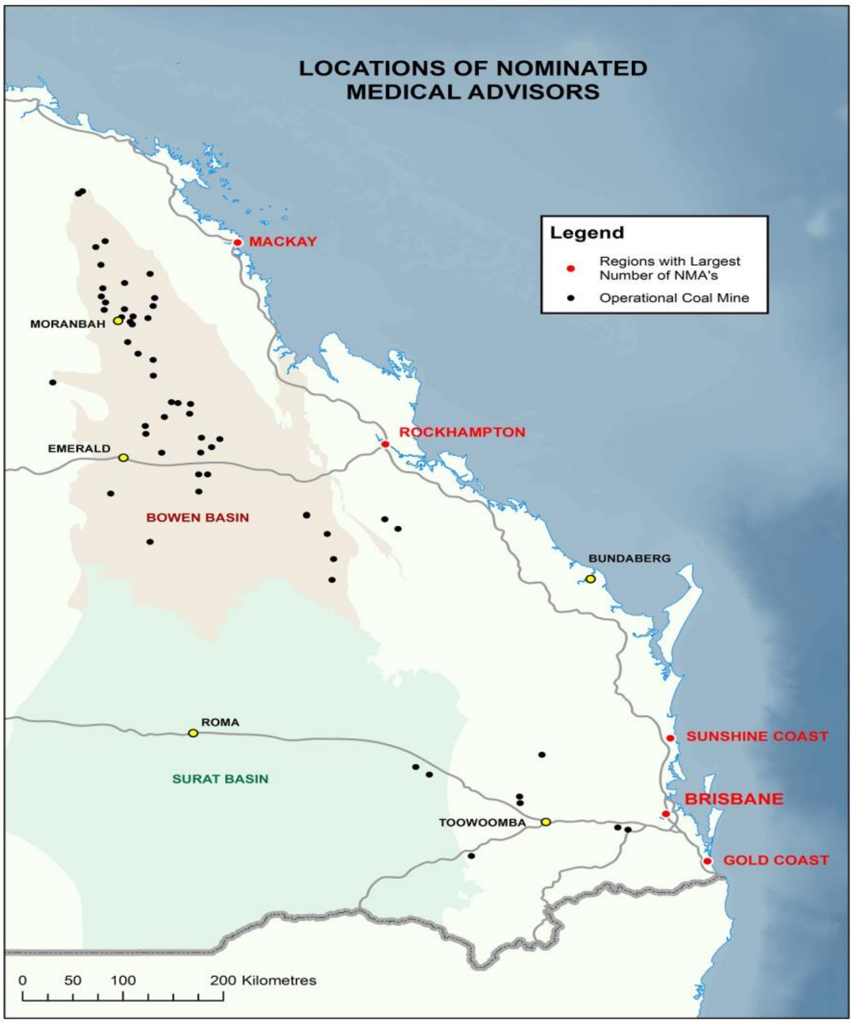

Figure 3: Underground mine and main locations of NMAs in Queensland (Figure courtesy of DNRM)

Nominated Medical Advisors - registration and training

There is no formal system for vetting the addition of NMAs to the list held by the DNRM, and selection of NMAs is at the discretion of the mine companies, contractors and labour hire firms. However, new doctors selected to become NMAs must be notified to the HSU.

The company and CFMEU representatives reported that though companies may have corporate medical advisors, NMAs are appointed by the specific mine sites, and in most cases are the local GPs. There may be up to two NMAs employed by companies per mine site, however labour-hire organisations tend to employ larger numbers of NMAs to cater for the geographical spread of their employees. For example, one company reported a pool of 20 to 30 medical advisers.

EMOs often perform the actual health assessments and complete section 3 of the form, but this is then forwarded to the company NMA to complete section 4. In this situation, the NMA has not collected the health information him/herself and so relies on the accuracy and quality of the information collected by the EMO or other health practitioners.

There is currently no formal training of NMAs prior to being registered to undertake coal mine workers' health assessments. However, regular meetings with NMAs were previously conducted by DNRM prior to the expansion of the number of NMAs during the mining boom. In addition, NMAs are not required to hold any specific qualifications apart from being a registered medical practitioner. Instead, the DNRM furnishes newly registered NMAs with an information kit. The current version (dated 24/2/15) is an 18-page document which outlines the process of the coal mine workers' health scheme, and an enclosed appendix illustrates examples of work restrictions relevant to nominated medical conditions, such as manual handling weight restrictions for musculoskeletal injury and diminished cardiovascular fitness. With respect to respiratory conditions, the information kit advises that individuals with chronic obstructive airways disease and pneumoconiosis are to avoid exposure to irritant airborne contaminants (including dusts) and should not work underground. However, there are no instructions or clinical standards to guide further evaluation and follow-up of abnormal clinical findings or newly diagnosed medical conditions, so the focus is mainly on fitness for work. NMAs are also advised not to disclose medical conditions on section 4.

Some companies reported a preference for NMAs with occupational medicine qualifications, but reiterated that local knowledge and mine proximity was important. In addition, most companies stated that they offered site visits for NMAs, particularly to their underground mines.

Limitations

There are currently too many NMAs on the HSU list who are eligible to perform health assessments under the current scheme. The inclusion of EMOs makes the pool of medical providers even larger. This situation has created challenges for the HSU in maintaining an accurate and up-to-date register of NMAs, especially as companies may not inform the DNRM of changes in appointments. Due to the large number of NMAs and the diverse geographical spread, it became more difficult to co-ordinate (previously held) NMA meetings and training and these are no longer held.

NMAs are advised to visit the mine sites for which they will be providing health assessment services under the scheme, but this is not mandated. Experienced medical providers working near the mines and/or those with specialist training in occupational medicine are likely to be familiar with hazards and risks specific to the coal mining industry. However, for many of the NMAs without a good knowledge of a coal mine worker's particular work environment, there are likely to be limitations in the conduct and quality of respiratory health assessments.

A large group of medical providers (NMAs and EMOs) with diverse qualifications and experience practising in a variety of clinic settings is likely to have further negative impact on quality assurance.

The lack of initial or ongoing training for NMAs is particularly concerning. There is currently no means of assessing NMAs' understanding of the content of the NMA information kit or its appropriate application, and no ongoing audit of NMAs' performance, apart from an administrative review at HSU. The main purpose of the information kit is to provide administrative procedures for conducting health assessments, rather than information about CMDLD or medical guidelines. There is no information in the kit about the primary purpose of the Coal Mine Workers' Health Scheme and no explicit instructions about the early signs of CMDLD, nor about procedures for clinical management/referral for suspected CMDLD cases.

Under the Regulations, the role and qualifications of the EMOs are undefined in the scheme, and EMOs are not required to be notified to the HSU. Given that more training and selection processes should be required for NMAs undertaking respiratory health assessments, allowing comparatively less trained EMOs to carry out the respiratory examination would continue to be a major weakness. Several companies highlighted the lack of quality control introduced by reliance on EMOs, especially where they are unfamiliar with mining work environments and the principles of health surveillance. However, they acknowledged that mine workers especially FIFO mine workers prefer to go to their local GPs, who may be an NMA or EMO, to conduct their health assessments.

10. Chest x-ray review

The purpose of this review was to identify deficiencies in the chest imaging component of the Coal Mine Workers' Health Scheme which may have contributed to the failure to identify early changes of CWP.

Sample size

The sample size of the number of coal miner CXRs required for the x-ray review was calculated[2] based on an estimated 3% prevalence of CWP (≥ 1/0 category by the ILO CXR classification system) among Queensland coal mine workers currently employed at a Queensland mine with more than 10 years of coal mine employment.

This estimate for prevalence is comparable to that reported by Blackley and colleagues [25] among underground coal miners in Kentucky, Virginia, and West Virginia, who participated in the USA Coal Workers' Health Surveillance Program between September 2005 and December 2012. A related study[26] found a 2.7% prevalence of at least ILO category 1 small opacities among coal workers who participated in the NIOSH surveillance program between 2000 and 2008. Based on these estimates, a sample size of 452 CXRs was determined to have enough power to detect a 3% prevalence of pneumoconiosis defined as ILO category 1/0 or greater.

The review team considered it important to include CXRs from as many mines as possible for this review. As some of the mines are small, the calculated number of CXRs needed was small and may not be representative. We therefore chose to request a minimum of 25 CXRs from each mine. The total requested was 478 CXRs. In addition, there are mine workers who are employed by contractors and work across different mines. We received 50 additional CXRs of miners for whom no mine was specified. It is likely that these CXRs were from miners who worked at a number of different mines. Ultimately, the total number of CXRs requested from DNRM was 528. The number of requested CXRs for coal miners from each mine is shown in Table 5.

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[2] The formula used for this calculation is $\mathbf{n = (Z^2 \times P(1 - P))/e^2}$, where Z = value from standard normal distribution corresponding to desired CI (Z=1.96 for 95% CI), P is expected true proportion, and e is desired precision (half of the desired CI width).

Table 5: Number of CXRs by mine (numbers supplied by DNRM)

Mine	Number of mine workers[a]	Sample size	Number received	Number missing
Aquila – N/A	0	-	2	0
Broadmeadow	**683**	63	13	50
Carborough	314	27	14	13
Cook	362	32	25	7
Crinum – *closed*	223	25	13	12
Ensham	209	25	10	15
Grasstree	639	59	18	41
Grosvenor[b]	249	25	2	23
Kestrel	536	50	39	11
Moranbah North	649	59	15	44
Newlands	109	25	10	15
North Goonyella	275	27	6	21
Oaky No. 1	248	25	7	18
Oaky North	386	36	29	7
Mine Not Specified	N/A	50	50	0
Total	**4,887**	**528**	**253**	**277**

[a] Number of employees reported at the mine as of November, 2015.

[b] Mine with new development and therefore very few miners with 10 years of exposure.

Protocol for CXR review

1) ILO Classification

Small scars caused by the body's reaction to coal mine dust inhalation may manifest as small opacities seen on CXR. CXRs were classified according to the ILO Classification of Radiographs for Pneumoconiosis.[3] Briefly, this classification system is used to characterize opacities consistent with pneumoconiosis through the comparison of the chest radiograph of interest with standard radiographs issued by the ILO. Small opacities are described by their profusion (the number of opacities); affected zones of the lung; and their size and shape (rounded or irregular). Of these characteristics, the key item for the purpose of deciding whether pneumoconiosis is present is the profusion, which is rated on a 12-point scale. Digital radiographs from the worker are classified by comparison to the appropriate digital image from the ILO 2011D standards; analogue films are classified by comparison to the ILO 2000 analogue standards. A copy of the NIOSH reporting form can be found at: http://www.cdc.gov/niosh/topics/surveillance/ords/pdfs/CWHSP-ReadingForm-2.8.pdf.

2) Use of multiple certified B-readers

All images were classified by two NIOSH certified B-readers[3] in a protocol detailed below. An additional three B-readers were available for additional readings when the primary readers did not agree.

The following is a list of B-Readers who participated in this review.

1. Robert Cohen, MD, FCCP – Respiratory physician, B-Reader. NIOSH Project Officer, American College of Radiology Pneumoconiosis Task Force
2. Kathleen DePonte, MD – Radiologist, B-Reader. Member of NIOSH Coal Worker's Health Surveillance Panel, Member of American College of Radiology Pneumoconiosis Task Force
3. Edward Lee Petsonk, MD – Respiratory physician, B-Reader. Professor of Medicine, West Virginia University, Member of NIOSH Coal Worker's Health Surveillance Panel, NIOSH Project Officer for American College of Radiology Pneumoconiosis Task Force
4. David Lynch, MD – Radiologist, B-Reader. Professor of Radiology, National Jewish Health, University of Colorado School of Medicine, Denver Colorado. Member of NIOSH Coal Worker's Health Surveillance Panel, Member of American College of Radiology Pneumoconiosis Task Force
5. Jack Parker, MD – Respiratory physician, B-Reader. Chairman, Division of Pulmonary and Critical Care Medicine, West Virginia University. Member of NIOSH Coal Worker's Health Surveillance Panel

3) Classification of CXR quality

1. Good.
2. Acceptable, with no technical defect likely to impair classification of the radiograph for pneumoconiosis.
3. Acceptable, with some technical defect but still adequate for classification purposes.
4. Unacceptable for classification purposes.

4) Classification of small and large opacity (presence and profusion) and reaching a final determination

1. Two classifications were considered to be in agreement if one of the following occurred:
    a. Both found one or more large opacities of 1 cm in size or greater consistent with complicated pneumoconiosis (category A, B, or C);
    b. Both found small opacities of less than 1 cm in size consistent with simple pneumoconiosis in the same major category (category 1, 2, or 3);
    c. Both classifications with finding of small opacities were within one minor category of each other, in this instance the higher minor category is selected (see ILO Classification 12-point scale, Table 6) except if there was a reading sequence of 0/1, 1/0, or 1/0, 0/1, which was not considered agreement; or,

[3] Note: B-readers are licensed medical practitioners who have been trained to classify images according to the ILO system and who have successfully passed an exam offered by the US NIOSH every 4 years.

d. Both classifications were negative (i.e., 0/-, 0/0, or 0/1) for opacities consistent with pneumoconiosis.

2. If there was agreement between the two classifications, as described above, the result was considered a final determination and reported.
3. When agreement was lacking, a third classification was obtained. If any two of the three classifications demonstrated agreement, the majority result was considered the final determination.
4. If agreement was lacking among the three classifications, independent classifications were obtained from two additional B-Readers and the final determination was the median category derived from the total of five classifications.

Table 6: ILO scale for classifying CXRs for pneumoconiosis

Opacity Size[a]	ILO Category	Classification of Pneumoconiosis
None	0/- 0/0 0/1	Negative
Small (<10 mm)	1/0 1/1 1/2 2/1 2/2 2/3 3/2 3/3 3/+	Simple
Large (≥10 mm)	A B C	Complicated

[a] As measured by the short-axis diameter.

5) Comparison of the final determination with the original reports on the x-rays to determine if there was a qualitative agreement

a. The original radiologist reports were reviewed by at least one qualified occupational pulmonologist. The vast majority of these reports did not use the ILO classification. For this reason, the reports were reviewed to determine if the radiologist recognized features consistent with pneumoconiosis and indicated this on the report.

b. The radiologist reports were categorised as:
(0) No report available
(1) Normal
(2) Abnormal with small opacities suggestive of simple pneumoconiosis
(3) Abnormal with large opacities suggestive of complicated pneumoconiosis
(4) Other abnormality reported, not suggestive of pneumoconiosis

c. The Coal Mine Workers' Health Scheme radiology report was considered to be in agreement with the final ILO reading by the CXR reviewers as follows:

(1) Normal – ILO categories 0/-, 0/0, or 0/1
(2) Suggestive of simple pneumoconiosis – ILO categories 1/0 through 3/+
(3) Suggestive of complicated pneumoconiosis – ILO category A, B, or C
(4) Other abnormality not suggestive of pneumoconiosis – ILO categories 0/-, 0/0, or 0/1

d. The NMA's final report was reviewed to determine if the NMA had reviewed the radiology report and made the appropriate recommendation with regard to fitness for work.

6) Report back to the DNRM

The DNRM are to receive the results, and have advised they will make arrangements to notify the relevant NMA, physician or individual, where there has been a finding through this review process.

Results

Originally, the DNRM provided 268 film prints of digital CXRs, which could not be used for the review because film prints of digital images are unreliable in the accurate assessment of the presence of pneumoconiotic opacities. The DNRM also provided 50 digital images in a time frame that was too late to be included for this report, but which will be evaluated later.

The results described here are of digital CXR images from 257 miners provided by the DNRM in time for this report. These images were selected for miners who met the eligibility criteria of 10 years of coal mining experience. CXRs received were taken between June 2009 and January 2016. Table 5 indicates the mines from which these CXRs were sourced. As shown in the table, while CXRs were sourced from every mine, several of these mines were represented by fewer than 10 CXRs (mainly the smaller mines). Also, less than 50% of requested CXRs from the following mines were able to be accessed by the time this report was issued: Broadmeadow, Ensham, Grasstree, Grosvenor, Moranbah North, Newlands, and Oaky Creek No. 1.

1) Quality Review

a. ILO Image Quality

Review of the ILO image quality scores showed that only 25% of CXRs were Quality 1, 55% were Quality 2, 19% were Quality 3, and 1% were Quality 4. The CXRs that were rated Quality 3 had technical defects that to some extent affected the ability to classify the images, although it was felt that classification was still possible. Images of Quality 3 should represent a much smaller proportion of CXR images in a surveillance program. Observed technical problems with the CXRs included images with poor positioning, (such as exclusion of portions of the lungs in the image or overlap of the lung fields by the shoulder blades), poor contrast, and excessive edge enhancement. These issues can make it difficult to accurately detect the small opacities of pneumoconiosis. Unfortunately, these technical problems cannot be resolved by manipulation of the digital images after image acquisition and processing has taken place.

b. Image Processing

Fifteen percent of the images that were reviewed had quality issues related to processing. Digital radiographic images undergo processing after acquisition. This "post processing" is performed at the radiographic unit in accordance with pre-programmed parameters set by the manufacturer, some of which are able to be modified by the user, according to user preferences. Typically, once these parameters are set at the radiographic unit for a specific type of examination, they are not changed on an individual patient basis. A digital receptor (which may be either a computerized radiography cassette or digital radiography detector) captures the image, and then the image is processed and sent to the Picture Archiving and Communication System (PACS) to be viewed and interpreted by the radiologist. While the radiologist can adjust some viewing settings, such as window and level (contrast and brightness) and magnification, he/she cannot undo or change the other elements of image processing at the PACS workstation.

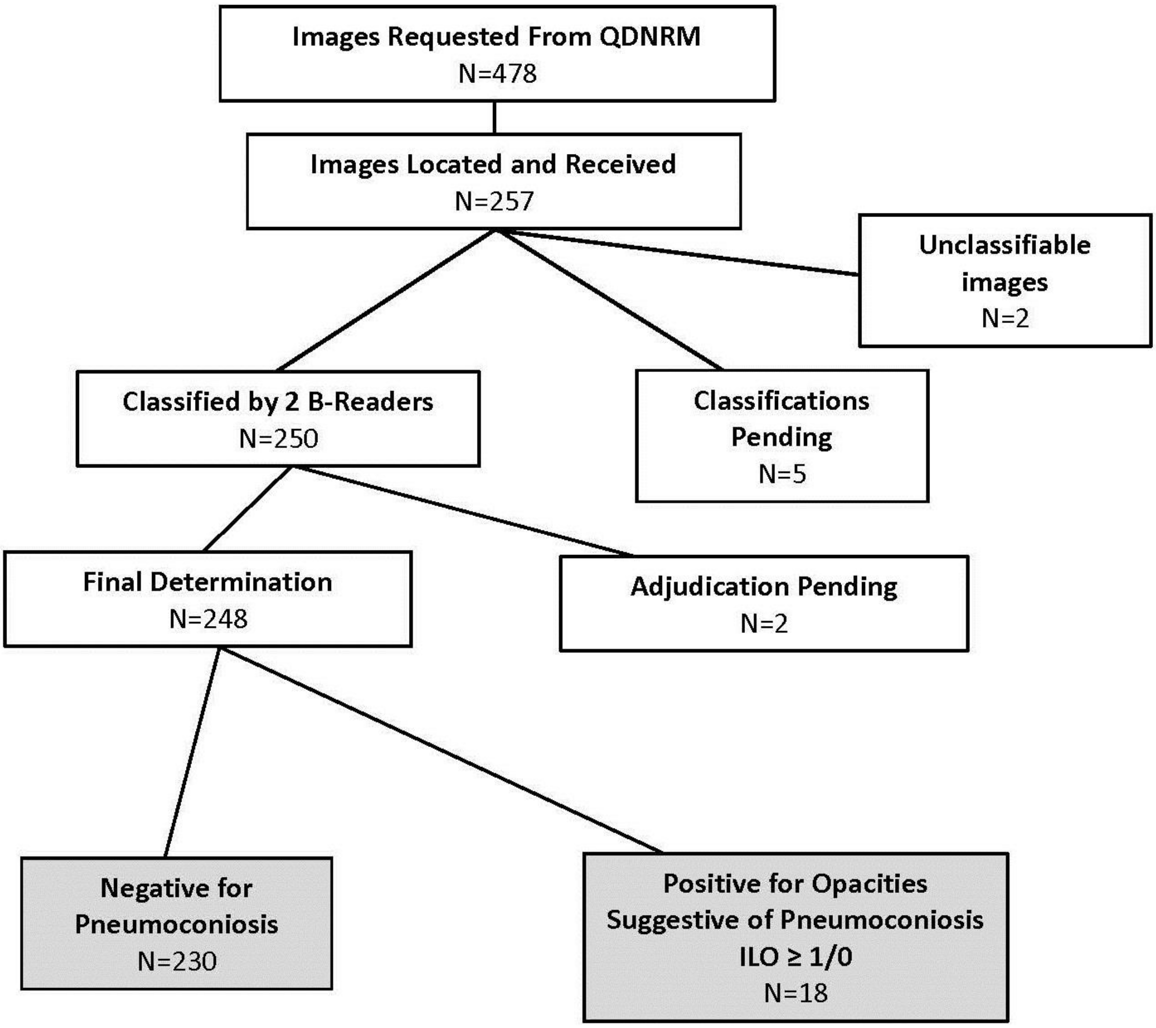
Post processing has evolved and improved over the years. The post processing modifications were developed with the primary purpose of improving the visibility of pathological changes. Initially these were primarily edge enhancement (unsharp masking) and noise reduction. More complex image-processing algorithms have been developed over the years to allow for optimal display of the wide dynamic range in radiographic images, particularly in chest films. Today's algorithms are more complex, but fundamentally have the same objective − to allow for better visualization of subtle pathology. While the image is enhanced to better display pathology, the same parameters also display normal structures more prominently and the reader must be able to recognize the subtle effects of image processing to separate anatomy from artefact. In the case of chest films, some image processing protocols will result in a "grainy" appearance to the lungs simulating certain types of small opacities. The radiologist who has set the image processing parameters to his/her preference and is used to this appearance as normal will recognize this appearance as normal. However, the same study, when sent to a different reader, may be interpreted as interstitial disease consistent with pneumoconiosis.

2) Presence or Absence of Pneumoconiosis

The CXRs were transmitted electronically to reviewers. All images were read according to the protocol described above. Given difficulties in receiving images in a timely fashion, only 250 images were classified by the time of this report (see Figure 4). Final determinations were obtained on 248 miners. Two CXRs were classified as unreadable (Quality 4).

Major Findings: No miner was found to have large opacities suggestive of complicated pneumoconiosis or progressive massive fibrosis. No miner was found to have small opacities consistent with of advanced or high-category (i.e., ≥ 2/1) simple pneumoconiosis. There were 18 miners, of the 248 (7.3%) with final determinations, whose CXRs were classified as having opacities at a profusion consistent with category 1 simple pneumoconiosis i.e. ILO classifications of 1/0, 1/1, or 1/2. Given the quality issues identified above and the possibility of emphysema resulting in irregular small opacities, it is recommended that these individuals undergo high resolution CT scanning prior to making a final diagnosis.

Figure 4: Flow chart of CXR review results



3) Comparison with Radiology Reports and NMA Reports

The radiology and NMA reports were analysed to determine whether or not the changes of pneumoconiosis were recognized and to determine if further action was taken. The results are shown in Table 7.

Three radiologist reports were not available for our review, leaving 15 reports. This comparison showed that only 2 out of these 15 (13%) CXRs identified by the reviewers as having features consistent with simple pneumoconiosis by chest radiograph were identified by the original radiologists as having interstitial abnormalities that could possibly be interpreted as evidence of pneumoconiosis. A number of these CXRs had irregular opacities. Irregular opacities have been well described in CWP,[27] although they may also occur with emphysema. The remainder (n=13) were classified as normal by the original radiologist. In neither case where possible pneumoconiosis was identified by the original radiologist did the NMA record a finding about possible CWP, nor was any recommendation made regarding fitness to work from a respiratory point of view.

Table 7: Comparison of findings of radiology reports and NMA assessment of the reports for those cases identified by the reviewers as having a final determination ≥ ILO category 1/0.

Case	Small Opacity Profusion	Radiologist Report	NMA Assessment of Report	NMA Action
1	1/0	Normal	Normal	Fit
2	1/0	Not available for review	None	Fit
3	1/0	Normal	Normal	Fit
4	1/0	Normal	Normal	Fit
5	1/0	Normal	Normal	Fit
6	1/0	Normal	Normal	Fit
7	1/0	Not available for review	None	Fit
8	1/0	Abnormal (Consistent with pneumoconiosis)	None	Fit
9	1/0	Normal	Normal	Not fit (right knee injury)
10	1/0	Normal	Normal	Fit
11	1/0	Not available for review	None	Fit
12	1/0	Normal	Normal	Fit
13	1/1	Abnormal (Consistent with pneumoconiosis)	None	Not fit (hearing, vision)
14	1/1	Normal	None	Fit
15	1/1	Normal	Normal	Fit
16	1/1	Normal	Normal	Fit
17	1/1	Normal	Normal	Fit
18	1/2	Normal	Normal	Fit

4) Findings from an additional Queensland radiology review

One coal mining company previously commissioned a review of all CXRs of its active miners, which was performed in 2015 and early 2016. Nearly 200 CXRs were reviewed using the same protocol we used in this study. Significant quality issues similar to those observed in the current review were identified. Although CT scans are generally **not** needed to make a radiographic diagnosis of pneumoconiosis, given the quality issues of those CXRs, miners with final determinations of simple pneumoconiosis were offered high-resolution CT (HRCT) scans to confirm the presence or absence of pneumoconiosis. While some of the CXRs had opacities that were verified by HRCT, the majority of these miners had negative HRCTs, so the quality issues of the CXRs led to over-reporting of simple pneumoconiosis. This is an important finding to assist in interpreting the findings in the current review.

11. Spirometry review

Spirometry is a standard investigative technique to assess lung function and is required for respiratory health assessments performed under the scheme. The aims of the review of spirometry procedures and testing were to:

1. Audit the spirometry equipment, quality control procedures and training and qualification of the spirometry technicians performing spirometry under the scheme.
2. Assess the quality of spirometry conducted as part of the current scheme for a sample of 258 coal mine workers.

The spirometry review therefore consisted of two components, which are discussed separately below.

11.1 Survey of spirometry equipment and training

We developed an online questionnaire to obtain information about spirometry testing, including the equipment used and their calibration procedures, and the qualifications and training of testers. A link to this online survey was distributed by the DNRM to all currently listed NMAs. The questionnaire is attached as Appendix 6 and participants' responses are summarised in Appendix 7.

Approximately one-third (74) of currently listed NMAs completed the online survey by the due date.

Results

Based on the responses, spirometry is mainly performed in GP (62%) or Occupational Medicine clinics (38%). Testing is primarily administered by registered nurses (77%) and medical practitioners (9%), but the qualifications of other staff performing spirometry include science graduate, GP and administration staff.

Forty percent of testers had over 10 years' experience in performing spirometry, however they conducted these tests infrequently. Only about a quarter performed more than 20 spirometry tests per month as part of the Coal Mine Workers' Health Scheme and more than 20 additional tests per week. Of the registered nurses performing spirometry, about a third had up to 5 years' experience, and approximately 20% performed 20 spirometry tests for the Coal Mine Workers' Health Scheme per month and more than 20 additional tests per week. In comparison, an accredited respiratory laboratory performs 15-20 spirometry tests per day (Professor Bruce Thompson, personal communication).

Spirometry training was limited. Approximately two-thirds of testers had attended a training course, but one-third were unable to specify the year this training was completed. Furthermore, 23% had completed their training more than three years ago. The National Asthma Council was the most frequently mentioned training course provider (35%), however just over one-fifth of responders could not nominate their training course organisation. Of the registered nurses performing spirometry, only 42% had undertaken a spirometry training course and could recall the name of the course.

The limited training may contribute to the poor knowledge of the spirometry equipment, including quality control measures. One quarter of respondents did not know whether their spirometer had automated quality control, 10% were unsure how many manoeuvres were stored for each person tested and almost half did not know the reference values used by their equipment. On the other hand, every NMA reported their spirometers produced flow-volume graphical display and approximately 84% reported their spirometers stored 3 or more manoeuvres for each person tested.

Overall, the reported quality control and assurance of spirometry testing needs to be improved. For example, although 79% of spirometers were reported to have had a calibration check, most (66%) had not been calibrated in 2016. This is a significant inadequacy considering devices used in the study require daily calibration checks. Furthermore, only about one-third of spirometry sites participate in ongoing quality assurance programs.

Fourteen percent of sites do not have a post-bronchodilator spirometry routine, 10% did not use a weight measurement device and one respondent did not use a height measurement device during spirometry.

It is concerning that there were a number of other questions that high proportions of responders were unable to answer, for example, a third of respondents did not know the date of purchase of the spirometer. However, we were not certain that the survey was completed by the actual spirometry tester or technician; if more junior staff were involved, they may not know the answers to some of the more technical questions.

In summary, these data indicate that a majority of the spirometry performed under the scheme is likely to be of poor quality and more ongoing training and quality assurance is needed to reach accepted standards.

11.2 Spirometry quality and reading

The review team developed a protocol to examine the quality and accuracy of a sample of 260 spirograms performed under the current scheme. These were received from the DNRM and were for workers from a large number of mines. The protocol is included in Appendix 8**:** . Quality and accuracy of spirometry was assessed by two reviewers, Professor Bruce Thompson and Dr Ryan Hoy, who are both very experienced in interpreting lung function data according to the accepted standards of the ATS/ERS.

Results

In total, 256 spirometry results were evaluated, four others were illegible. Of the 256 spirograms, 102 were deemed to be of poor technical quality, i.e. the spirometry was poorly executed and did not allow meaningful interpretation. If these results are produced in an accredited respiratory laboratory they would be rejected and the tests, repeated.

154 spirometry results were included as they had sufficient demographic data for interpretation. In accordance with ATS/ERS standards, the lower limit of normal (LLN) was determined by the 5th percentile of a healthy, non-smoking population. The NHANES reference values were

used for the analysis. This most likely differed from NMAs' interpretation where pre-defined cut-off values are used to identify abnormality, such as $FEV_1/FVC < 0.70$ indicating airflow obstruction. FEV_1, forced expiratory volume in one second, is a measure of airflow limitation; FVC, forced vital capacity, is a measure of the total lung volume; and the ratio, FEV_1/FVC, is a measure of airway obstruction, i.e. where the airway is closed down and pushing air out of the lungs is impaired. Cut-off values are inaccurate and cause misclassification, specifically under-diagnosis of abnormalities in younger, taller individuals and over-diagnosis in those older or shorter.

Thirty spirometry results were assessed as abnormal, while the majority [n = 124 (81%)] were considered to be within normal limits by the reviewers.

Of the 30 spirograms with abnormalities, six showed mild obstructive disease patterns, and 24 showed "possible restriction" (21 with mild severity, and 3 with moderate severity). The NMA reports accurately identified only two of the abnormal spirometry results, the remaining 29 were reported as normal. These 29 abnormal results were from workers employed at a number of coal mines, however the largest proportion (10) were not registered with a particular mine.

Obstruction implies narrowing of the airways, and is usually the most common pattern identified with spirometry. Restriction implies reduction of lung capacity or volume, though this can only be confirmed with more specific and advanced lung function tests, including static (plethysmographic) lung volumes. Importantly, CMDLD includes both obstructive and restrictive respiratory diseases.

All 124 spirograms assessed as normal by the reviewers were also reported as normal by the NMAs. However, the actual data (FEV_1, FVC, and FEV_1/FVC) extracted from the spirogram by the reviewers and NMAs were consistent for 110 (89%) results. The main reason for lack of agreement was because the NMA did not select the most appropriate values, for example, the best results produced during the spirometry tests.

In summary, less than half of the spirometry results evaluated for this review had been accurately interpreted and reported by NMAs. The results of 130 are essentially unknown, though for different reasons: 4 were illegible photocopies; 102 were poor quality; and 24 showed "possible restriction". The review team recommends follow-up of these results, especially the three coal mine workers with moderate possible restrictive disease. In addition, although the six results that showed obstructive pattern were deemed mild, it is important that these individuals have had recent (and regular) spirometry, as obstructive respiratory disease can progress without appropriate treatment and management.

The DNRM have received the spirometry findings and have advised they will make arrangements to notify the relevant NMA, physician or individual, where there has been a finding through this review process.

Detailed measures to improve the quality of spirometry are provided in Appendix 9.

In addition, the Queensland Health Spirometry Guideline follows ATS requirements and is available at:

https://www.health.qld.gov.au/qhpolicy/docs/gdl/qh-gdl-386.pdf .

12. Health assessment form data handling and storage

We reviewed the system for data handling and storage used by DNRM, including accessibility by the NMAs of previous health assessments, through discussions with DNRM staff members. We also visited the data storage centre at Stafford to inspect and discuss the DNRM database and security arrangements.

Current situation

Data handling

The HSU receives full health assessments, including CXR reports and films from the NMAs by ordinary mail. The hard copy forms are initially checked by the data entry operators for completeness, for example to check that: individual health assessments consist of all seven pages; the worker's date of birth has been recorded consistently; spirometry results have been transcribed onto the appropriate section of the form; and the EMO examination date in section 3 corresponds with the EMO date in section 4. Incomplete and inaccurately completed health assessment forms are returned to the relevant NMAs for amendments. Although original CXR films (or CDs) and spirograms are supposed to be sent with their corresponding health assessments to the HSU, NMAs may not always comply with this requirement. In the case of spirometry printouts, there may be some uncertainty among NMAs about the requirement for these to be sent to DNRM.

Data storage

Prior to the mid-1990s all data from all health assessment forms were manually entered into a database. Since approximately the late 2000s, the forms have been scanned, and more recently only selected variables manually entered into the DNRM database at SIMTARS. The health assessments that are scanned are saved into the data entry operators' files on the SIMTARS hard drive, which is password protected. Individual health assessments files are renamed with the worker's surname and date of birth to aid search and retrieval upon request.

Hard copies of health assessments and CXR films are currently stored in boxes and shelves in storage facilities at three locations: Stafford, Geebung and Eagle Farm.

The storage facility at Stafford was acquired at the end of 2015. Health assessment files are segregated according to the first letter of surnames and each box is also given a numerical ID. The health assessment files are a mixture of records that have been entered but not scanned, those that are scanned but not entered and those that are entered and scanned. The warehouse is secured by a gate which requires a security code and a door which requires an access swipe card.

The storage facility at Geebung is based in a Government department in a privately-owned company, and has been in use from approximately 2011. All health assessment files at this facility have been scanned and entered into the DNRM database. The storage boxes have a barcode and an HSU registration number, and contain up to fifty files (a list of which is enclosed within the box). The health assessments can only be accessed by DNRM staff based at the facility.

The facility at Eagle Farm is used to store archived files, that is, health assessments that were completed between 1983 to the early 1990s. Most health assessments have been entered, but no health assessments at this facility have been scanned. The files can only be accessed by Eagle Farm staff members. The DNRM database is only accessible by authorised HSU staff members.

CXR films are arranged alphabetically and some are stored separately from their corresponding health assessment files. X-ray wallets with unique registration numbers were previously used to store health assessment records for each worker, however this system ceased when scanning was introduced in the late 2000s. Therefore, the sequential health assessment records for a particular worker are often stored separately.

According to the 2015 Queensland Mines and Quarries annual report,[28] of 16,463 total health assessments received from NMAs in 2014/15 just under 3,000 assessments (<18%) had been entered into the database. A backlog of approximately 150,000 health assessments awaiting database entry had grown to almost 170,000 whilst this review was underway.

The DNRM has advised that steps are in place to clear this backlog, for example, by scanning and only entering key variables into the database. Furthermore, the health assessments for underground coal mine workers (which account for <10% of the 170,000) have been prioritised. As of 23 June 2016, 70,000 health assessments had been processed including 10,000 underground coal miners' assessments. The remaining assessments for underground workers are expected to be cleared by the end of 2016, and the backlog of the other health assessments by mid-2017.

Limitations

The process of sending and receiving health assessments by ordinary mail is not consistent with contemporary methods of transfer and receipt of medical records, which are predominantly electronic. NMAs are required to send the entire assessments but do not always submit CXR films or spirograms, so reliance on this means of communication is ineffective. Manual checking of documents for completeness and accuracy and manual database entry is slow, cumbersome and prone to quality issues as a result of human error. The DNRM review is purely administrative and involves no medical review or audit.

Scanning capability was introduced by the DNRM, in part to assist data storage, as well as searching and retrieval of files. However, with approximately 100,000 health assessments awaiting scanning, this process has not been maximally utilised. A mixture of scanned and/or entered health records is currently stored at three different locations and, although the files have been sorted alphabetically and numerically, access to records for a particular worker could be hampered by separate storage of the files. The sequential health assessments for individual workers have not been consistently linked and this contributes to inefficiencies of the data storage system and difficulties in accessing previous health assessment records.

Resources to enter data into the database did not increase when the number of health assessments increased during the mining boom, resulting in a large backlog of forms awaiting entry into the DNRM database. This further hampers access of previous records.

Electronic data entry by the NMA at the time of the health assessment would reduce workload for the HSU as scanning and manual entry would no longer be needed and facilitate completeness of data entry and medical review by HSU. Electronic data storage would also allow much easier access to previous health assessment forms by NMAs, though would have to comply with current privacy constraints. Importantly, it would facilitate collation and analysis of group surveillance data to assess trends in CMDLD.

13. Interstate and overseas health surveillance schemes for miners

We reviewed health surveillance systems for mine workers in Australia, and overseas including the USA (NIOSH), UK, South Africa and Japan. The purpose was to determine which components of these programs could be incorporated to improve the Queensland scheme. In Australia, only two other states have had a health assessment scheme for mine workers, and one of these, Western Australia (WA), has recently ceased its surveillance program.

New South Wales

This section is summarised from the NSW Coal Services (CS) website, and from discussions with Coal Services Health (CSH) representatives.

CS is a corporation owned equally by the NSW Mineral Council and the Trade Union (CFMEU) and was set up in 2002.[29] Among other functions, CS provide:

- occupational health and rehabilitation services for workers engaged in the coal industry, including providing preventative medical services, monitoring workers' health and investigating related health matters;
- collection, collation and dissemination of statistics relating to the health of workers engaged in the coal industry;
- promotion of the welfare of workers and former workers in the coal industry in the state;
- monitoring, promotion and specification of adequate training standards relating to health for workers engaged in the coal industry; and
- monitoring of dust levels in coal mines.

Business units within CS provide services to the coal industry. Health surveillance under Order 41[30] is provided by CSH, and dust exposure monitoring under Order 42[31] by Coal Mines Technical Services.

Services are provided by CS to CHPPs, underground and open-cut mines. Labour hire companies are included, so contractors must also have regular medicals. Any former coal miner, including retired mine workers within NSW can attend a CSH office for a medical assessment, and CXR, if clinically indicated. Retired miners are contacted through the relevant NSW Retired Miners Association and the mining union. Some retired miners choose to attend, while others may attend their own GP.

Pre-employment and periodic medicals (usually every 3 years) are carried out by CSH on workers at coal mines. CSH employs 8-9 doctors (usually occupational health specialists who are in training or who have completed their training) and other staff, e.g. nurses, at 5 clinics.

All periodic medicals are carried out by CSH, though some companies arrange their own pre-employment medicals they are required to send the data to CSH for quality checking and data entry.

Staff directly enter data from the medicals to an electronic system as it is collected. A miner's previous data, including the occupational history, is visible to medical staff who can examine previous symptomatology, spirometry, CXR etc. CSH thus have a complete occupational and health history of each coal miner in electronic form.

The respiratory component of the medical includes a symptom questionnaire (based on the standard British Medical Research Council questionnaire), spirometry and a CXR. Spirometry is carried out in-house by nurses trained by the Asthma Foundation, and who undergo regular in-house training and annual competency testing.

A CXR is normally recommended every 6 years for mine site workers. The decision about CXR frequency is made by the CSH doctor after examination of the whole work history and is based on knowledge of the 'at risk' jobs, rather than relying on SEGs which vary from site to site and over time. For some workers, depending on the history, symptoms and signs, a CXR may be recommended more frequently. For individuals not thought to be dust-exposed e.g. administrative staff, the CXR interval might be up to 12 years.

Most of the CXRs are taken at two CSH sites, but may also be taken at other facilities. A CXR is read by one of a small pool of CSH radiologists across the state. The radiologists are aware that the CXRs are from miners. They are familiar with the ILO classification but do not undergo any specific or extra training in respect of this classification. The radiologists report the films using the usual radiology form, rather than the ILO form.

Any adverse medical findings are discussed at weekly review meetings by medical staff and, where necessary, the worker and their GP are contacted. Respiratory specialists may then become involved and their findings would be fed back to the GP and to CSH. Where necessary, with the individual's permission, the findings are fed back to the company so that appropriate restrictions can be placed on work practices/exposures.

An information sheet on respiratory diseases related to coal dust exposure has been developed for workers.

Western Australia

Western Australia's MineHealth system ceased in January 2013 after the outcome of epidemiological studies of the surveillance system database showed that health assessments neither prevented nor detected ill-health at an early stage.

The requirements for undertaking health assessments are stipulated in *The Mines Safety and Inspection Regulations 1995*, and health surveillance for mining employees in WA was administered by the Department of Mines and Petroleum Resources Safety. Details of the surveillance scheme have been summarised from the publication 'Guide to health surveillance system for mining employees',[32] and thus was not specifically for coal mine workers.

Objectives of the scheme were clearly stated from the outset, which were to: assess health status on a regular basis; analyse collected data to detect adverse health effects at the earliest opportunity; and provide data for future epidemiological studies. As well as setting out the responsibility of employers, employees and responsible medical practitioner or approved persons, the guide also included detailed instructions about how to complete all components of the health assessment form.

The health surveillance scheme was applicable to all miners except those who fulfilled the exemption criteria, such as workers not exposed to significant levels of hazardous agents, and employees who work for a cumulative period of less than three months in a 12-month period. Employees were issued with a health surveillance card (with a unique number and expiration date) by the Department of Mines and Petroleum. Initial health assessments were to be completed within 3 months of commencing a job, and periodically at least every five years thereafter.

The approved medical assessment form was concise, included a formal respiratory questionnaire and had an entire page dedicated to spirometry which was to be conducted accorded to ATS standards. A doctor or "approved person" could undertake the assessments, however medical practitioners were required to complete a one-day approved persons course before performing lung function tests, and to attend refresher courses every 2 years unless exempted. Completed forms were submitted to the Mines Occupational Physician. Although there was no formal auditing of these forms, approvals to conduct the medicals were revoked if an "unacceptable" number of poor quality forms was submitted to Resources Safety.

CXRs were only required by employees who had worked in "designated work categories" in surface, underground and non-mining (such as tunnelling) environments for a specified duration, in WA or other states. A list of the "designated work categories" is provided in an appendix of the guide. CXRs were reviewed and reported by radiologists, but were no longer required to be reviewed by a CXR reader for coding purposes. Regulations required CXR reports to be recorded and, the employee notified of the results and given an explanation if follow-up was required. Medical practitioners were also required to specify remedial actions that were taken for abnormalities detected in other components of the health assessment.

All components of the health assessment, including the CXR film and radiology report, were forwarded to Resources Safety and transferred to the MINEHEALTH database.

NIOSH (USA)

The Respiratory Health Division of NIOSH, (within The Centers for Disease Control and Prevention) operates the Coal Workers' Health Surveillance Program (CWHSP) in the United States. The CWHSP was established by the Federal Coal Mine Health and Safety Act of 1969 and has been in continuous operation since 1970. The program is mandated by law, enforced by MSHA, part of the US Department of Labor and is administered by NIOSH. The CWHSP has operated four different programs since it began. These programs require that the operators participate by offering these services to all coal miners, however the miners are not obligated to participate. Participation rates have varied between 25% and 50% over the years.

1. Coal Workers' X-Ray Surveillance Program (CWXSP) 1970-2016

CWXSP operated from 1970 until February of 2016 when it was replaced by the newly legislated expanded program. This program collected demographic information and work histories in addition to performing CXR surveillance. Operators of underground coal mines were required to post a NIOSH-approved health examination plan providing health surveillance to their underground miners every five years. The operators chose the CXR facility and offered the miners the opportunity to go to those sites free of charge and obtain a CXR. The CXR was interpreted by on site physicians known as A-readers, and then sent to NIOSH for formal ILO classification by a panel of carefully selected B-readers for final determinations.

2. Miners Choice Program – 1999-2002

In addition to this program NIOSH and MSHA expanded participation to surface miners and also allowed miners to choose the site for their CXR rather than being required to go to the site selected by the coal operator. This program also consisted only of CXR screening and occupational histories.

3. Expanded Coal Workers' Health Surveillance Program (ECWHSP) – 2005 to present

The ECWHSP was developed in response to findings of increasing rates of pneumoconiosis and rapidly progressive pneumoconiosis detected by the CWXSP in certain areas of the country known as "hot spots". This program continues to this day. This program consists of a mobile van operated by NIOSH, which travels throughout the country for several months of the year. The program offers CXRs which are transmitted directly to NIOSH for B-reader interpretation. The ECWHSP also collects information on respiratory symptoms, occupational histories, smoking status, blood pressure measurements, and spirometry testing.

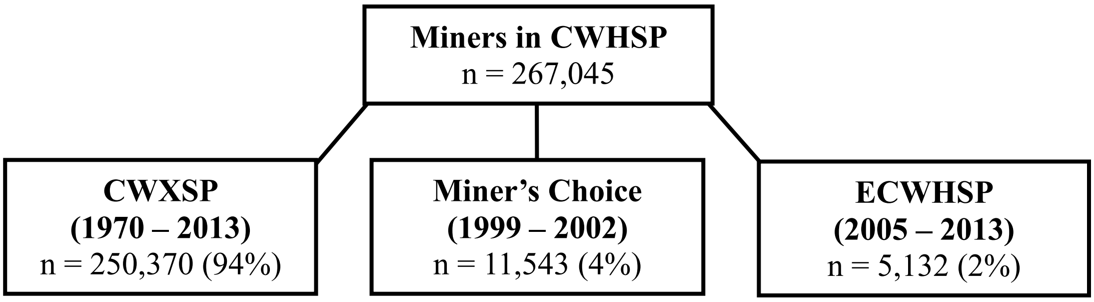


Figure 5: Distribution of coal miners in NIOSH's Coal Workers' Health Surveillance Program across different phases of the surveillance program, 1970 – 2013.

As noted in Figure 5, participation in the CWHSP is voluntary and as such, there is no set frequency of medical testing for participating miners, however operators have been required to offer testing every 5 years. Miners may appear in the program multiple times throughout their mining career, but participation is not required. It is not advised to receive more than one CXR within a 5 year time period, therefore while a miner may participate on a more frequent basis, they would be advised to undertake a CXR only once within a 5 year period. Miners are notified of their medical results after participation in the CWHSP. If evidence of disease or impairment is found, the miner in encouraged to follow up with their personal doctor. Employers are not notified of an employee's health status.

NIOSH reviews information on facilities which provide CXR screening and certifies those clinics before they may participate. NIOSH requires separate certification for x-ray and spirometry facilities which are based on the equipment used, the technician certifications, and a sample of CXRs or lung function tests for quality review by NIOSH experts. Facilities may be approved for x-rays only, spirometry only, or both see: http://www.cdc.gov/niosh/topics/surveillance /ords /pdfs/CWHSP-Facility-2.11.pdf.

Facilities that are NIOSH-approved for spirometry can provide the respiratory assessment as well as lung function test to the CWHSP. All persons administering spirometry exams must have successfully completed a NIOSH-approved Spirometry Training Course. This certification must be maintained through periodic refresher courses. Spirometry test results must be interpreted by physician or other health professional with appropriate state licenses for this service, in accordance with ATS guidelines for spirometry interpretation.

All CXRs taken as part of the CWHSP are read and interpreted by NIOSH-certified B-Readers. B-Readers are physicians who have demonstrated proficiency in interpreting and classifying CXRs specifically for pneumoconioses. B-Readers classify CXRs according to the ILO classification system see:
(http://www.cdc.gov/niosh/topics/ surveillance/ords/pdfs/CWHSP-ReadingForm-2.8.pdf). These physicians are tested every four years in order for their B-Reader certification to remain valid. The CWHSP data is collected, managed, and maintained by NIOSH staff. NIOSH uses

the CWHSP data to estimate disease prevalence and identify geographic areas of resurgent disease.

Detailed work histories for up to 13 previous mining positions are collected as part of the CWHSP. Work histories include the names of prior mines, which can be linked to geographic location, mine characteristics, and job titles. See: (http://www.cdc.gov/niosh/topics/surveillance /ords/pdfs/CWHSP-ReadingForm-2.8.pdf). The CWHSP also contains data on CXRs with a standardized ILO classification by independent NIOSH B-Readers. Spirometry with age, height, FEV_1, FVC, FEV_1/FVC ratio; smoking status (former/current/never); and data from respiratory symptom questionnaires are available starting in 2005. The CWHSP also contains demographic information such as sex and race/ethnicity, as well as the body weight of the participating miners.

NIOSH produces de-identified publicly available aggregate data sets from the CWHSP for research purposes in addition to the data sets maintained for internal research use.

United Kingdom

The last underground coal mine in the UK ceased operation in 2015, although many open cut coal mines remain in operation and silicosis remains an important occupational lung disease. The Health and Safety Executive has published guides for health surveillance for workers exposed to respirable crystalline silica (RCS), [33, 34] and these are summarised below. Although health monitoring is not mandatory, information contained in the publication will assist employers to comply with the *Control of Substances Hazardous to Health Regulations 2002* to control exposure and protect workers' health.

The guides begin by stating the purpose of health surveillance, and reiterate that it is never an alternative to proper exposure control. The categories of RCS-exposed workers for inclusion in surveillance are clearly outlined, and include individuals working in underground and open-cut environments in high-risk industries and occupational groups, as well as retirees. Health monitoring is also advised in situations where there have been previous work-related cases, where there is reliance on RPE as an exposure control measure; or where there is evidence of work-related ill-health in the industry.

Questionnaires and lung function tests are recommended at baseline, and annually thereafter, and sample proformas are enclosed in the guides. Posterior Anterior CXRs are advised at baseline (to enable comparisons with subsequent CXRs, after 15 years work history), and every three years thereafter unless advised otherwise by a health professional. The ILO classification is not explicitly recommended for CXR reading, though the grade of silicosis (if present) is to be recorded. Radiographs should be read by a suitably qualified radiologist. Spirometry is to be conducted and interpreted according to the ATS criteria, and both spirometry and CXRs should be assessed relative to previous results.

The results of the health surveillance should be explained to the workers by the health professionals, who could be a doctor or nurse, especially if silicosis is diagnosed. Although there are no prescribed clinical guidelines for management of abnormal findings, there are suggestions about what constitutes "abnormal" and the frequency of subsequent health assessments. For example, an abnormal lung function result includes an average drop in FEV_1 of 100mls per year, and spirometry should be repeated early if FEV_1 declines by 200mls or more. The Health and Safety Executive also recommend seeking the opinion of an appropriate occupational health professional for abnormal results, and to determine fitness for work and any action required to slow disease progression.

Health professionals are also required to collate, interpret and report the result trends across groups and individuals, in particular to identify the need for an employer to review and/or revise exposure risk assessments. Health results and records must be stored for 40 years.

Japan

Coal mine workers in Japan do not participate in a mandatory health surveillance scheme. However, it is one of six countries that participates in the Asian Intensive Reader of Pneumoconiosis project (AIR Pneumo). This is a non-government initiative to promote quality assurance of medical screening and surveillance for pneumoconioses. It was established in 2003 with an aim to upgrade skills of medical specialists in developing countries on the application of the ILO International Classification of Radiographs of Pneumoconioses, and to contribute to the implementation of the ILO/WHO Global Program for Elimination of Silicosis.

AIR Pneumo consists of three educational tools: attendance at an interactive 2.5 day-course, including a CXR view-box reading seminar and practice; provision of CXR teaching materials; and examination and certification of proficiency to read chest radiographs of pneumoconioses. The target audience includes chest physicians, radiologists, occupational physicians and GPs with an interest in occupational lung diseases [35]

South Africa

A number of minerals are mined and/or occur in South African mines, including gold, platinum and silica. Although mines are required by law to establish and maintain disease surveillance programs, there is no formal national or provincial health screening for mine workers in South Africa. [36] However, under the *Occupational Diseases in Mines and Works Act*, the pathology division of South Africa's National Institute of Occupational Health (NIOH) provides an autopsy service for deceased mine workers and former mine workers for the diagnosis of compensable disease, regardless of the clinical cause of death. The information is recorded in the Pathology Automation System database, and is currently the only source and resource for disease surveillance of occupational lung disease.

Mine medical officers, other doctors conducting medical examinations for former miners, and panel members who certify cases for compensation do not require specific qualifications to read CXRs. However, South Africa NIOH has recognised the utility of standardised reading and assessment of disease progression and will be presenting an ILO training program in November 2016. Importantly, the program will be tailored to local conditions, especially the high rates of pulmonary tuberculosis (David Rees, NIOH, personal communication).

14. Queensland medical capacity

We identified the specialist medical expertise and resources currently available in Queensland to contribute to the performance of high quality medical assessments for the early detection of CMDLD, including performance and interpretation of high quality CXR and spirometry. Based on the findings of aspects of this review outlined earlier in this report, specialist input will be needed for the following:

1. The development of clinical guidelines for NMAs to assist them in undertaking the respiratory health assessment, assessing coal dust exposure, identifying what signs/symptoms require follow up and further investigation, including specialist opinion when respiratory abnormalities are detected
2. High quality expertise in CMDLD among specialist respiratory physicians for referral and subsequent clinical management, including advice on reducing coal dust exposure of coal miners suspected of having CMDLD
3. A robust system for the reporting of CXRs by radiologists in line with the ILO classification, including relevant training and auditing
4. A robust system for the performance and reporting of spirometry to acceptable standards, including relevant training and auditing
5. Assistance in the development and delivery of training materials for NMAs and specialists involved in the health assessment scheme

Three relevant Australian specialist medical organisations are:

- The Royal Australian and New Zealand College of Radiologists (RANZCR)
- The Thoracic Society of Australia and New Zealand (TSANZ)
- The Australasian Faculty of occupational and Environmental Medicine (AFOEM) of the Royal Australasian College of Physicians (RACP)

These organisations have been contacted by the review team and all have indicated a strong willingness to assist in building improved capability in the health assessment scheme in Queensland in the areas indicated above. During the review, the RANZCR and TSANZ have each identified members in Queensland who are willing to provide relevant expertise to the scheme.

The Royal Australian College of General Practitioners is another Australian body relevant to building medical capacity within the scheme, as GPs are often the first point of contact for coal miners who develop respiratory symptoms. To start the process of increasing awareness among GPs, the review team has developed a CMDLD Fact Sheet for GPs, which was provided to the DNRM and distributed to Queensland GPs through Queensland Health (see Appendix 10).

Specific activities which would increase the quality and robustness of the respiratory component of the health assessment scheme for CMDLD in the future include:

- Introducing a training program for doctors, which they must successfully complete before being approved by the DNRM to perform respiratory health assessments for CMDLD.
- RANZCR, TSANZ and AFOEM will need to be involved in the design and running of this training program.
- Developing clinical guidelines to ensure consistency in identifying what respiratory abnormalities found at the health assessment require follow up and further

investigation, establishing consistent criteria in the diagnosis of CMDLD and appropriate management, including measures necessary to reduce or eliminate further coal dust exposure.

- Establishing an accreditation system for spirometry to TSANZ standards, this will require input from TSANZ, especially respiratory scientists.
- Establishing a centralised system of independent dual reporting of digital CXRs performed for the scheme, involving a small group radiologists adequately trained in interpreting and reporting these films using the ILO classification and who are reporting on such films regularly enough to maintain skills. The dual reporting is important due to known high degree of variability among radiologists in detecting early opacities. Such a system would also involve ongoing clinical audit of a sample of CXRs and the radiologist reports to ensure that reporting standards among the radiologists are maintained. This model has been implemented successfully for mammographic screening.
- Conducting workshops at the annual conferences of the RANZCR, TSANZ and AFOEM, as is done in similar US medical bodies, to update involved members of these bodies in those aspects of CMDLD relevant to their specialty.
- Establishing a system of clinical grand round, which is a well-established medical system whereby relevant specialists meet to discuss cases requiring multidisciplinary expertise. For cases of CMDLD, such grand rounds would need to involve at least one radiologist, thoracic physician and occupational physician to fully assess workers found to have respiratory abnormalities suggestive of CMDLD at their respiratory health assessment.
- Establishing a system of health surveillance, involving the analysis and reporting of grouped results from the health assessment scheme to monitor trends across the industry and over time. This will require epidemiological input in the design of the surveillance system and analysis and reporting of the data. There are very few models for comprehensive surveillance of occupational disease in Australia, despite there being a strong need,[37] one being the Australian Mesothelioma Registry.[38] Such a surveillance system should include retired workers and those who have moved to another industry, given the long latency of the development of CMDLD after first exposure, which may only develop some years after ceasing work as a coal miner.
- One way that more accurate numbers and rates of CMDLD would be identified by the surveillance scheme would be to make CMDLD reportable diseases, as is the case with other diseases, such as cancer and communicable diseases. While cancer can usually be accurately diagnosed by pathology slides and communicable diseases can usually be accurately diagnosed by laboratory tests, the accurate diagnosis of respiratory diseases included in CMDLD do not rely on a single pathology or laboratory test, but require integrated consideration of the worker's cumulative exposure, respiratory symptomatology and physical signs, serial spirometry results, CXR findings and for specific conditions, other special investigations. Making all of the conditions included in CMDLD notifiable would require very specific diagnostic criteria to be set then consideration of establishing a medical panel to review possible cases, in line with the system used by the Dust Diseases Board in NSW or the Medical Panels in Victoria.

15. Other sources of data about the extent of CWP

As limited information was available to the review team about the extent of CWP among Queensland coal mine workers, we identified and examined routinely collected health data to help estimate the prevalence of CWP, from Queensland hospital records and workers' national and state-based compensation data. All of these data sources have their limitations, which are discussed below.

Queensland hospital data

To assist the review, Queensland Health undertook a preliminary search of its public hospital data to identify patients who had been hospitalised with CWP within the last five years.[39] The search was conducted using ICD-10 code J60: Coal Workers Pneumoconiosis. However, as this code includes CWP and other lung diseases associated with carbon exposure, a significant number of patients were identified who had not been Queensland coal miners, or coal miners at all. Relying solely on the J60 code for hospital inpatients overestimates the prevalence of CWP among Queensland mine workers as it includes:

- Non-miners with lung disease from exposure to carbon dust (the other major categories are anthracosis, and anthracosilicosis, but could have been coded using the silicosis code)
- The majority of the patients with a J60 code were found to have carbon pigment in lymph glands which were biopsied as part of a staging process for patients diagnosed with cancer
- Miners who worked overseas and/or interstate

To refine the search, the DNRM provided a list of over 100,000 people who had had a Queensland coal mine workers' medical since the inception of the scheme (in 1983), and this was cross-checked with Queensland public hospital records from the last 20 years. Twenty one individuals assigned a J60 code and who had been hospitalised between July 1995 and November 2015 were identified. The available hospital charts of these 21 individuals were reviewed by Queensland Health, and four were categorised as "probable" and seven as "possible" CWP cases.

De-identified data on ten of the possible and probable CWP cases were provided in the Queensland Health report.[39] (The other case details were not provided to avoid identification of the individual.) The mean age at hospitalisation for the ten cases was 69 years, though three individuals were under the age of 65. The majority were thus likely to have been retired at hospitalisation, but retired miners are not included in the current Coal Mine Workers' Health Scheme.

These findings could indicate that CWP is more prevalent among Queensland miners or former miners than otherwise known, and would be reinforced by the following factors:

- Queensland Health only has access to J60 codes and case history data from public hospitals, so cases only diagnosed or treated in private hospitals will not be identified and cannot be investigated.
- CWP may have been present in a miner or former miner, but may not have been diagnosed and therefore not coded. CWP with an ILO classification of 1/0 would be asymptomatic.

- Not all mine workers with CWP would have required hospitalisation.

However, as previously mentioned, a case being assigned a J60 code is not definitive identification of CWP, even after cross-referencing with the DNRM records and these cases would still need to be independently verified.

In summary, Queensland Health data indicate that more cases of CWP than those reported to DNRM have probably occurred in the past 20 years. However, limitations in the various data sources being compared make it difficult to reach firm conclusions on the incidence of CWP. It should also be noted that this review of cases by Queensland Health only looked at CWP and did not investigate other respiratory diseases among coal miners which are included in CMDLD.

Queensland compensation data

Q-COMP in Queensland is the authority responsible for the administration of WC claims. At the request of the review team, Q-COMP searched their claims database for compensation claims for CWP over the past 10 years. Because of the small numbers in each year, we have not provided yearly breakdowns, to preserve confidentiality. Instead we present summary findings. Over the past 10 years, there have been six accepted cases, with four being accepted in the 2015/16 year to date, while two were accepted in the late 2000s. There are also 6 pending cases, with five of these submitted in the current financial year, one rejected case and two withdrawn cases.

It should be noted that compensation claims have their limitations, especially for claims for disease as opposed to acute trauma, as the link between exposure and disease can easily be missed. Workers' compensation is only available for current workers, so retired workers are not eligible for wage replacement. Compensation payments usually require evidence of impairment or inability to work. However, the early stages of CWP are asymptomatic so a coal mine worker may not meet the requirements for compensation. Given the long latency of coal dust exposure until the onset of disease, compensation data are not an accurate indicator of the extent of CWP, nor other forms of CMDLD.

Safe Work Australia data

Safe Work Australia (SWA) collects national WC data. At the request of the review team, SWA extracted data for pneumoconiosis claims from 2000-01 to 2013-14. They found 236 accepted WC claims for respiratory diseases such as silicosis and pneumoconiosis (due to coal dust or other causes).

This included 162 WC claims for silicosis, 72 WC claims for pneumoconiosis (excluding asbestosis, CWP and silicosis), and 2 WC claims for CWP. Both of the CWP claims were from Victoria.[4] Of the total number of claims for all types of pneumoconiosis over this recent 13

[4]. In an earlier version of this report, this section contained some incorrectly information from SWA and read: They found 237 accepted WC claims for respiratory diseases such as silicosis and pneumoconiosis (due to coal dust, asbestos, silica or other causes). (SWA website accessed 7/3/2016).
This included 162 WC claims for silicosis, 72 WC claims for pneumoconiosis (excluding asbestosis, CWP and silicosis), and 3 WC claims for CWP. Of the CWP claims, two were from NSW and the other was from WA. (See erratum at the beginning of this report for further details about these corrections.)

year period, 21 were from the mining sector, including 19 claims for silicosis and 2 claims for other respiratory diseases. (SWA data, personal communication)

It is important to note that SWA WC data, like the other data sources referred to above, also have several limitations. Notably, they do not capture all occurrences of disease as it only covers employees who are eligible for WC, and thus excludes self-employed and retired workers, as well as those who have been absent from work for less than five work days because of their condition.

There is some disparity between the SWA and Q-COMP WC data for CWP, which is mainly because SWA data lags state data collection, so it does not include recent cases. However, the two accepted WC claims for CWP in the late 2000s in the Q-COMP database were not identified in the SWA database. This highlights the limitations in any individual WC data source in identifying accurate data on disease prevalence or incidence.

16. Research framework to estimate CMDLD prevalence among coal miners

One part of the scope of the review was to outline a research framework to more accurately assess the prevalence of CMDLD among Queensland coal miners. This focus was thought important as little is known about the extent of CMDLD among Queensland coal miners and the other parts of the review were primarily aimed at assessing the quality and limitations of the scheme. In addition, the findings of previous chapter on other routine data sources cannot be relied upon to provide reliable estimates based on hospitalisations or WC claims. The CXR and spirometry review in this report examined CXRs from individuals who have worked for more than 10 years as a miner and accessible spirograms from DNRM. It is therefore not a random sample of miners and former miners and so it cannot be used to estimate the prevalence of CMDLD in Queensland.

As CMDLD can continue to develop after exposure has ceased, a survey to estimate the prevalence of CMDLD would need to include both current and former miners. Although the number of retired miners who participate is likely to be small, they are important as they are likely to have had the highest exposures. In addition, they may have left the industry due to development of respiratory problems, and a prevalence survey should capture this. The previous Rathus Abrahams CXR survey in 1984 included 7,784 employees, and though there were 123 retirees included, this was only a small proportion of retired miners.[15]

The proposed research framework is designed to estimate the current prevalence (number of existing cases) of CMDLD among Queensland coal mine workers, including those cases undetected by the current scheme.

Study design

The most appropriate research design to measure prevalence is a cross-sectional study, which involves measuring CMDLD in current and retired mine workers at one point in time. An advantage of this approach is that once participants are recruited they can be followed over time, longitudinally, to measure the incidence (new cases over time) of CMDLD. However, if a properly designed health surveillance program, based on the regular health assessments under a revised scheme was established, this could serve the same purpose as a longitudinal study.

Inclusion criteria

The most efficient approach would be to define the study group at risk of CMDLD with a minimum number of years of work in coal mines, such as 10 years. Setting this criterion will exclude those with minimal risk of having CMDLD at the time of the survey. This period is chosen as those with fewer years of exposure are at lower risk of developing disease and so would potentially dilute the recruitment efforts with no added benefit.

As referred to above, the study group should include current miners, retired miners andformer miners (i.e. those who are still working, but in jobs outside the coal mining industry) who meet the minimum work duration criterion. It is especially important to include retired and former miners, some of whom may have left the industry as a result of respiratory conditions and are likely to have had longer exposure to coal mine dust, be older, and consequently more likely to have developed CMDLD.

Ideally, miners should be recruited from all mining sectors, that is, underground and open-cut mines, and CHPPs. This will increase the study size and the statistical power of the study, and result in a greater ability to detect excess risks of CMDLD, even if the excess risk is low. If the study was small, then low risks may not be detected. Miners may have moved from one sector to another, an open cut miner may previously have worked underground and *vice versa*, so inclusion of the likely lower-exposed open-cut miners is important. In addition, the likely differences in extent of exposure between these sectors would be informative as analyses could be undertaken to assess risks of CMDLD at different levels of exposure.

Assembly of the study group

Current miners can be identified through companies, including contractors and labour-hire firms. Identifying retired and former miners is likely to be more difficult as their contact details might be unavailable, however the following records could be used:

- Company records
- Trade Union records
- Existing DNRM medical records

It will be important to develop a complete list of current, retired and former miners to approach to take part in the survey, as voluntary participation is very likely to introduce bias into the findings. Including a large number of volunteers may result in an over or an underestimation of those with CMDLD, and thus skew the actual disease prevalence found in the survey.

Contact and recruitment process

The record holders will need to provide access to contact details for participants in the survey. It will be important to establish the completeness of these records and to ensure that contact details for prospective participants are up to date. If up to date contact details are not available for former miners, then other sources of contact information, such as the electoral roll could be used.

Some organisations may be reluctant to provide this contact information because of data privacy concern. However, the Australian Privacy Principles do allow the disclosure of such information for medical research, especially if the research is deemed to be of high public interest, which would be the case with this survey.

The study would need approval from a properly constituted Human Research Ethics Committee (HREC). An HREC is usually interested in reviewing the study design, contact procedures (including the explanatory statement and consent forms), data collection and storage, means of feedback to participants and overall study governance. The HREC will also want reassurance that the researchers are acting independently of the companies, government and other stakeholders, and that confidentiality of the data will be preserved.

Eligible current miners and retired/former miners would be contacted by email, telephone or by post, and asked to participate in the study. They would be provided with a plain language explanatory statement about why the study is being carried out, the research team, what the study would entail and how they will be advised of their results. At enrolment into the study, participants must sign a consent form. The questionnaire part of the study survey could be designed to be completed online, by telephone or by mail.

There is a likelihood that some current miners or more probably former miners may not respond to the invitation. This may be because contact details were incorrect so the invitation was not received, the individual is unwell or deceased, or because they are healthy and so are not interested. It would be important to know the number of eligible and invited workers so that the response rate can be calculated. Higher response rates provide more confidence in study findings, as it is less likely to be prone to participation bias and will also ensure that there is sufficient statistical power for the survey.

Follow up invitation reminders would be needed, with two reminders normally considered acceptable by the HREC.

Data to be collected

The first stage of data collection would be through a questionnaire. This would include:

- Respiratory symptom questionnaire (standard questionnaires are available)
- Relevant medical history, e.g. asthma, and a smoking history
- Full occupational history including duration of employment as a coal miner, types of mines and jobs held at each, and other relevant (non-mining) jobs

CXR and spirometry, and perhaps other respiratory tests would also need to be included. These would need to be performed at clinic(s) with sufficient quality control procedures. The respiratory health outcomes of interest (CMDLDs) would be defined (based on a mix of history, spirometry abnormalities and CXR abnormalities), prior to the start of the survey and the individuals fitting these defined criteria would be identified from the collected data.

Pilot study

The contact, recruitment and survey procedures would need to be piloted on a small sample of potential participants prior to the start of the main survey. The clinical investigations would also have to be piloted to ensure that they have adequate quality control and do not impose too great a travel burden on participants, some of whom may be elderly and possibly ill.

Study governance

The study should have a stakeholder Advisory Committee, including representatives from the DNRM, mine operators, the CFMEU, current employees, as well as other researcher(s) independent of the study team undertaking the survey. The members of the Committee would advise the research group about various aspects of the study, promote it to their members and facilitate dissemination of the findings.

A Scientific Advisory Group made up of three or four independent researchers can be a further way of ensuring the scientific integrity of the survey and its findings. The researchers' role would include reading the study protocol and suggesting means of strengthening its conduct, including data analyses. They can also provide an independent evaluation of the scientific merit of the study, as well as the quality and robustness of the findings and report.

17. An ideal Queensland coal mine workers' respiratory health assessment scheme

This section draws together the proposed modifications to the respiratory component of the scheme to address the identified limitations, as outlined in the previous sections of this report, and to outline the key aspects of a best practice scheme.

The purpose of the revised respiratory component of the scheme should be to:

- Identify reduced/impaired respiratory health indicative of CMDLD
- Provide appropriate referral for follow-up, diagnosis and management, including appropriate reductions in further exposure to dust, for coal mine workers with respiratory abnormalities
- Collect, analyse and report group surveillance data to monitor trends in CMDLD, and to inform Government, industry and trade unions reviews of dust exposure levels and occupational exposure limits for coal mines
- Provide feedback to mine companies where reduced/impaired respiratory health is likely to be due to coal mine dust exposure, so that exposure levels can be reviewed

The revised respiratory component of the scheme should include the following components:

- Current and former workers in underground and open-cut mines and CHPPs would be included
- All coal mine workers should be registered under the scheme on entry into the industry, and up-to-date contact details would be maintained
- A complete occupational history would be obtained from the worker on entry into the industry, and updated at subsequent health assessments
- Employers and workers would be informed about an upcoming periodic health assessment as part of the surveillance component of the scheme
- A limited pool of trained doctors would be approved by the DNRM after review of their qualifications and experience
- The training for these doctors should include the objectives and purpose of the scheme, CMDLD and associated diagnostic criteria and knowledge of the coal mining industry
- Doctors should be available in the main mining regions of Moranbah and Emerald, with additional offices sited in Mackay, Rockhampton and Brisbane for the convenience of drive-in-drive-out and fly-in-fly-out coal mine workers
- Respiratory health assessments would be completed at 3-5 year intervals and should include:
    - a comprehensive medical history, including smoking history
    - a standard respiratory symptom questionnaire
    - a focused respiratory physical examination
    - spirometry

  - a CXR (if assessed by the doctor as being indicated)

- CXRs would be dual read and reported according to the ILO classification by trained radiologists in a limited pool to ensure they read enough CXRs under the scheme to maintain skills
- The CXR interval should be determined by the doctor undertaking the health assessments and should take into account past and current exposure. More frequent assessments including CXR may be required for those workers with longer periods of higher dust exposure
- Spirometry would be conducted by a trained technician to TSANZ standards and interpreted by trained doctors
- There would be a process of clinical audit of the spirometry and CXR data
- Clinical guidelines including referral pathways for further investigations and specialist opinion are also established for workers with spirometry, CXR or other respiratory abnormalities, and these results are to be discussed with individual miners and their local doctor
- Cases of CMDLD identified under the scheme would be reported to DNRM after diagnosis
- Electronic data entry (with appropriate data security) is implemented so that current health assessments can be reviewed in the light of previous medical records
- DNRM oversees regular review of the respiratory health data to audit quality
- The collected respiratory health data are analysed at least annually as part of a health surveillance program to examine trends in CMDLD
- An implementation group which could include representatives of stakeholders and relevant medical bodies would be established to ensure that the new respiratory scheme is implemented and in a timely manner
- DNRM provides regular reports on the function and findings of the new scheme to the Coal Mining Safety and Health Advisory Committee[5] so that appropriate industry-wide action can be taken where indicated, for example review/revision of dust exposure levels.
- A review of the new scheme after its first 3 years of operation to confirm that it is meeting its objectives and regularly thereafter to ensure that it remains 'fit for purpose'.

[5] The Coal Mining Safety and Health Advisory Committee is a tripartite body set up by DNRM. Its mission statement includes the following: To represent and influence the industry to improve safety and health and to review and recommend improvements to safety and health in coal mines.

Glossary

ACGIH	American Conference of Governmental Industrial Hygienists
AFOEM	Australasian Faculty of Occupational and Environmental Medicine
AIHW	Australian Institute of health and Welfare
ATS	American Thoracic Society
CD	Compact Disc
CFMEU	Construction Forestry Mining and Energy Union
CHPP	Coal Handling and Preparation Plants
CMDLD	Coal Mine Dust Lung Disease
CMSHR	Coal Mining Safety and Health Regulation (2001)
COPD	Chronic Obstructive Pulmonary Disease
CS	Coal Services (NSW)
CSH	Coal Services Health (NSW)
CT	Computed Tomography
CWHSP	Coal Workers' Health Surveillance Program (US)
CWP	Coal Workers' Pneumoconiosis
CWXSP	Coal Workers' X-Ray Surveillance Program (US)
CXR	Chest X-ray
DICOM	Digital Imaging and Communications in Medicine
DNRM	Department of Natural Resources and Mines
ECWHSP	Enhanced Coal Workers Health Surveillance Program (US)
EMO	Examining Medical Officer
ERS	European Respiratory Society
FEV_1	Forced Expiratory Volume (in one second)
FVC	Forced Vital Capacity
GP	General Practitioners
HRCT	high-resolution CT
HREC	Human Research Ethics Committee
HSU	Health Surveillance Unit
IARC	International Agency for Research on Cancer
ICD	International Classification of Diseases
ILO	International Labour Organization
J60	ICD code for CWP which includes anthracosilicosis, anthracosis and coal worker lung
LLN	Lower Limit of Normal
MSHA	Mine Safety and Health Administration (US)
NIOH	South Africa's National Institute of Occupational Health
NIOSH	National Institute for Occupational Safety and Health (US)
NMA	Nominated Medical Adviser
NSW	New South Wales
OEL	Occupational Exposure Limits

PACS	Picture Archiving and Communication System
PMF	Progressive Massive Fibrosis
PPE	Personal Protective Equipment
Q-COMP	Queensland Compensation
RACP	Royal Australasian College of Physicians
RANZCR	Royal Australian and New Zealand College of Radiologists
RCS	Respirable Crystalline Silica
RPE	Respiratory Protective Equipment
SEG	Similar Exposure Group
SIMTARS	Safety in Mines Testing and Research Station
SMR	Standardized Mortality Ratio
STEL	Short Term Exposure Limit
SWA	Safe Work Australia
TLV	Threshold Limit Values
TSANZ	Thoracic Society of Australia and New Zealand
TWA	Time Weighted Average
U/G	Underground
WA	Western Australia
WC	Workers' Compensation
WHO	World Health Organisation

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Appendices

Appendix 1: Occupational exposure limits for coal dust and silica

There are two types of OEL, those such as the American Conference of Governmental Industrial Hygienists (ACGIH) which are health-based, and those that are regulatory or pragmatic limits (usually higher) which take into account the feasibility and cost-effectiveness of control (and sometimes measurement feasibility) in relation to the risks.

Coal Dust Exposure Limits

The ACGIH set Threshold Limit Values (TLVs) for coal dust in 1988, replacing the 2 mg/m^3 that had been proposed in 1971 with 0.4 mg/m^3 respirable fraction for anthracite and 0.9 mg/m^3 respirable fraction for bituminous coal.[41] The TLVs are set to prevent the development of COPD and PMF. The TLV documentation states that a small risk of the latter disease will remain at this TLV, and that exposure should be reduced to those lowest achievable and that silica exposure should also be controlled.[41]

Anthracite coal dust would appear to be more fibrogenic then bituminous coal dust and the ACGIH recommends lower exposure limits for dust from anthracite than from bituminous coal[41] based on risk modelling (see Table 8).

Table 8: Predicated prevalence rates of CWP and PMF among US coal miners aged 58 following exposure 1 mg/m^3 respirable coal mine dust over a 40-year working life time (after ACGIH [41])

	% CWP Category 1 and greater	% CWP Category 2 and greater	% PMF
Anthracite	12.8	4.6	3.4
Bituminous	11.9	4.1	2.9

Table 9 lists the occupational exposure limits by country, mainly sourced from the German government website GESTIS in 2016.[42] The Australian and New Zealand limit of 3 mg/m^3 is the highest value listed for respirable dust. The UK Advisory Committee on Toxic Substances has expressed concern that the UK value of 2 mg/m^3 may not adequately protect health "because of doubts that the limit was not soundly-based". [42] The OEL of 2 mg/m^3 was included in the published UK 2002 list and its 2003 supplement, but was omitted from the published 2005 list.[42]

The ACGIH TLV for bituminous coal dust is less than a third of the current Australian exposure limit. Some of the OELs listed for the anthracite dust (0.4 $mg/m^{3)}$ are almost an order of magnitude lower than the Australian limit (Belgium, Ireland and Spain), but the GESTIS source[42] did not identify whether they applied as inhalable or respirable dust. Ontario uses the ACGIH TLVs values as respirable dust limits.

Table 9: Occupational exposure limits for coal mine dust [8, 21, 42-44]

Country	Coal Dust 8 Hour TWA mg/m³			
	Anthracite	Bituminous	Inhalable fraction	Respirable fraction
Australia				**3**
NSW				**2.5**
ACGIH TLV	0.4 (1)	0.9 (1)		
Belgium	0.4	0.9		0.4
Canada - Ontario	0.4 (1)	0.9 (1)		
Denmark				2
Ireland	0.4	0.9		1.6
Latvia	4	4		
New Zealand				3 (3)
People's Republic of China			4 (2)	2.5 (2)
Singapore	2 (1)			
Spain	0.4	0.9		
South Korea				1
USA - OSHA PEL				2.4 (4)
USA - MSHA				1.5 (1)(4)
USA - NIOSH REL				1(1)
United Kingdom				2 (5)

(1) Respirable fraction or aerosol
(2) Free SiO2 < 10%
(3) 0.15 mg/m³ respirable quartz
(4) < 5% SiO_2 if >5% SiO_2, the standard is 10/% quartz
(5) No longer included in published lists

Silica Dust Exposure Limits

The international OELs for silica are listed in Table 10. The Australian workplace exposure limits for silica are similar to those of most countries, but higher than the TLV for respirable crystalline silica set by the ACGIH in 2006, and higher than the values set by many countries for cristobalite (the main form of crystalline silica). The ACGIH document states that the silica value was set to prevent lung cancer and the development of silicosis which had been identified in retirees.[45] Silica has been identified as a human carcinogen by the International Agency for Research on Cancer (IARC),[46] part of the World Health Organisation (WHO).

Table 10: 8 Hour TWA occupational exposure limits (OELs) and short-term exposure limits (STEL) listed for silica [42, 43, 47]

Country	Silica 8 Hour TWA mg/m^3				
	Quartz Cas 14808-60-7	Mineral Dust with Respirable Quartz	Respirable Crystalline Silica	Cristobalite, total Cas 14464-46-1	Tridymite Cas 15468-32-3
ACGIH			0.025	0.025	
Australia	0.1 (1)		0.1	0.1 (1)	0.1 (1)
Austria	0.15 (1)		0.15		0.15 (1)
Belgium	0.1		0.1	0.05	0.05
Canada - Ontario	0.1 (1)			0.05 (1)	
Canada - Québec	0.1		0.05		0.05
Denmark	0.3 (0.6 STEL)(2) 0.1 (0.2 STEL)(1)	0.5	0.05 (0.1 STEL)	0.15 (0.3 STEL)	0.15 (2)
Japan		E=3.0/(1.19 Q+1)(7)			0.05 (1)
Finland	0.05 (1)		0.05		0.05 (1)
France	0.1 (1)(3)			0.05 (1)(3)	0.05 (1)(3)
Hungary	0.15 (1)			0.15 (1)	0.15 (1)
Ireland	0.1 (1)		0.1	0.1 (1)	0.1 (1)
New Zealand	0.2 (1)			0.1 (1)	0.1 (1)
People's Republic of China	1 (1)(4) 0.7 (1)(5) 0.5 (1)(6)		0.7 (3) 0.3 (4) 0.2 (5)		
Singapore	0.1 (1)		(8)	0.05 (1)	0.05 (1)
South Korea	0.05			0.05 (1)	0.05
Spain	0.1 (1)			0.05 (1)	
Sweden	0.1 (1)			0.05 (1)	0.05 (1)
Switzerland	0.15 (1)		0.15	0.15 (1)	0.15 (1)
The Netherlands	0.075 (1)		0.0758	0.075 (1)	0.075 (1)
USA - NIOSH REL	0.05		0.05	0.05	0.05
USA - OSHA PEL				0.05 (1)	0.05 (1)
United Kingdom			0.1		

(1) Respirable dust, fraction or aerosol;
(2) Inhalable or total dust
(3) Restrictive statutory limit values
(4) 10% <= free SiO2 <= 50%
(5) 50% < free SiO2 <= 80%
(6) free SiO2 < 80%
(7) E = administrative control level; Q = content of free silica (percent) Dust of sand and stones, rocks, ores (minerals), metallic or carbon.
(8) See cristobalite, quartz, tridymite, tripoli

Appendix 2: Scope of the review of the respiratory component of the Coal Mine Workers' Health Scheme

A. The adequacy of the scope, processes, quality and reporting of the respiratory component of the existing medical assessment program, including information provided by the employer on risk of dust exposure, medical history, physical examination, chest radiography and spirometry, in detecting the early stages of coal mine dust lung disease.

B. The expertise and resources required, firstly to undertake high quality medical assessments (respiratory component) under the scheme, secondly to have effective referral pathways for suspected of a CMDLD, thirdly to use the gathered data to effectively implement a high quality medical surveillance program for the early detection of coal mine dust lung disease in Queensland coal miners and fourthly to make the information available to relevant stakeholders for necessary action.

C. The expertise and resources currently available in Queensland to perform medical assessments, perform and interpret high quality CXR and perform and interpret high quality spirometry. This will include a review of expertise and training of the current list of Nominated Medical Advisers, the use of EMOs and the specialist respiratory physicians available for referral and subsequent patient care.

D. Where deficiencies are found, make recommendations to improve the current program for the medical assessment of coal mine dust lung disease to achieve a state of the art program for the reliable detection of early disease.

E. Recommendations to build capacity in Queensland to ensure that a list is available of sufficient numbers of suitably qualified practitioners to be NMAs, respiratory physicians, trained personnel to carry out and interpret chest x-rays (CXR) and spirometry, where the current level of expertise and/or resources are found to be inadequate.

F. Depending upon findings from A, B and C, make recommendations for an interim strategy to handle undetected cases and ensure that the current cohort of mine workers is effectively screened for coal mine dust lung disease until longer term recommendations can be implemented.

G. Develop a methodology for the review of past x-rays and spirometry to estimate the extent of coal mine dust lung disease that may have been undetected by the medical assessment scheme.

H. Develop a research plan to measure the current prevalence of CMDLD in Queensland coal mine workers.

Appendix 3: Coal Mine Workers' Health Scheme - Health Assessment Form[6]

[6] The DNRM advised that NMAs have been issued with an amended form (dated 01/05/16) that includes additional instructions about: the category of coal mine workers who require a CXR; qualifications for individuals conducting spirometry and CXRs; and the standards for interpreting/reporting these tests, including the use of the ILO classification.

Coal Mine Workers' Health Scheme - Health Assessment Form

***Section 46 Coal Mining Safety and Health Regulation 2001* Form Number CMSHR 1**
(Form approved by Chief Inspector under section 281 of the *Coal Mining Safety and Health Act 1999)*

Name (Full Given Name(s) and Family Name)	Date of Birth

Privacy Obligations

Health surveillance information is collected by the Department of Employment, Economic Development and Innovation for the purpose of identifying medical conditions or impacts on health resulting from exposure to chemical and physical agents in the coal mining industry. It is collected under the authority of Part 6 – Division 2 of the *Coal Mining Safety and Health Regulation 2001*.

The Department will not disclose this information to any person except in accordance with the Regulation. The Regulation requires that the identity of a coal mine worker is protected when information is disclosed for research purposes.

Guidance Notes for completion of Health Assessment

Employer

- ❑ Must arrange for the Health Assessment of Coal Mine Worker.
- ❑ Must complete Section 1 on page 2 which includes informing the Examining Medical Officer or Nominated Medical Adviser if: a colour vision test is required; the worker is, or may be, exposed to dust (and therefore a chest x-ray is required); and the SEG (similar exposure group) of the worker.
- ❑ Must meet the cost of the Health Assessment.

Coal Mine Worker

- ❑ Must bring photo identification to have identity checked by the Examining Medical Officer.
- ❑ Must complete Section 2 on pages 2 to 3.
- ❑ In relation to Section 2 - Work History:
  - ***if the coal mine worker is commencing work*** – full work history must be provided; or
  - ***if the coal mine worker is already employed in the industry*** – only work history since last Health Assessment is required.
- ❑ Should request the Nominated Medical Adviser provide a copy of the Health Assessment Report and an explanation.

Examining Medical Officer/ Nominated Medical Adviser

- ❑ Must check photo identification provided by the Employee.
- ❑ Must review Section 1 and Section 2 (pages 2 to 3 with the coal mine worker and comment on any abnormality).
- ❑ Must complete Section 3 on pages 4 to 6
- ❑ Must attach a separate statement if space on Form is insufficient.
- ❑ Must take advice from the employer on the requirements for a colour vision test and/or chest x-ray.
- ❑ Must **not** complete the "Section 4 Health Assessment Report" if not a Nominated Medical Adviser.
- ❑ Must, where appropriate, forward the completed Health Assessment Form (intact) to Nominated Medical Adviser.

Nominated Medical Adviser

- ❑ Must review Sections 1, 2 and 3.
- ❑ Must assess whether the Health Assessment provides adequate information to make a report on the fitness for duty of the coal mine worker.
- ❑ If the coal mine worker has an abnormal colour vision and/or hearing result affecting fitness for duty, a practical test should be arranged.
- ❑ Must complete "Section 4 Health Assessment Report".
- ❑ Must provide an explanation of "Section 4 Health Assessment Report" to the Coal Mine Worker and, where practical, secure the signature of the Coal Mine Worker on the Health Assessment Report:
- ❑ Must provide a copy of "Section 4 Health Assessment Report" to:
  - the Coal Mine Worker at the address shown on page 2; and
  - the employer.
- ❑ Must forward a copy of the complete "Health Assessment Form" (all 7 pages) to the Health Surveillance Unit of the Department of Employment, Economic Development and Innovation.
- ❑ Must maintain secure records of the Health Assessment and associated documentation.

Section 1 – Employer to complete

Name of Nominated Medical Adviser

Employer

Coal Worker's Position

Description:	
Generic SEG*:	**Company SEG**:**

Mine (e.g. Southern Colliery)

SEGs are groups of workers with similar exposure
* Generic SEG is sourced from the list provided by Safety & Health ** Company SEG is the employer SEG

(a) Is the coal mine worker at risk from dust exposure (X-ray needed)?	❑ Yes	❑ No
(b) Will the coal mine worker be working underground?	❑ Yes	❑ No
(c) Does the coal mine worker require colour discrimination?	❑ Yes	❑ No
(d) Is the worker at risk from occupational noise?	❑ Yes	❑ No
(e) Is the worker at risk from hazardous chemicals? (comment)	❑ Yes	❑ No
(f) Are there hazardous duties requiring a specific fitness assessment? (comment)	❑ Yes	❑ No

Comment --

Section 2 – Coal Mine Worker to complete

2.1 Coal Mine Worker

(a) Family Name | Given Name (s)

(b) Date of Birth | (d) ❑ Male ❑ Female | (e) Telephone:

(c) Address:

2.2 Work History (coal mine worker to refer to Guidance Notes on the coversheet)

Year		Job Title or Description	Employer
From	To		

2.3 Health-related History

		Yes	No
(a)	Have you previously had a medical examination under this scheme?	❑	❑
(b)	If Yes, when was the last examination?		
(c)	Have you been admitted to a hospital or undergone surgery or an operation?	❑	❑
(d)	Have you ever had an illness or operation that has prevented you from undertaking your normal duties for more than two weeks?	❑	❑
(e)	Have you ever had an injury that has prevented you from undertaking your normal duties for more than two weeks?	❑	❑
(f)	Are you taking any medication?	❑	❑
(g)	Do you use hearing protection whilst in noisy areas?	❑	❑
(h)	Do you currently smoke, or have you ever smoked?	❑	❑

(Supply details) START.............. STOP .... TYPE … … … .... QUANTITY/ DAY ....

Examining Medical Officer's comments on Questions 2.1 to 2.3

2.4 Have you ever suffered from, or do you now suffer from, any of the following?

		Yes	No			Yes	No
(a)	Heart disease or heart surgery	❑	❑	(n)	Diabetes	❑	❑
(b)	Chest pain, angina or tightness in chest	❑	❑	(o)	Sciatica, lumbago, slipped disc	❑	❑
(c)	High blood pressure	❑	❑	(p)	Neck injury or whiplash	❑	❑
(d)	Asthma, bronchitis or other lung diseases	❑	❑	(q)	Back or neck pain which has prevented you from undertaking full duties	❑	❑
(e)	Abnormal shortness of breath or wheezing	❑	❑	(r)	Knee problems, cartilage injury	❑	❑
(f)	Deafness, loss of hearing or ear problems	❑	❑	(s)	Fractures or dislocations	❑	❑
(g)	Ringing noises in your ears	❑	❑	(t)	Shoulder, knee or any other joint injury	❑	❑
(h)	Other hearing difficulties	❑	❑	(u)	Hernia	❑	❑
(i)	Disease or disorder of the nervous system	❑	❑	(v)	Arthritis or rheumatism	❑	❑
(j)	Episodes of numbness or weakness	❑	❑	(w)	Dermatitis, eczema, or skin problems	❑	❑
(k)	Psychiatric illness	❑	❑	(x)	Allergies	❑	❑
(l)	Blackouts, fits or epilepsy	❑	❑	(y)	Allergic reaction or reaction to chemicals or dust	❑	❑
(m)	RSI, tenosynovitis, over-use syndrome or wrist strain	❑	❑				

2.5 Previous vaccinations and blood tests

(a)	When were you last immunised against Tetanus?	Year	
(b)	When were you last immunised against Hepatitis A?	Year	
(c)	When were you last immunised against Hepatitis B?	Year	
(d)	When was your last cholesterol test?	Year	

Examining Medical Officer's comments on Questions 2.4,and 2.5 --

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Coal Mine Worker's Declaration (to be witnessed by Examining Medical Officer)

I certify to the best of my knowledge that the above information supplied by me is true and correct.
I understand that if any of the information given is knowingly false, my employment may be terminated.

Signature …………………………………………………………………… Date / /

Witness …………………………………………………………………….. Date / /

Section 3 – Clinical Findings – Examining Medical Officer to complete

3.0	**ID Check**	Type
3.1	**Height**	cm
3.2	**Weight**	kg

Comment

3.3 **Vision** **Visual acuity**

		Uncorrected			Corrected	
		Right	Left		Right	Left
(a)-(b)	Distant	6/	6/	(e)-(f)	6/	6/
(c)-(d)	Near	N	N	(g)-(h)	N	N

3.4 **Visual fields** (by confrontation) Abnormal ❑ Normal ❑

3.5 **Colour Vision Test** (if indicated by employer)
Ishihara (if abnormal, the NMA to arrange practical test) Abnormal ❑ Normal ❑

3.6 Work-related colour vision practical test (if Ishihara test abnormal) Unsatisfactory ❑ Satisfactory ❑

3.7 **Hearing**

	Audiogram	500 Hz	1000 Hz	1500 Hz	2000 Hz	3000 Hz	4000 Hz	6000 Hz	8000 Hz
(a)-(h)	Left								
(i)-(p)	Right								

(q) Time since last high noise exposure? hours

(r) Audiogram result Abnormal ❑ Normal ❑

(s) Were hearing aids used Yes ❑ No ❑

(t) Auditory canals Abnormal ❑ Normal ❑

(u) Tympanic membranes Abnormal ❑ Normal ❑

The result is normal if hearing threshold is 40dB or less in the better ear at 500, 1000, 1500 and 2000 Hz. If an abnormal result impacts on a coal mine worker's "fitness for duty", the NMA should consider a practical test.

Examining Medical Officer's comments on Questions 3.1 to 3.7 (Note any abnormality, including past noise exposure, workers' compensation claims and tinnitus)

3.8 **Cardiovascular System** **Systolic** **Diastolic**

(a) Blood Pressure

(b) (Repeated if necessary

(c) Pulse rate /min

(d) Peripheral pulses Absent ❑ Present ❑

(e) Heart sounds Abnormal ❑ Normal ❑

(f) Evidence of cardiac failure or oedema Yes ❑ No ❑

(g) Varicose veins Yes ❑ No ❑

(h) E.C.G. (if indicated by some abnormality) Abnormal ❑ Normal ❑

Examining Medical Officer's comments on Questions 3.8 ------------------------------

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3.9 Respiratory system

Litres	Observed		Predicted		Observed/Predicted %	
Forced exp. Vol. 1 sec- FEV_1	(b)		(e)		(h)	
Forced vital capacity - FVC	(c)		(f)		(i)	
FEV_1/FVC%	(d)		(g)			

3.10 Spirometry *(abnormal includes $FEV_1/FVC<70\%$)* Abnormal ❑ Normal ❑

3.11 Auscultation of chest Abnormal ❑ Normal ❑

3.12 (a) Was chest x-ray undertaken (as advised by employer) Yes ❑ No ❑

(b) Date x-ray was taken / / ❑ ❑

(c) Quality of film? Unsatisfactory ❑ Satisfactory ❑

(d) What was the result? (Also attach x-ray film to this Report) Abnormal ❑ Normal ❑

3.13 Musculo-skeletal system

	Abnormal	Normal
(a) **Lower back**		
(i) Range of movement	❑	❑
(ii) Posture and gait	❑	❑
(iii) Straight leg raising	❑	❑
(b) **Neck** – range of movement	❑	❑
(c) **Joint movements**		
(i) Upper Limbs	❑	❑
(ii) Lower Limbs	❑	❑
(iii) Reflexes	❑	❑

3.14 Urinalysis and Blood Sugar

	Present	Absent
(a) Sugar	❑	❑
(b) Protein/albumin	❑	❑
(c) Blood	❑	❑
(d) Blood sugar analysis (optional)	❑	❑

3.15 Abdomen

(a) Abdominal scars	❑	❑
(b) Abdominal mass	❑	❑
(c) Hernia	❑	❑

3.16 Skin

(a) Eczema, dermatitis or allergy	❑	❑
(b) Skin cancer or other abnormality	❑	❑

Examining Medical Officer's comments on Questions 3.9 to 3.16 --

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3.17 Is the coal mine worker's fitness for duty is likely to be affected by any of the following?

		Yes	No
(a)	Dietary Habits	❑	❑
(b)	Exercise routine	❑	❑
(c)	Stress Level	❑	❑
(d)	Alcohol Consumption	❑	❑
(e)	Drugs or medication not prescribed by a doctor	❑	❑

3.18 Is there any reason why the coal mine worker may be not fit for duty in relation to work:

		Yes	No
(a)	As an operator of (or working around) around heavy vehicles	❑	❑
(b)	Underground (including use of self-rescue breathing devices and escape)	❑	❑
(c)	Shift work	❑	❑
(d)	Performing heavy manual handling	❑	❑
(e)	In wet or muddy conditions	❑	❑
(f)	In dusty conditions	❑	❑
(g)	At height or on ladders	❑	❑
(h)	In confined spaces	❑	❑
(i)	While wearing safety footwear or other personal protective equipment such as ear plugs, glasses and respirators	❑	❑
(j)	Another capacity – define ……………………………………………………..	❑	❑

Examining Medical Officer's comments on Questions 3.17 and 3.18 --

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Examining Medical Officer's name and address	**Signature**
Please print or stamp	**Date / /**

Approved Form - Section 4 – Health Assessment Report

Coal Mine Worker’s Details

Family Name	Given Name(s)	Date of birth
		......./......../.........

Employer	Mine(s) (if applicable)

Examination Details

Date of Examination by EMO: ..../........./.................

Position (e.g. job title (generic)):

Is the assessment for underground work? Yes ❑ No ❑

As at the date of this examination, the coal mine worker:

❑ Is fit to undertake any position

❑ Is fit to undertake the proposed / current position

❑ Is suitable for and has no condition which precludes participation in mines rescue - See Mines Rescue Medical Guidelines
For Queensland Mines Rescue Service personnel / applicants only.

❑ Is fit to undertake the proposed / current position subject to the following restriction(s) (if necessary, outline a management program)

❑ Is not fit to undertake the proposed / current position because of the following restriction(s):

The duration of the restriction is:

Is a further review necessary? Yes ❑ Date / / No ❑

Specify full or type of review required:

Was a chest x-ray taken? Yes ❑ Date / / No ❑

As Nominated Medical Adviser I have explained the restriction / additional assessment to the worker Yes ❑ No ❑

As Nominated Medical Adviser I have provided a copy of Section 4 to the worker (refer Note a): Yes ❑

I have been advised of the outcome of this assessment. (Practical constraints prevent this from being a compulsory item)	**Coal Mine Worker’s Signature**	**Date / /**
Nominated Medical Adviser's name and address: Practice stamp	**NMA's Signature:**	**Date / /**

Distribution:

(a) copy of Section 4 to coal mine worker at address shown on page 2; and
(b) copy of Section 4 to employer; or in the case of Mines Rescue membership a copy also to Queensland Mines Rescue Service, GPO Box 156, Dysart, Qld 4745; and
(c) copy of complete Health Assessment Form to Health Surveillance Unit, Simtars, Department of Natural Resources and Mines, PO Box 467, Goodna Qld 4300.

Appendix 4: Completion and quality assessment of a sample of 91 completed health assessment forms

	Section/Questions	**Included in the DNRM dataset**	**If Y, degree of completeness**	
Section 1	**Employer to complete**		Num.	Qual.
	Name of NMA	Yes	91/91	91/91
	Employer	Yes	82/91	79/82
	Coal workers' position - description	Yes	90/91	89/90
	Coal workers' position - generic SEG	Yes	4/91	-
	Coal workers' position – company SEG	Yes	0/91	0/0
	Mine	Yes	91/91	58/91
	(a) Dust exposure (X-ray needed?) - Y/N *(Duplicate Q – see section 3/3.12)*	Yes	60/91	56/91
	(b) Underground work - Y/N	Yes	66/91	66/66
Section 2	**Coal Mine Worker to complete**			
2.1	(a) Family Name, Given Names	N/A – De-identified data		
	(b) Date of Birth	Yes	91/91	91/91
	(c) Address	N/A – De-identified data		
	(d) Gender	Yes	91/91	91/91
	(e) Telephone	N/A – De-identified data		
2.2	**Work history**	No		
2.3	**Health-related history**			
	(a) Previous med./examination under scheme – Y/N	No		
	(b) If yes, date of last examination	No		
	(c) Current smoker, or ever smoked – Y/N Supply details – Start, Stop, Type, Quantity/day	Yes No	89/91	89/89
2.4	**Ever suffered from, or currently suffer from any of the following:**	No		
	(b) Chest pain, angina or tightness of chest – Y/N (?)	No		
	(d) Asthma, bronchitis or other lung diseases – Y/N	No		
	(e) Abnormal shortness of breath or wheezing – Y/N	No		
	(y) Allergic reaction or reaction to chemicals or dust – Y/N (?) – *irritant*	No		
	No detailed questions about respiratory symptoms			
Section 3	**Clinical Findings**			
3.1	Height	Yes	91/91	90/91
3.2	Weight	Yes	91/91	90/91
3.8	**Cardiovascular system**			
	(h) ECG - AbN/N (R-sided heart changes)	Yes	68	5/68
3.9	**Respiratory system**			
	(b) FEV_1 – observed	Yes	88/91	-

	Section/Questions	Included in the DNRM dataset	If Y, degree of completeness	
	(e) FEV_1 – predicted	Yes	88/91	-
	(h) FEV_1 – observed/predicted %	Yes	87/91	86/87
	(c) FVC – observed	Yes	88/91	-
	(f) FVC – predicted	Yes	88/91	-
	(i) FVC – observed/predicted %	Yes	87/91	84/87
	(d) FEV_1/FVC% - observed	Yes	88/91	85/88
	(g) FEV_1/FVC% - predicted	Yes	88/91	86/88
3.10	Spirometry – abnormal/normal	Yes	90/91	90/90
3.11	Auscultation of chest – abnormal/normal	Yes	90/91	90/90
3.12	CXR undertaken – Y/N	Yes	91/91	91/91
	Date CXR taken	Yes	85/91	83/85
	Quality of film – unsatisfactory/satisfactory	No		
	What was the result – AbN/N Attach film to report	Yes No	70/91	70/70
3.17	**Is coal mine worker's fitness for duty likely to be affected by any of the following**	No		
	No lifestyle question relating to respiratory system, e.g. smoking			
3.18	**Is there any reason why the coal mine worker may not be fit for duty in relation to work:**	No		
	(b) Underground (including use of self-rescue breathing devices & escape) – Y/N	No		
	(d) Performing heavy manual handling – Y/N	No		
	(f) In dusty conditions – Y/N	No		
	(h) In confined spaces – Y/N (?)			
	(i) While wearing safety footwear or other PPE such as ear plugs, glasses and respirators – Y/N	No		
Section 4	**Health Assessment Report**			
	Examination Details			
	Date of examination by EMO (Name of EMO – not on assessment form)	Yes Yes	91/91 59	0 2/59
	Is assessment for underground work – Y/N *(Duplicate Q – see Section 1)*	Yes	85	62/85
	Detail of restrictions	Yes		?4
	NMA explained restriction/additional assessment	No		
	1. Fit for duty – 5 options to select from with a tick 2. None of the options are specific for the respiratory system	Entered as "true" or "false"		
	NMA provided copy of Section 4 to worker - Y	No		
	Coal mine workers' signature/date	No		
	NMA's stamp & signature NMA date	Yes	91/91 91/91	91/91 91/91

Detailed explanation of the quality issues of completed health assessment forms

	Section/Questions	**No. of entries**	**Details**
Section 1	**Employer to complete**		
	Employer	3	"H", "Self", "Services"
	Coal workers' position - description	1	"U/G"
	Coal workers' position - generic SEG	-	
	Mine	33	12 "Unknown" BUT 11 with employer named; remainder no employer named 21 "Various mines" BUT 20 with employer named; remainder no employer named
	(a) Dust exposure (X-ray needed?) - Y/N (*Duplicate Q – see Section 3*)	35	4 "N", but CXR "Y" 31 blanks, but CXR "Y"
Section 3	**Clinical Findings**		
3.1	Height	1	"0" entered
3.2	Weight	1	"0" entered
3.8	**Cardiovascular system**		
	(h)ECG - AbN/N (R-sided heart changes)	63	"X" entered instead of "A" or "N"
3.9	**Respiratory system**		
3.9	FEV_1 – observed	-	
	FEV_1 – predicted	-	
	FEV_1 – observed/predicted %	1	FEV_1 observed & FEV_1 predicted but no %
	FVC – observed	-	
	FVC – predicted	-	
	FVC – observed/predicted %	3	FVC observed & FVC predicted but no % FVC observed > predicted but =100% FVC observed > predicted but <100%
	FEV_1/FVC% - observed	3	FEV_1 > FVC but <100%
	FEV_1/FVC% - predicted	2	FEV_1 > FVC but <100%
3.12	(b) Date CXR taken	2	Incomplete "11/10", "06/2001"

	Section/Questions	No. of entries	Details
Section 4	**Health Assessment Report** Examination Details		
	Date of examination by EMO (Name of EMO – not on assessment form, but in the DNRM database)	0 57	55 with surnames only 2 with the names of the surgery
	59 medicals completed by an EMO (35 doctors in total, including 14 NMAs) 28 medicals completed by EMOs who are also NMAs		
	Is assessment for underground work – Y/N (*Duplicate question – see Section 1*)	23	Work U/G cf. U/G work Blank cf. "Y" (18) Blank cf. "N" (1) "N" cf. "Y" (3) "Y" cf. "N" (1)
	Detail of restrictions	4	Not clear from the details if these relate to a respiratory condition

Appendix 5: List of NMAs, by practice type and qualifications

In total, there were 237 Nominated Medical Advisers (NMAs) conducting the coal workers' health assessments, in over 140 surgeries and in five different States. The majority (146) of NMAs were General Practitioners who were mainly based in General Practice clinics, followed by Medical Practitioners (57) with General registration practising in both Occupational Health Service and General Practice clinics. There were only twenty-eight specialist Occupational Physicians participating in the coal workers' health scheme. The different surgeries included ninety-seven General Practice clinics and forty-three Occupational Health Service clinics.

Queensland

The majority (approximately 90%) of NMAs and surgeries where the coal workers' health assessments were conducted were in Queensland. The coal workers' health assessments were undertaken in twenty-eight Queensland regions and these activities were concentrated in six regions: Brisbane, Mackay, Sunshine Coast, Rockhampton, Gold Coast and Brisbane City.

In Brisbane there were forty-eight NMAs based in twenty-nine different surgeries, including nine Occupational Health Service clinics and sixteen General Practice clinics. Three specialist Occupational Physicians, three General Practitioners and seven non-specialists conducted the assessments in the Occupational Health Service clinics. There were an additional two specialist Occupational Physicians practising from private clinics. The General Practice clinics were comprised of twenty-six General Practitioners and five non-specialists.

In Mackay there were forty NMAs based in twenty different surgeries, including three Occupational Health Service clinics and seventeen General Practice clinics. Medical Practitioners in the Occupational Health Service clinics included one specialist Occupational Physician, five General Practitioners and one non-specialist. There were one specialist Occupational Physician, twenty-three General Practitioners and nine non-specialists in the General Practice clinics.

On the Sunshine Coast the coal workers' health assessments were conducted by nineteen NMAs, all of whom were based in General Practice clinics. The NMAs included fourteen General Practitioners, four non-specialists and no specialist Occupational Physicians.

In Rockhampton, the distribution of NMAs was similar to the Sunshine Coast, but there were two Occupational Health Service clinics.

On the Gold Coast there were 12 NMAs in eleven different surgeries, including two Occupational Health Service clinics and nine General Practices. Eight General Practitioners and two non-specialists were based in the General Practice clinics.

In Brisbane City there was a similar number of NMAs as the Gold Coast, but there were more Occupational Health Service clinics (5) than General Practice clinics (1). There were five Specialist Occupational Physicians, four General Practitioners and three non-specialists.

Other States

The coal workers' health assessment was conducted in four other States: New South Wales, Victoria, Western Australia and South Australia. There were twenty-seven NMAs, based in eleven different Occupational Health Centres and three General Practices. The Medical Practitioners included nine specialist Occupational Physicians, nine General Practitioners and nine non-specialists.

Appendix 6: Spirometry survey

Dear participants,

As part of our review of the operation of the Coal Mine Workers' Health Scheme, we are seeking further information about the conduct of spirometry during the health assessments.

This survey is being sent to all Medical Practitioners listed as Nominated Medical Advisers with the Queensland Department of Natural Resources and Mines.

The survey will take approximately 15 minutes to complete, however you may need the assistance of the technician, nurse or other individual(s) who actually perform the spirometry. It is important that you complete as many questions as possible before submitting the survey.

The data collected during this survey will be sent directly to Monash University for analysis. Only anonymised group data will be reported to the Queensland Department of Natural Resources and Mines.

Your assistance with our review is appreciated.

START OF SURVEY

1. Type of site where spirometry performed

☐ General Practice
☐ Occupational Health Clinic
☐ Hospital
☐ Other facility (please specify) _________

2. Manufacturer of spirometer

☐ Don't know
Please specify _________

3. Spirometer model

☐ Don't know
Please specify _________

4. Year spirometer acquired

☐ Don't know
Please specify year (XXXX) _____________

5. Spirometer software version

☐ Don't know
Please specify _________

6. Does the spirometer have automated quality control?

☐ Yes
☐ No
☐ Don't know

7. Does the spirometer produce volume-time graphical displays?

☐ Yes
☐ No
☐ Don't know

8. Does the spirometer produce flow-volume graphical displays?

☐ Yes
☐ No
☐ Don't know

9. Does the spirometer store all manoeuvres performed for each individual tested?

☐ Yes
☐ No
☐ Don't know

10. How many manoeuvres does the spirometer store for each individual tested?

☐ 1
☐ 2
☐ 3
☐ More than 3
☐ Don't know

11. What is the electronic output format of the spirometer?

☐ 2005 American Thoracic Society/European Thoracic Society (ATS/ETS)
☐ Don't know
Other (please specify) __________

12. What software does the spirometer use for report generation?

☐ Don't know
Please specify __________

13. What reference values do the reports use? e.g. National Health and Nutrition Examination Survey (NHANES)

☐ Don't know
Please specify __________

14. How often is the spirometer calibrated?

☐ At least daily
☐ Weekly
☐ Monthly
☐ Less than monthly
☐ Don't know

15. Which year was it last calibrated?
    Please specify year (XXXX) ______________

16. Does the spirometer have a calibration check?
    ☐ Yes
    ☐ No
    ☐ Don't know

17. Do you take part in an on-going spirometry quality assurance program?
    ☐ Yes
    ☐ No
    ☐ Don't know

18. What year did you last participate in a quality assurance program (if applicable)?
    Please specify year (XXXX) ______________

19. Do you have a post-bronchodilator spirometry routine?
    ☐ Yes
    ☐ No
    ☐ Don't know

20. Is a spacer used to administer the bronchodilator?
    ☐ Yes
    ☐ No
    ☐ Don't know

21. Is a spirometry procedure manual available at the site where spirometry is performed?
    ☐ Yes
    ☐ No
    ☐ Don't know

22. Which year was the spirometry procedure manual last revised?
    ☐ Don't know
    Please specify year (XXXX) ______________

23. Is a height measurement device used during the spirometry?
    ☐ Yes
    ☐ No
    ☐ Don't know

24. Is a weight measurement device used during spirometry?
    ☐ Yes
    ☐ No
    ☐ Don't know

25. What are the qualifications of the person usually administering spirometry for the coal mine workers' health scheme?

☐ Medical practitioner
☐ Registered nurse
☐ Science graduate
☐ Don't know
Other (please specify) _________

26. How many spirometry tests, approximately, does he/she perform *per month* for the coal mine workers' health scheme?

☐ Fewer than 1 per month
☐ Between 1 and 5 per month
☐ Between 6 and 20 per month
☐ More than 20 per month

27. How many spirometry tests, approximately, does he/she perform *per week*, excluding tests performed for the coal mine workers' health scheme?

☐ Fewer than 1 per week
☐ Between 1 and 5 per week
☐ Between 6 and 20 per week
☐ More than 20 per week

28. How many years of experience at performing spirometry does he/she have?

☐ Fewer than 1 year
☐ Between 1 and 5 years
☐ Between 6 and 10 years
☐ More than 10 years

29. Has this person attended a spirometry training course?

☐ Yes
☐ No
☐ Don't know

30. If yes to question 29, which year did he/she attend the spirometry training course?

☐ Don't know
Please specify year (XXXX) _____________

31. If yes to question 29, what was the name of the organisation that delivered the training?

☐ National Asthma Council
☐ Thoracic Society Australia and New Zealand (TSANZ)
☐ Don't know
Other (please specify) _________

Appendix 7: Summary of spirometry survey data

Question	Response	%	N	Total
1. Type of site where spirometry performed	General Practice	62.2	46	74
	Occupational Medicine Clinic	36.5	27	
	Hospital	0	0	
	Other (GP/Occ med clinic)	1.4	1	
2. Manufacturer of spirometer	MIR (variety)	21.1	15	71
	Vitalograph	19.7	14	
	QRS	9.9	7	
	Welch Allyn	7.0	5	
	Others (all fewer than 5 responses)	35.2	25	
	Don't know	7.0	5	
3. Spirometer model	MiniSpir	15.3	11	72
	Spiro	12.5	9	
	Alpha	8.3	6	
	Orbit	8.3	6	
	Other (all fewer than 5 responses)	43.1	31	
	Don't know	12.5	9	
4. Year spirometer acquired	Pre 2013	16.4	12	73
	2013	12.3	9	
	2014	9.6	7	
	2015	15.1	11	
	2016	12.3	9	
	Unclear	2.7	2	
	Don't know	31.5	23	
5. Spirometer software version	Winspiro	21.6	16	74
	Office medic	8.1	6	
	Other (all fewer than 5 responses)	50.0	37	
	Don't know	20.3	15	

Question	Response	%	N	Total
6. Does the spirometer have automated quality control?	Yes No Don't know	63.8 11.6 24.6	44 8 17	69
7. Does the spirometer produce volume-time graphical displays?	Yes No Don't Know	90.3 4.2 5.6	65 3 4	72
8. Does the spirometer produce flow-volume graphical displays?	Yes No Don't Know	100 0 0	74 0 0	74
9. Does the spirometer store all manoeuvres performed for each individual tested?	Yes No Don't know	94.4 1.4 4.2	68 1 3	72
10. How many manoeuvres does the spirometer store for each individual tested?	1 2 3 More than 3 Don't know	2.7 4.1 33.8 50.0 9.5	2 3 25 37 7	74
11. What is the electronic output format of the spirometer?	2005 American Thoracic Society/European Thoracic Society (ATS/ETS) Other (please specify) *European, CE or ERS (5) Other (3)* Don't know	44.6 10.8 44.6	33 8 33	74
12. What software does the spirometer use for report generation?	Winspiro Office medic Medical director Others (all fewer than 5 responses) Don't know	23.0 6.8 6.8 35.1 28.4	17 5 5 26 21	74
13. What reference values do the reports use? e.g. National Health and Nutrition Examination Survey (NHANES)	NHANES Knudsen Other (all fewer than 5 responses) Don't know	21.9 6.8 24.7 46.6	16 5 18 34	73

Question	Response	%	N	Total
14. How often is the spirometer calibrated?	At least daily	19.4	14	72
	Weekly	5.6	4	
	Monthly	20.8	15	
	Less than monthly	41.7	30	
	Don't know	12.5	9	
15. Which year was it last calibrated?	Pre 2015	4.3	3	70
	2015	34.3	24	
	2016	50.0	35	
	Other e.g. unknown or self-calibrates	11.4	8	
16. Does the spirometer have a calibration check?	Yes	79.2	57	72
	No	6.9	5	
	Don't know	13.9	10	
17. Do you take part in an ongoing spirometry quality assurance program?	Yes	29.2	21	72
	No	59.7	43	
	Don't know	11.1	8	
18. What year did you last participate in a quality assurance program (if applicable)?	Pre 2015	16.2	6	38
	2015	29.7	11	
	2016	13.5	5	
	N/A	27.0	10	
	Other (all fewer than 5 responses)	13.5	6	
19. Do you have a post-bronchodilator spirometry routine?	Yes	79.7	59	74
	No	14.9	11	
	Don't know	5.4	4	
20. Is a spacer used to administer the bronchodilator?	Yes	78.1	57	73
	No	19.2	14	
	Don't know	2.7	2	
21. Is a spirometry procedure manual available at the site where spirometry is performed?	Yes	91.9	68	74
	No	6.8	5	
	Don't know	1.4	1	

Question	Response	%	N	Total
22. Which year was the spirometry procedure manual last revised?	Pre 2014	16.9	12	71
	2014	7.0	5	
	2015	19.7	14	
	2016	19.7	14	
	Other	4.2	3	
	Don't know	32.4	23	
23. Is a height measurement device used during the spirometry?	Yes	98.6	73	74
	No	1.4	1	
	Don't know	0	0	
24. Is a weight measurement device used during spirometry?	Yes	90.5	67	74
	No	9.5	7	
	Don't know	0	0	
25. What are the qualifications of the person usually administering spirometry for the coal mine workers' health scheme?	Medical practitioner	8.1	6	74
	Registered or enrolled nurse	81.1	60	
	Science graduate	1.4	1	
	Occ Med/Health screener	2.7	2	
	Clerical	2.7	2	
	Other	4.1	3	
	Don't know	0	0	
26. How many spirometry tests, approximately, does he/she perform per month for the coal mine workers' health scheme?	Fewer than 1 per month	4.1	3	74
	Between 1 and 5 per month	37.8	28	
	Between 6 and 20 per month	35.1	26	
	More than 20 per month	23.0	17	
27. How many spirometry tests, approximately, does he/she perform per week, excluding tests performed for the coal mine workers' health scheme?	Fewer than 1 per week	6.8	5	73
	Between 1 and 5 per week	37.0	27	
	Between 6 and 20 per week	30.1	22	
	More than 20 per week	26.0	19	

Question	Response	%	N	Total
28. How many years of experience at performing spirometry does he/she have?	Fewer than 1 year	0	0	74
	Between 1 and 5 years	33.8	25	
	Between 6 and 10 years	25.7	19	
	More than 10 years	40.5	30	
29. Has this person attended a spirometry training course?	Yes	62.2	46	74
	No	28.4	21	
	Don't know	9.5	7	
30. If yes to question 29, which year did he/she attend the spirometry training course?	Pre 2013	15.4	8	52
	2013	7.7	4	
	2014	11.5	6	
	2015	23.1	12	
	2016	3.8	2	
	Other	7.7	4	
	Don't know	30.8	16	
31. If yes to question 29, what was the name of the organisation that delivered the training?	National Asthma Council	35.4	17	48
	Thoracic Society Australia and New Zealand (TSANZ)	2.1	1	
	Don't know	22.9	11	
	Other (all fewer than 5 responses)	39.6	19	

Appendix 8: Spirometry review protocol

The quality and accuracy of a sample of approximately 300 spirograms and their corresponding Nominated Medical Adviser (NMA) reports were examined as part of the review. The sample of spirograms were selected to be representative of the various Queensland mines, and were restricted, where possible, to coal miners at a higher risk of developing changes in lung function, i.e. individuals with at least 10 years of underground work.

Dr Ryan Hoy and Professor Bruce Thompson are experienced in interpreting lung function data, and undertook the review.

The quality of spirometry was assessed according to the guidelines set out in the National Asthma Council handbook, *Spirometry – The measurement and interpretation of ventilatory function in clinical practice* and the 2005 American Thoracic Society/European Respiratory Society (ATS/ERS) Standardisation of Spirometry. In particular, there was specific evaluation of the presence of artefact (such as cough, leak and early termination), adequate start and satisfactory exhalation. Spirograms were deemed to be poor quality if one or more of the previously noted criteria are not acceptable. As well as the above criteria, the ATS/ERS Standards also requires three acceptable spirograms to be recorded and saved, and repeatability between tests to be present, that is, two largest values of forced vital capacity (FVC) must be within 0.150 L of each other and two largest values of forced expiratory volume in 1 second (FEV_1) must be within 0.150 L of each other. Spirograms were also evaluated for the presence of adequate documentation, repeatability of results and quality of spirometry.

The accuracy of spirometry results were interpreted in accordance with the 2005 ATS/ERS interpretive strategies. The lower limit of normal (LLN) is taken to be equal to the 5th percentile of a healthy, non-smoking population. Pattern and severity of abnormal results (or lung function impairment) were assessed according to the following ATS/ERS classification:

Obstruction
- $FEV_1/VC < 5$th percentile of predicted

Restriction
- Reduced VC does not prove a restrictive pulmonary defect, but may be suggestive of lung restriction when FEV_1/VC is normal or increased

Mixed defect
- FEV_1/VC and TLC < 5th percentile of predicted

Severity of Impairment

$FEV_1 \geq$ LLN (Normal)
70% reference $\leq FEV_1 <$ LLN (Mild)
60% reference $\leq FEV_1 <$ 70% reference (Moderate)
50% reference $\leq FEV_1 <$ 60% reference (Moderately Severe)
35% reference $\leq FEV_1 <$ 50% reference (Severe)
$FEV_1 <$ 35% reference (Very Severe)

Spirometry review procedure

1. The two reviewers independently examined the spirometry data according to the outlined criteria for acceptability and repeatability.
2. The following fields were extracted by a research assistant from the health assessment forms, and entered into an EXCEL spreadsheet (to facilitate data collation and analysis):
    - Study ID
    - Name of Mine
    - FEV_1 – observed, predicted, and observed/predicted %
    - FVC – observed, predicted, and observed/predicted %
    - FEV_1/FVC% – observed and predicted
    - Spirometry result – abnormal or normal
    - NMA/EMO comments
3. The following fields were assessed and extracted from the spirograms by the reviewers, where possible, and entered into an EXCEL spreadsheet:
    - Study ID
    - Reference values used
    - Data readable – Y/N (e.g. based on quality of photocopy)
    - ATS/ERS standards met – Y/N
    - Artefact free – Y/N
    - Good start – Y/N
    - Satisfactory exhalation – Y/N
    - 3 spirograms provided – Y/N
    - 2 largest FVC within 0.15l – Y/N
    - 2 largest FEV_1 within 0.15l – Y/N
    - Largest FVC, FVC % predicted
    - Largest FEV_1, FEV_1 % predicted
    - FEV_1/FVC, FEV_1/FVC % predicted
    - Interpretation – normal/abnormal
    - Obstructive – Y/N
    - Restrictive – Y/N
    - Severity
    - Other comments
4. The interpretation of the two reviewers was compared to determine whether there was agreement in evaluation of spirometry quality and the results.
    a) If there was agreement, the result was considered final and reported
    b) When agreement was lacking, reviewers met and discussed the results to reach agreement by consensus.
5. The final results were compared with the existing NMA reports (i.e. NMA/EMO results entered in Q3.9 and Q3.10 for agreement)
    a) Overall findings were reported, focusing on agreement between the existing reports and reviewers' interpretations.

   b) Where there was disagreement, any common features e.g. one particular mine will also be reported and/or investigated

6. Where a major discrepancy was found, the coal mine worker will be notified via DNRM and the appropriate medical practitioner(s) about results of the re-evaluation of their spirometry according to procedures within the Coal Mine Workers' Health Scheme.

Appendix 9: Detailed measures to improve quality of spirometry

1. Adoption of the 2013 American Thoracic Society (ATS) Technical Standards: Spirometry in the Occupational Setting, with development of consensus regarding each of the components (see ATS List below) specific to the task of underground coal mining in Queensland.
2. Spirometry must be performed at Thoracic Society of Australia and New Zealand (TSANZ) accredited respiratory laboratory. Currently, there are 10 TSANZ accredited respiratory laboratories in Queensland. A list of accredited laboratories and accreditation processes is available at:
   https://www.thoracic.org.au/respiratorylaboratoryaccreditation/australia
3. Spirometry testing facilities and staff require registration with the Coal Mine Health Surveillance Program. The testing facility and staff will be designated registration numbers, which need to be recorded on test results when performed and submitted to the Surveillance Program. Approval requires provision of documentation for review including:
   a. Documentation of current accreditation of the laboratory by TSANZ.
   b. Staff training certification: Each person administering spirometry must provide documentation of successful completion of an approved spirometry training program and refresher courses on a periodic basis as determined by TSANZ accreditation. The most recent TSANZ position paper regarding training courses recommends the duration of a spirometry training course is at least 10 hours, particularly if participants are spirometry naïve. A refresher course should be attended within the first 12 months of completion of the initial course, and thereafter every three years
4. Test performance and interpretation factors:
   a. Spirometry must be performed and recorded in accordance with current ATS/ERS Standardisation of Spirometry. Each session must have the goal of obtaining at least 3 acceptable spirograms with 2 repeatable forced expiratory manoeuvres.
   b. Spirometry tests should be interpreted by a physician or respiratory scientist with expertise in spirometry.
   c. Interpretation must follow the current ATS/ERS Interpretative strategies for lung function tests and use the fifth percentile lower limit of normal (LLN) to differentiate normality from abnormality, rather than a fixed value, such as 80% of predicted. In the workplace setting it has been noted that use of fixed values to detect abnormality will result in false negative results for younger workers and false-positive results in older workers.
   d. Data should be recorded and stored to allow interpretation of longitudinal changes to permit detection of greater than expected rate of decline.
   e. Detection of abnormal test results or greater than expected rates of decline must result in further evaluation of the worker. For example, if reduced a vital capacity is noted on spirometry the worker should be referred for more complex respiratory function tests including plethysmographic lung volumes and gas transfer.
5. Equipment factors:

    a. Spirometry system must be in a quality control program consistent with current ATS/ERS Standardisation of Spirometry and TSANZ accreditation manual.
    b. Use spirometers that can save and export all data and all flow–volume and volume–time curves and can display them on real-time graphical displays large enough for inspection of quality by scientists as tests are performed.
    c. Whenever possible, use the same type of spirometer for serial testing, and document the spirometer used.
    d. The spirometry software must automatically perform quality assurance checks on expiratory manoeuvers during the testing session.

6. Scientist/operator training:
    a. Provide scientists with initial training and periodic refresher courses by an approved spirometry training program, which should include hands-on practical experience.
    b. Use spirometers that can assess quality of tests and provide automated real-time feedback to technicians.
    c. Conduct ongoing review of the quality of spirometry tests that are performed and provide technicians timely, ongoing feedback about the quality of their tests and how to correct problems that are identified. This is also a requirement of TSANZ respiratory laboratory accreditation.

7. Spirometry results and other data to be specified must be submitted to the Coal Mine Health Surveillance Program with 14 days of completing the test. The Coal Mine Health Surveillance Program will undertake review of provided data by a respiratory physician for assessment of quality, validation of results and longitudinal change for individual workers. A database will be maintained of all spirometry results. Centralised review of all results will allow provision of recommendation for potential intervention for specific workers, testing sites and/or mine sites.

<u>Components of a workplace spirometry program from the 2013 Official American Thoracic Society (ATS) Technical Standards: Spirometry in the Occupational Setting</u>

1. Define purpose of the spirometry testing, such as:
    a. Medical surveillance (to detect effects of inhalational exposures/occupational lung diseases)
    b. Appropriate job placement (after hire, before job placement)
    c. Component of medical evaluation for respirator usage
    d. Component of an impairment or disability evaluation
2. Define parameters for the spirometry program, including:
    a. Inhalational exposures and lung diseases of concern
    b. Regulatory and workplace-mandated requirements
    c. Frequency of testing
    d. Workers to be tested (based on potential hazards or other concerns)
3. Clarify responsibility for evaluation of:
    a. The individual worker
    b. Aggregate analysis of the spirometry and other data collected on the group of workers
4. Clarify lines of communication of relevant information between the patient, employer, and medical provider.
5. Ensure that spirometers and technician training meet or exceed ATS recommendations.
6. Establish and maintain an effective quality assurance program.

7. Define appropriate spirometry reference values and interpretative strategies.
8. Establish triggers for further evaluation and initial action plan.

Standards incorporated in recommendations:

Pellegrino R, et al. ATS/ERS Task Force: Standardisation Of Lung Function Testing. Interpretative strategies for lung function tests. Eur Respir J 2005; 26: 948–968

Miller M.R, et al. ATS/ERS Task Force: Standardisation Of Lung Function Testing. Standardisation of spirometry. Eur Respir J 2005; 26: 319–338

Redlich C, et al. Official American Thoracic Society Technical Standards: Spirometry in the Occupational Setting. Am J Respir Crit Care Med 2014; 189 : 984–994

The National Institute for Occupational Safety and Health (NIOSH) Coal Mine Health Surveillance Program (CWHSP) Accessed 5/6/16.

http://www.cdc.gov/niosh/topics/surveillance/ords/coalminerhealth.html

Thoracic Society of Australia and New Zealand – Respiratory Function Laboratory Accreditation: Accessed 9/6/16

https://www.thoracic.org.au/respiratorylaboratoryaccreditation/respiratory-function-laboratory-accreditation

Appendix 10: Coal Miners Dust Lung Disease – Fact sheet for GPs

Coal Mine Dust Lung Disease – Fact sheet for GPs

Since May 2015, there have been six confirmed cases of coal workers' pneumoconiosis (CWP), one form of coal mine dust lung disease (CMDLD), reported among former and current Queensland coal mine workers, and the outcome of at least one suspected case is still pending. The Queensland Department of Natural Resources and Mines (DNRM) has commissioned an independent review of the respiratory component of the coal mine workers' health scheme, including an interim strategy to detect and manage further CMDLD cases. This fact sheet contains information for General Practitioners about CMDLD, to assist in the assessment and management of such cases. Due to the high media interest in this issue, many coal miners in Queensland are likely to be worried about their respiratory health and seek advice from their GP.

Summary

- Coal miners occupationally-exposed to respirable coal mine dust over several years are at risk of developing coal mine dust lung disease, which includes CWP, emphysema, chronic bronchitis, and lung function impairment.
- CMDLD should also be considered in former coal miners, such as retirees and ex-industry employees, who present with significant respiratory symptoms. These diseases develop gradually, usually after at least 10 years of exposure, however in sensitive miners or in cases of intense exposure symptoms may occur sooner.
- Typical symptoms of CMDLD include cough, sputum production, and shortness of breath, however individuals with early disease may be asymptomatic but may have detectable chest x-ray or spirometry findings.
- Early detection of CMDLD is based on chest imaging and lung function testing, usually with plain chest radiography and spirometry, along with careful evaluation of respiratory symptoms.
- Individuals who are or have been coal mine workers and are suspected of having CWP should be referred to a Respiratory and/or Occupational physician for further assessment. Links to lists of such physicians can be found at https://www.business.qld.gov.au/industry/mining/safety-health/mining-safety-health/medicals/coal-board-medical/pneumoconiosis-screening

About Coal Mine Dust Lung Disease

Coal mine dust lung disease is the broad term for diseases caused by coal mine dust exposure, and comprises a group of occupational lung diseases that result from the cumulative inhalation of respirable coal mine dust over several years. Coal miners are at risk of developing these diseases, which include pneumoconioses (coal workers' pneumoconiosis, silicosis, and mixed dust pneumoconiosis). Pneumoconiosis is a disease of the lung parenchyma caused by deposition of dust particles, and the reaction of lung tissue to the dust.

Emphysema, chronic bronchitis, lung function impairment, and diffuse dust-related fibrosis are other manifestations of the disease.

Coal workers' pneumoconiosis, the form of disease identified by chest imaging, can be further classified by severity: simple CWP which may be category 1, 2, or 3 reflecting increasing profusion of scars seen on chest imaging. The more severe stage of the disease known as complicated CWP or progressive massive fibrosis (PMF) is diagnosed when a scar is greater than one cm in diameter. The likelihood of CWP development is directly related to the intensity and duration of exposure to coal mine dust. The disease typically occurs after at least 10 years of exposure, and the risk of disease persists after exposure has ceased.

Under the current Queensland Coal Mine Workers' Health Scheme, all coal mine workers are required to undergo a medical assessment prior to the start of their employment at a coal mine, and then at least once every five years during their employment. Employees identified as at risk from dust exposure, in particular underground coal miners are also required to undertake chest x-rays as part of their health assessments. Given the long latency between exposure and disease occurrence, the population at risk extends to previous employees including retired coal miners and coal miners who have transferred to other industries.
Coal workers' pneumoconiosis was thought to have been eradicated from Australia, with no new cases having been reported for many years. In light of the recent CWP cases increased vigilance is required among treating doctors, in particular GPs, to identify individuals with early stages of CWP.

Symptoms
Individuals with early-stage coal workers' pneumoconiosis are often asymptomatic, however typical symptoms of CWP (and other CMDLD) include cough, sputum production, wheezing, and shortness of breath. Progressive massive fibrosis is a debilitating and life-threatening condition, and individuals may present with more severe symptoms. Emphysema, chronic bronchitis and lung function impairment are well described adverse health outcomes of coal mine dust exposure and have the same presentation seen when caused by tobacco smoke exposure. The toxicity of tobacco smoke and coal mine dust are roughly equal in potency, and result in an additive effect.

Investigations
Detection of coal mine dust lung disease requires identification of relevant occupational exposure history and evaluation of respiratory symptoms, as well as chest imaging and lung function testing, which usually includes plain chest radiograph and spirometry. Chest imaging is interpreted using International Labour Office (ILO) criteria. Coal workers' pneumoconiosis is a more complex disease to diagnose, and suspected cases should be referred to specialist Respiratory or Occupational physicians for assessment and management. All confirmed cases of CWP should be reported to the Queensland Department of Natural Resources and Mines by treating specialists.

There is currently no effective treatment for coal workers' pneumoconiosis, and emphasis is therefore on early detection of asymptomatic or early-stage disease, and advice to avoid further exposure to coal mine dust and other respiratory hazards including smoking cessation.

Further information

The Queensland Department of Natural Resources and Mines has compiled a list of Respiratory physicians who can be contacted for further assessment of potential cases of CWP. A list of radiology clinics reporting chest x-rays to the ILO classification has also been compiled. These lists can be accessed on the Department's webpage, and will be regularly updated. See https://www.business.qld.gov.au/industry/mining/safety-health/mining-safety-health/medicals/coal-board-medical/pneumoconiosis-screening

Reference

Petsonk EL, Rose C, Cohen R. Coal Mine Dust Lung Disease – New Lessons from an Old Exposure. *Am J Respir Crit Care Med* 2013;187(11):1178-85.

COAL WORKERS' PNEUMOCONIOSIS SELECT COMMITTEE

ADDITIONAL REQUEST No.7

on 14 October 2016

Is it possible that there is a significant number of confirmed cases that are basically tucked away in the archives somewhere, that no-one has been really notified about?
We will be able, either now or in a subsequent session, to explain what we have been doing to assess whether that risk exists….
Part of our preparatory work for the independent Monash review required us to review our database and understand our records more deeply, in order to prepare for that independent review. As the DG said, **we would be very happy to come back with that level of detail** at a subsequent briefing.
How far back did you go? To what year?
I believe the review extended at least beyond a decade and possibly two decades from memory, but I will confirm that.[1]

REQUEST: Please provide the level of detail requested for the above as well as confirmation of how far back the review extended.

ANSWER:

The Monash review was concerned with the existing Coal Mine Workers' Health Scheme (the Scheme) which has been in place since 2001.

Item A of the Scope of the review of the respiratory component of the Scheme describes:

> *The adequacy of the scope, processes, quality and reporting of the respiratory component of the existing medical assessment program, including information provided by the employer on risk of dust exposure, medical history, physical examination, chest radiography and spirometry, in detecting the early stages of coal mine dust lung disease.*

(underlining added)

The full scope of the review is set out at appendix 2 to the Monash report (Attachment A).

[1] Public briefing transcript, Brisbane, 14 October 2016, pp 7

COAL WORKERS' PNEUMOCONIOSIS SELECT COMMITTEE

ADDITIONAL REQUEST No.8

on 14 October 2016

Hearing context: …. I am personally aware of issues that have been raised in relation to Mines Inspectorate resources for many, many years.

REQUEST: Can you please go back and have a look at the records of the department and advise the committee whether there have been any issues raised in relation to the resourcing of the Mines Inspectorate and produce it to the committee?[1]

ANSWER: The department is aware that from time to time questions about the resourcing of the Inspectorate have been raised and they are reflected on the public record.

If the committee request is referring to specific correspondence, the department seeks further details to enable it to undertake a targeted records search.

[1] Public briefing transcript, Brisbane, 14 October 2016, pp 9

COAL WORKERS' PNEUMOCONIOSIS SELECT COMMITTEE

ADDITIONAL REQUEST No.10

on 14 October 2016

QUESTION: In relation to the form that you referred to, is that a departmental form or does each company develop its own? Could we have a copy of that supplied to the committee please?[1]

ANSWER:

See response to additional request No. 5.

[1] Public briefing transcript, Brisbane, 14 October 2016, pp 20

Guidance Note
QGN07

Guidance to Coal Mines in reporting Serious Accidents and High Potential Incidents to an Inspector of Mines or an Industry Safety and Health Representative

Coal Mining Safety and Health Act 1999

January 2016, Version 6

Queensland Government

This publication has been compiled by Kevin Poynter of the Mines Inspectorate, Department of Natural Resources and Mines.

Guidance Note – QGN07

Guidance to Coal Mines in Reporting Serious Accidents and High Potential Incidents to an Inspector of Mines or an Industry Safety and Health Representative

This Guidance Note has been issued by the Mines Inspectorate from the Department of Natural Resources and Mines to provide guidance to coal mines in reporting serious accidents and high potential incidents to an Inspector of Mines or an Industry Safety and Health Representative.

This Guidance Note is not a Guideline as defined in the *Mining and Quarrying Safety and Health Act 1999* (MQSH Act) or a Recognised Standard as defined in the *Coal Mining Safety and Health Act 1999* (CMSH Act).

Guidance Notes may be updated from time to time. To ensure you have the latest version, either check the Department of Natural Resources and Mines website or contact your local Inspector of Mines.

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Glossary of terms

Table 1 – Glossary of terms

Term	Definition
SSE	• Site Senior Executive
The Act	• *Coal Mining Safety and Health Act 1999*
CMSHA	• *Coal Mining Safety and Health Act 1999*
The Regulation	• Coal Mining Safety and Health Regulation 1999
CMSHR	• Coal Mining Safety and Health Regulation 1999
ISHR	• Industry Safety and Health Representative
IOM	• Inspector of Mines
SSHR	• Site Safety and Health Representative
SHMS	• Safety Health Management System
HPI	• High Potential Incident

1 Purpose

The purpose of this Guidance Note QGN 07 is to provide practical guidance to Operators, Site Senior Executives, managers and coal mine workers about requirements for reporting serious accidents and high potential incidents to an Inspector of Mines and an Industry Safety and Health Representative.

2 Scope

This Guidance Note applies to reporting of accidents incidents and diseases as required under Sections 198, 200 and 201 of the *Coal Mining Safety and Health Act 1999* (The Act) and Sections 14 and 16 of the Coal Mines Safety and Health Regulations 2001 (The Regulations).

The Guidance Note contains a table and notes designed to clarify what has to be reported to an IOM and an ISHR and required timeframes.

3 Application

3.1 General

The Coal Mining legislation requires a SSE to report all serious accidents and high potential incidents to an IOM and an ISHR. There are also requirements about:-

- Commencing an investigation
- Not interfering with the site without permission of an IOM
- Reporting to a Site Health and Safety Representative.

3.2 Context

Accidents are costly, both in human and commercial terms, and it is important that data is collected and not lost. However, contemporary safety management practice recognises that measuring 'lost time injuries' alone is reactive, and not the best indication of safety and health performance.

Incidents where things have gone wrong and injuries could have occurred but didn't, must also be identified, recorded and acted on. Identification and investigation of these incidents ensures that management is aware of the conditions that contributed to the event and can implement strategies for managing the risks to prevent the re-occurrence of the incident. Supplying this data benefits the industry as a whole, and it indicates a mature and effective accident and incident reporting system at the coal mine.

3.3 Legal requirements

It is essential that SSEs are fully aware of their obligations relating to accident and incident reporting

Legislation

The *Coal Mining Safety and Health Act 1999*, (the Act) requires that incidents and accidents be reported under the following Sections:

- **Section 198 Notice of accidents, incidents or diseases**, imposes obligations on the site senior executive to notify an inspector and an industry safety and health representative in the event of accidents, incidents or diseases.
- **Section 198(3) Notice of accidents, incidents or diseases** imposes obligations on the site senior executive to notify an inspector and an industry safety and health representative, for incidents of a type described in 198(2), to provide the Primary Information as detailed in 198(3)(A)
- **Section 200 Site not to be interfered with without permission**, requires that the site of a serious accident or high potential incident of a type prescribed by regulation, is not interfered with without the permission of an inspector.
- **Section 201 Action to be taken in relation to investigation of accident or incident**, requires that in the SSE must investigate a serious accident or a high potential incident at a mine of a type prescribed by regulation and that he must forward the report to an inspector within 1 month.

Further guidance is provided by the Coal Mining Safety and Health Regulation 2001(the Regulations)

- **Regulation 13 Prescribed types of high potential incidents** defines that a prescribed high potential incident mentioned in 198(2)(b) of the Act can be found in Schedule 1 of the regulation
- **Regulation 14 Prescribed types of serious accidents and high potential incidents —**Defines that a type of serious accident or high potential accident referred to in Sections 200 and 201 of the Act can be found in schedule 2, part 1 and part 2 of the regulation
- **Regulation 16 (1) Giving notice of incidents,** requires that the SSE must give an inspector notice, in the approved form, about a following incident at the mine within 1 month after it happens

Coal Mines Safety and Health Act 1999

Section 16 Serious Accident

A ***serious accident*** at a coal mine is an accident at a coal mine that causes—

(a) the death of a person; or
(b) person to be admitted to a hospital as an in-patient for treatment for the injury.

Section 17 High Potential Incident

A ***high potential incident*** at a coal mine is an event, or a series of events, that causes or has the potential to cause a significant adverse effect on the safety or health of a person.

4 Guidance

4.1 Guide to reporting requirements

The SSE must, as soon as practicable after becoming aware of a Serious Accident, HPI or death at a coal mine, notify an IOM and an ISHR about the accident, incident or death either orally or by notice.

If the SSE makes the notification orally, the SSE must follow up with written confirmation within 48 hours unless it is a death at a coal mine then he must confirm the oral report by notice within 24 hours.

Section 198(1) of the Act refers to any HPI as defined by The Act Section 17 or serious accident as defined by The Act Section 16 that occurs even if it is not listed in Schedule 1 of the regulation.

Appraisal of an Incident by SSE

The Act Section 198 (1) requires the SSE to notify an Inspector and an ISHR. Prior to this the SSE will make an appraisal of the incident to be reported. Very often the full extent of the incident is unknown, thus considerations need to be made into factors such as:-

- Seriousness of the injury (actual consequence)?
- Is it likely to be less or worse than initial reports suggest?
- Was it only good fortune that the incident was not more serious (potential consequence)?

If in doubt, call an IOM

As an SSE may not always contactable, persons in control of the mine must be competent in appraisal of an incident to assist the SSE. For example, Duty Managers on weekend.

What is meant by As Soon as Practicable?

The words 'As soon as' is an indication that there should be no delay in reporting.

The word 'practicable' suggests a level of consideration.

If an incident had the potential to be serious or the injury is significant or had the potential to be significant, the 'as soon as' becomes the salient part of the SSE obligation, however if the incident had low potential and minor injury then a level of 'practicability' comes into the reporting decision making.

Primary Information

The Act Section 198 (3) of the Act requires the SSE to provide the "Primary Information" and to notify 'as soon as possible after becoming aware' for those incidents that are described in The Act Section 198 (2). These incidents have a high level of seriousness and therefore require a correspondingly higher level of reporting. When the SSE becomes 'aware' of the incident then 'as soon as possible' must notify an Inspector. The notification includes the 'primary information'.

The notification is not necessarily one communication. Notification can be done in a number of ways and a number of times as information become available.

For instance; a phone call for initial notification that includes as much of the information that is known, (primary information) will satisfy the 'as soon as' test, and then followed promptly by e-mail, facsimile or another phone call with the remainder of the information for the completeness test.

Employee being transferred to Hospital

If an SSE becomes aware that an employee is injured and being transferred to hospital, the SSE should not delay notification to an IOM on the grounds that there is uncertainty as to whether it is "serious accident" or not as defined by the Act Section 17.

It is likely that even if the employee is not admitted to hospital as an inpatient he/she has suffered a significant adverse effect and therefor it is an HPI and should be notified. If the SSE is uncertain then notify an inspector

SSE Additional Obligations

Sections 198(2) of the Act impose obligations on the site senior executive to undertake additional requirements for incidents that are prescribed under a regulation. The prescribed incidents referred to in 198(2) are listed in the Regulations in Schedule 1, and Schedule 2, Part 1 and Part 2. Regulation 14 refers to these Schedules and provides guidance on requirements of Section 200 and 201 of the Act

The Act 198(3) states the obligation of the site senior executive to provide the primary information as soon as possible for all events listed in Section 198(2) of the Act.

Guidance Table

Further guidance is provided in Table 2 and 3. This table provides both a colour code for actions as well as a Yes or No requirement for actions required by the legislation. The list refers details for reporting and actions required by the Act Sections 198(1), 198 (2) and 198(3)

- Table 2and 3 may be integrated into the sites SHMS particularly in relation to supporting the elements of Regulation 16.

Not every serious accident or high potential incident can be listed in this table. Accidents and incidents not listed in the Schedules 1 or Schedule 2, Part (1) and Part (2) of the regulation may still constitute a High Potential Incident by definition under Section 17 of the Act.

An example might be a coal mine worker being hit by a cricket ball sized rock projected out of a crusher. The incident may not have resulted in any injury but the potential for that rock to strike the coal mine worker in a way that could have caused a significant adverse effect on his or her safety and health would meet the criteria of HPI under the Section 17 of the Act and as such should be reported as required by Section 198(1) of the Act.

4.1.1 Incidents involving an Explosive

The SSE must notify both an Explosives Inspector and an IOM of misfires or incidents involving an explosive.

The definition of a misfire is taken from the *Explosives Act 1999*

Table 2 – HPIs and Serious Accidents (a guide which can supplement the legislation)

Yes	**Means Action Required**
No	**Means No Action Required**

HPIs and Serious Accidents prescribed under Section 200 and 201 of the CMSHA 1999	Site not to be interfered with without permission Section 200 CMSHA 1999	Notify as soon as practicable of becoming aware	Oral report confirmed by notice within 48hrs	Oral report for a death confirmed within 24 hrs	Primary information	SSE Report to inspector Section 201 CMSHA	Form 5A
an incident causing the death of a person	Yes	Yes	No	Yes	Yes	No	Yes
an incident causing a serious bodily injury to a person	Yes	Yes	Yes	No	Yes	No	Yes
a serious accident a person to be admitted to a hospital as an in-patient for treatment for the injury	No	Yes	Yes	No	No	No	Yes
an unplanned ignition of gas, dust or a combination of gas and dust	Yes	Yes	Yes	No	Yes	Yes	Yes
damage to, or failure of, haulage equipment used to transport a person in a shaft or slope, if the damage or failure causes a hazard	Yes	Yes	Yes	No	Yes	No	Yes
the failure in service of explosion protection of explosion-protected equipment	Yes	Yes	Yes	No	Yes	Yes	Yes
a failure of electrical equipment or an electrical installation causing an electric shock to a person	Yes	Yes	Yes	No	Yes	Yes	Yes
an unplanned ignition or explosion of a blasting agent or explosive	Yes	Yes	Yes	No	Yes	Yes	Yes
a major structural failure of equipment, if the failure causes a hazard	Yes	Yes	Yes	No	Yes	Yes	Yes
the spontaneous combustion of coal or other material in an underground mine	No	Yes	Yes	No	Yes	Yes	Yes
an Inrush	No	Yes	Yes	No	Yes	Yes	Yes
an electric Shock of a person	Yes	Yes	Yes	No	Yes	Yes	Yes
a major failure of strata	No	Yes	Yes	No	Yes	Yes	Yes
the entrapment of a person	No	Yes	Yes	No	Yes	Yes	Yes
a major structural failure of equipment	No	Yes	Yes	No	Yes	Yes	Yes
an abnormal circumstance declaration	No	Yes	Yes	No	Yes	Yes	Yes

Table 3 – Schedule 1 items (a guide which can supplement the legislation)

Yes	Means Action Required
No	Means No Action Required

Schedule 1 items not listed in Act 200 and 201 and HPI that meets the description in CMSHA 17	**Site not to be interfered with without permission**	**Notify as soon as practicable of becoming aware**	**Oral report confirmed by notice within 48hrs**	**Oral report for a death confirmed within 24 hrs**	**Primary information**	**SSE Report to inspector Section 201 CMSHA**	**Form 5A**
an unplanned event causing the withdrawal of a person from the mine or part of the mine	No	Yes	Yes	No	Yes	No	Yes
an unplanned event that causes only 1 escape way from the	No	Yes	Yes	No	Yes	No	Yes
an unplanned event that causes only 1 escape way from the mine to be available for use	No	Yes	Yes	No	Yes	No	Yes
a fire on a vehicle or plant	No	Yes	Yes	No	Yes	No	Yes
an incident involving an explosive	No	Yes	Yes	No	Yes	No	Yes
An Incident not listed in any schedule but meets the definition of an HPI under Section 17 of the CMSHA 1999	No	Yes	Yes	No	Yes	No	Yes
Any of the following incident that endangers the safety or health of a person							
(a) a fire;	No	Yes	Yes	No	Yes	No	Yes
(b) a ventilation failure causing a dangerous accumulation of methane or other gas	No	Yes	Yes	No	Yes	No	Yes
(c) an inrush;	No	Yes	Yes	No	Yes	Yes	Yes
(d) a coal or rock outburst;	No	Yes	Yes	No	Yes	No	Yes
(e) damage to, or failure of, haulage equipment used to transport a person in a shaft or slope	No	Yes	Yes	No	No,unless the failure causes a hazard	No	Yes
(f) an unplanned movement of, or failure to stop, a vehicle	No	Yes	Yes	No	Yes	No	Yes
(g) the failure in service of explosion protection of explosion-protected equipment	No	Yes	Yes	No	Yes	No	Yes
(h) a failure of electrical equipment or an electrical installation	No	Yes	Yes	No	Yes	Yes	Yes
an unplanned ignition or explosion of a blasting agent or explosive	Yes	Yes	Yes	No	Yes	Yes	Yes
(j) a failure of strata control;	No	Yes	Yes	No	Yes	No	Yes
(k) the exposure of a person to a hazardous substance;	No	Yes	Yes	No	Yes	No	Yes
(l) an unforeseen hazard requiring a review of the mine's safety and health management system	No	Yes	Yes	No	Yes	No	Yes
(m) the unplanned immersion of a person in liquid;	No	Yes	Yes	No	Yes	No	Yes
(n) an unplanned movement of earth or coal;	No	Yes	Yes	No	Yes	No	Yes
(o) a structural failure of equipment;	No	Yes	Yes	No	Yes, if the failure causes a hazard	No	Yes
(p) a collision involving a vehicle or plant	No	Yes	Yes	No	Yes	No	Yes

Sections 198, 200 and 201, the definitions and schedules are set out in full in **4.2 Legislation**, or in the *Coal Mining Safety and Health Act 1999* and the Coal Mining Safety and Health Regulation 2001 which can be found at http://www.legislation.qld.gov.au/Legislation Docs/CurrentC.htm

Flow Chart

The flow chart in Figure 1 describes the process for reporting requirements for Serious Accidents and HPIs under the *Coal Mining Safety and Health Act 1999*.

Step 1:

If the event or series of events is, or is likely to be, a high potential incident and or a serious accident (See definitions Sections 16 and 17 of the *Coal Mines Safety and Health Act 1999*),

- The Site Senior executive must notify it as soon as practicable after he becomes aware of it either orally or in writing. If an oral report is made it must be followed up in writing within 48 hours unless the oral report was for a death at a coal mine then it must be followed up in writing within 24 hours.

Step 2:

If the incident is a HPI or Serious Accident is a prescribed type of serious accident and high potential incident—Act, Sections 200 and 201 as prescribed under CMSHR Regulation 14,

- The SSE must meet the obligations of CMSHA Sections 200 or 201 for incidents and accidents listed in CMSHR Schedule 1 or Schedule 2, Part 1 or Part 2

  It is sometimes not possible to determine if an accident meets the definition of a serious accident until the injured person is admitted to hospital. However it is likely that when medical intervention is required that the incident is an HPI as a significant adverse effect has occurred and the SSE should report it as an HPI. The SSE can update the incident to a serious accident later a time.

Step 3:

If the Incident or accident is prescribed under CMSHR Regulation 14 and listed in CMSHR Schedule 2, Part 1 then CMSHA Section 200,

- The SSE must ensure that the site must not be interfered with until permission is granted by an Inspector to disturb the site.

Note under the Act s170 ,an IOM may issue a directive orally or by notice to Isolate the Site of an Incident to preserve evidence after a HPI or Serious Accident

Step 4:

If the Incident or accident is prescribed under CMSHR Regulation 14 and listed in CMSHR Schedule 2, Part 2 then CMSHA Section 201(c),

- The SSE is required to investigate and provide his investigation report to an Inspector within one month.

Step 5:

If an Inspector requests a copy of the SSE's investigation report under CMSHA Section 128(h) and Section 142,

- The SSE must forward the report to the inspector as requested in an agreed timeframe.

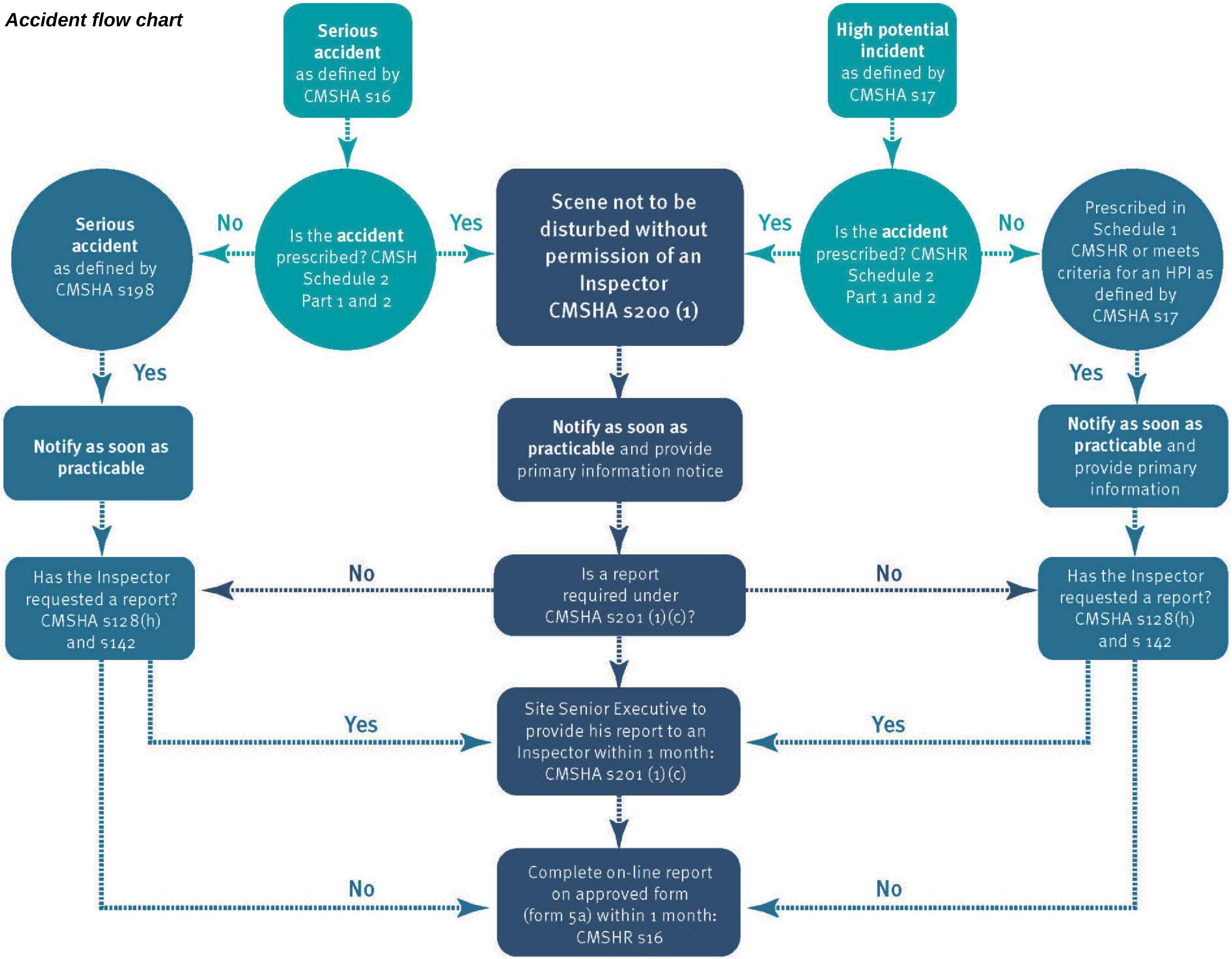
Step 6:

The on-line report form (form 5A) should be completed within one month for all notified incidents and accidents and any death at a coal mine.

Note: - Where an incident occurs that does not meet the legislative requirements for reporting but the SSE believes that the incident is significant and can provide valuable information for the Inspectorate and industry he can report it as a non-reportable incident (NRI).

HPI and Accident flow chart

Figure 1 – HPI and Accident flow chart



4.2 Legislation

Coal Mining Safety and Health Act 1999 **(Sections 198, 200, 201, 16, 17)**

198 Notice of accidents, incidents or diseases

(1) Subject to subsections (2) and (3), as soon as practicable after becoming aware of a serious accident, high potential incident or a death at a coal mine, the site senior executive for the coal mine must notify an inspector and an industry safety and health representative about the accident, incident or death either orally or by notice.

Maximum penalty - 40 penalty units.

(2) Subsection (3) applies to—

(a) a serious accident at a coal mine resulting in a person receiving—
(i) a bodily injury endangering, or likely to endanger, the person's life; or
(ii) an injury causing, or likely to cause, a permanent injury to the person's health; or
(b) a high potential incident at a coal mine of a type prescribed under a regulation; or
(c) a death at a coal mine, whether or not caused by an accident at the coal mine.

(3) The site senior executive must, as soon as possible after becoming aware of the accident, incident or death, by notice or orally notify an inspector and an industry safety and health representative about the accident, incident or death in terms that include the information (the primary information) stated in subsection (3A).

(3A) for subsection (3), the primary information is all of the following—

(a) the precise location where the accident, incident or death happened;

(b) when the accident, incident or death happened;

(c) number of persons involved in the accident, incident or death;

(d) if the notification is about a death, whether or not caused by an accident—the name of the person who died;

(e) if the notification is about a serious accident or high potential incident—

(i) the name of any person who saw the accident or incident, or who was present when the accident or incident happened; and

(ii) the name of any person who was injured as a result of the accident or incident;

(f) if no one was present when the person mentioned in paragraph (d) died or the person mentioned in paragraph (e)(ii) was injured—the name of the person who found the deceased or injured person;

(g) a brief description of how the accident, incident or death happened.

Examples of types of descriptions that may be given under paragraph (g)—

• 'A light vehicle fell into the pit after the light vehicle collided with a truck on a ramp leading into the pit.'

• 'A worker fell from the top of a storage bin into the wash plant.'

(3B) If the site senior executive does not know the primary information at the time the notification is made under subsection (3), the site senior executive must—
(a) take all reasonable steps to find out the primary information as soon as possible; and

(b) as soon as possible after the primary information becomes known to the site senior executive, give the primary information to the inspector and representative.

Maximum penalty - 40 penalty units.

(3C) It is not a defence in a proceeding under subsection (3) or (3B) that the giving of the primary information might tend to incriminate the site senior executive.

(3D) The primary information is not admissible in evidence against the site senior executive in any criminal proceeding.

(3E) Subsection (3D) does not prevent the primary information being admitted in evidence in criminal proceedings about the falsity or misleading nature of the primary information.

(4) If the site senior executive makes an oral report under subsection (1) or (3), the executive must confirm the report by notice within 48 hours.

Maximum penalty - 40 penalty units.

(5) However, if the oral report relates to a death, the site senior executive must confirm the oral report by notice within 24 hours.

Maximum penalty - 80 penalty units.

(6) As soon as practicable after receiving a report of a disease prescribed under a regulation as a disease that must be reported under this Section, the site senior executive must give an inspector and an industry safety and health representative notice about the disease.

Maximum penalty - 40 penalty units.

200 Site not to be interfered with without permission

(1) A person must not interfere with a place at a coal mine that is the site of a serious accident or high potential incident of a type prescribed by regulation, without the permission of an inspector.

Maximum penalty - 200 penalty units.

(2) Permission under subsection (1) must not be unreasonably withheld.

(3) For this division, action taken to save life or prevent further injury at a place is not interference with the place.

201 Action to be taken in relation to site of accident or incident

(1) If there is a serious accident or high potential incident, the site senior executive must—

(a) carry out an investigation to decide the causes of the accident or incident; and

(b) prepare a report about the accident or incident that includes recommendations to prevent the accident or incident happening again; and

(c) if the accident or incident is a type prescribed by regulation—forward the report to an inspector within 1 month after the accident or incident.

Maximum penalty - 100 penalty units.

(2) The site senior executive must ensure that the place of the accident or incident is not interfered with until—

(a) all relevant details about the accident or incident have been recorded and, if possible, photographed; and

(b) sufficient measurements have been taken to allow the development of an accurate plan of the site; and

(c) a list of witnesses to the accident or incident has been compiled.

Maximum penalty - 100 penalty units.

The terms ‘serious accident’ and ‘high potential incident’ are defined in the *Coal Mining Safety and Health Act 1999*, in Sections 16 and 17 below:

17 Meaning of *serious accident*

A ***serious accident*** at a coal mine is an accident at a coal mine that causes—

(a) the death of a person; or
(b) a person to be admitted to a hospital as an in-patient for treatment for the injury.

18 Meaning of high potential incident

A ***high potential incident*** at a coal mine is an event, or a series of events, that causes or has the potential to cause a significant adverse effect on the safety or health of a person.

The Coal Mining Safety and Health Regulation 2001 (Sections 13, 14, 16, Schedule 1, Schedule 2)

13 Prescribed types of high potential incidents—Act, s 198

A type of high potential incident mentioned in schedule 1 is prescribed for Section 198(2)(b) of the Act.

14 Prescribed types of serious accidents and high potential incidents—Act, ss 200 and 201

(1) A type of serious accident or high potential incident mentioned in schedule 2, part 1, is prescribed for Section 200(1) of the Act.

(2) A type of serious accident or high potential incident mentioned in schedule 2, part 2, is prescribed for Section 201(1)(c) of the Act.

16 Giving notice of incidents

(1) The site senior executive must give an inspector notice, in the approved form, about a following incident at the mine within 1 month after it happens—

(a) a person suffers an injury—

(i) of a severity that requires treatment by a doctor, or a nurse, or a person qualified to give first aid; or

(ii) preventing the person from carrying out the person’s normal duties at the mine;

(b) a high potential incident not mentioned in paragraph (a).

(2) A mine’s safety and health management system must include procedures for—

(a) telling a site safety and health representative about the things mentioned in Section 106 of the Act; and
(b) giving notice to an inspector and industry safety and health representative under Section 198 of the Act.

(3) In this Section—

nurse means a person registered under the Health Practitioner Regulation National Law to practise in the nursing and midwifery profession as a nurse, other than as a student.

Schedule 1: Types of high potential incidents for Section 198 of the Act

Section 13

1 an unplanned ignition of gas, dust, or a combination of gas and dust

2 the spontaneous combustion of coal or other material in an underground mine

3 the entrapment of a person

4 an electric shock to a person

5 an unplanned event causing the withdrawal of a person from the mine or part of the mine

6 an abnormal circumstances declaration

7 an unplanned event that causes only 1 escapeway from the mine to be available for use

8 a fire on a vehicle or plant

9 an incident involving an explosive

10 a following incident that endangers the safety or health of a person—

(a) a fire;

(b) a ventilation failure causing a dangerous accumulation of methane or other gas;

(c) an inrush;

(d) a coal or rock outburst;

(e) damage to, or failure of, haulage equipment used to transport a person in a shaft or slope;

(f) an unplanned movement of, or failure to stop, a vehicle or plant;

(g) the failure in service of explosion protection of explosion-protected equipment;

(h) a failure of electrical equipment or an electrical installation;

(i) an unplanned ignition or explosion of a blasting agent or explosive;

(j) a failure of strata control;

(k) the exposure of a person to a hazardous substance;

(l) an unforeseen hazard requiring a review of the mine's safety and health management system;

(m) the unplanned immersion of a person in liquid;

(n) an unplanned movement of earth or coal;

(o) a structural failure of equipment;

(p) a collision involving a vehicle or plant

Schedule 2: Types of serious accidents and high potential incidents for Sections 200(1) and 201(1) of the Act

Section 14

Part 1 Types for Section 200(1)

1. an incident causing the death of, or a serious bodily injury to, a person
2. an unplanned ignition of gas, dust, or a combination of gas and dust
3. damage to, or failure of, haulage equipment used to transport a person in a shaft or slope, if the damage or failure causes a hazard
4. the failure in service of explosion protection of explosion protected equipment
5. a failure of electrical equipment or an electrical installation causing an electric shock to a person
6. an unplanned ignition or explosion of a blasting agent or explosive
7. a major structural failure of equipment, if the failure causes a hazard

Part 2 Types for Section 201(1)

1. an unplanned ignition of gas, dust, or a combination of gas and dust
2. the spontaneous combustion of coal or other material in an underground mine
3. an inrush
4. the failure in service of explosion protection of explosion protected equipment
5. an electric shock to a person
6. an unplanned ignition or explosion of a blasting agent or explosive
7. a major failure of strata control
8. the entrapment of a person
9. an abnormal circumstances declaration
10. a major structural failure of equipment

5 References

Coal Mining Safety and Health Act 1999

Coal Mining Safety and Health Regulation 2001

Guidance Note QGN09

Reviewing the Effectiveness of Safety and Health Management Systems

Coal Mining Safety and Health Act 1999
Mining and Quarrying Safety and Health Act 1999

October 2008, Version 2

Queensland the Smart State

Queensland Government
Department of Mines and Energy

GUIDANCE NOTE – QGN9

Reviewing the Effectiveness of Safety and Health Management Systems

This Guidance Note has been issued by Safety and Health, of the Department of Mines and Energy, to provide assistance to operators in meeting their obligations to review the effectiveness and implementation of safety and health management systems at Queensland mines and quarries.

This Guidance Note is not a Guideline as defined in the *Mining and Quarrying Safety and Health Act 1999*. In some circumstances, compliance with this Guidance Note may not be sufficient to ensure compliance with the requirements in the legislation.

Guidance Notes may be updated from time to time. To ensure you have the latest version, either check the Department of Mines and Energy website or contact your local inspector of mines.

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CONTENTS

1 Foreword

The Queensland *Coal Mining Safety and Health Act 1999* and the *Mining and Quarrying Safety and Health Act 1999* protect the safety and health of mine workers and those who are affected as a result of mining operations.

These statutes require that risks to safety and health from mining operations be identified and controlled to within acceptable limits and be as low as reasonably achievable (referred to as an acceptable level of risk)[1]. One of the primary ways this is achieved is that each mine develops a safety and health management system that identifies hazards, examines attendant risk and ensures that these risks are controlled within acceptable limits. Under the legislation the site senior executive and the mine operator are given separate but complementary obligations to ensure that this is achieved[2].

The site senior executive has the obligation to develop and implement the mines safety and health management system and to ensure the risk to persons from mining operations is at an acceptable level. The mine operator has the obligation to audit and review the system to ensure it is effectively controlling risks to within acceptable levels.

It is important for the operator to be aware that obligations cannot be transferred from the operator to the site senior executive in the discharge of this obligation. Attention is drawn to the provisions of the legislation that prevents a person with obligations from transferring the obligations to another person[3]. The question has arisen on how to assess the effectiveness of a safety and health management system and this Guidance Note addresses this question.

The basis of the approach taken in the Guidance Note is to consider a safety and health management system as a dynamic system consisting of various subsystems each carrying out a vital function. Accepting this model if each subsystem is found to be working effectively then the overall system can be considered effective. This approach parallels the approach taken in diagnosing the condition of systems in science and engineering.

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[1] **Acceptable level of risk**
Coal Mining Safety and Health Act 1999: section 30: "How an acceptable level of risk is to be achieved"; *Mining and Quarrying Safety and Health Act 1999*: section 27: "Risk management"

[2] **Obligations**
Coal Mining Safety and Health Act 199: section 41 "Obligations of coal mine operator", subparagraph (1)(e) and (f), section 42 "Obligations of site senior executive", subparagraphs (a) and (c); *Mining and Quarrying Safety and Health Act 1999*: section 38 "Obligations of the operators", subparagraphs (1)(d) and (e)*; section 39 "Obligation of site senior executive", subparagraphs (a) and (c)*

[3] **Transfer of obligations**
Coal Mining Safety and Health Act 1999 section 36: *Mining and Quarrying Safety and Health Act 1999* section 33; "Person not relieved of obligations"-

Reviewing the Effectiveness of Safety and Health Management Systems

The obligation placed on mine operators regarding safety and health management systems is expressed in the terms “audit” and “review”. Auditing is simply the mechanism by which information is obtained for a particular purpose. For example obtaining information to determine compliance (either with legislation or corporate standards) is a compliance audit; for the subject at hand obtaining information to determine effectiveness is an effectiveness audit.

It should be noted that most audits carried out in industry are compliance audits and the number of effectiveness audits carried out has been limited. The legislation does not define the word “audit” however industry has accepted the meaning included in the various standards; namely to systematically examine documents and records to sufficient depth to verify whether the system meets some established criteria. Some definitions of auditing contain elements of review (see Definitions and Appendix B).

The term ‘review’ in this document is used in the sense that the information obtained by auditing is critically evaluated; in the Guidance Note this means evaluating whether the safety and health management system is keeping risk at an acceptable level.

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Australian Standard “AS/NZS 4804 Occupational health and safety managements systems – General guidelines on principle, systems and supporting techniques clause 4.5 ‘Review and Improvement’” states the following:

“Management review is a cornerstone of the management system, providing an opportunity for senior management to regularly review the operation of the system and its continuing suitability in the face of change to make adjustments to build upon and improve its effectiveness.”

This Guidance Note endorses this statement.

2 Purpose and scope

This Guidance Note is provided to assist operators to meet their obligations[4] under the mining safety and health legislation to review the effectiveness and implementation of a mine's safety and health management system to ensure the risk to persons from mining operations is at an acceptable level.

The document is not intended to be an exhaustive treatment of reviewing a safety and health management system but a guide. For example two areas not specifically mentioned in this Guidance Note which a concerned mine operator would review in detail are compliance with legislation and the competence of mine workers to carry out the tasks. These areas are extensive enough to be worthy of separate reviews.

Any review carried out by an operator would have to take into account the conditions at a mine such as the complexity and associated hazard levels and past performance in establishing and maintaining an acceptable level or risk.

The Guidance Note identifies and examines some of the key subsystems that would be included in an effective safety and health management system if the system is to deliver an acceptable level of risk and remain capable of accommodating the changing circumstances that occur at every mine site.

The document is neither a recognised standard as defined in the *Coal Mining Safety and Health Act 1999* nor a guideline as defined in the *Mining and Quarrying Safety and Health Act 1999*[5].

[4] *Coal Mining Safety and Health Act 1999*: Part 3, Safety and health obligations, s41(1)(e) & (f); *Mining and Quarrying Safety and Health Act 1999*: Part 3, Safety and health obligations, s38(1)((e) & (f)
[5] *Coal Mining Safety and Health Act 1999*: Part 5, Recognised standards; *Mining Quarrying Safety and Health Act 1999*: Part 5, Guidelines

3 Introduction

An effective safety and health management system is a dynamic system that when implemented ensures that risks to the safety and health of mine workers are at an acceptable level and leads to continuously improving safety and health standards at the mine.

The site senior executive and the operator of a mine both have obligations regarding a mine's a safety and health management system. The site senior executive has an obligation to develop and implement a safety and health management system with the aim of ensuring the mine controls risks to an acceptable level; the mine operator has the obligation to review the site senior executive's safety and health management system and determine whether it is implemented and working effectively and if necessary require any a corrective action to be taken to make it effective.

This Guidance Note is designed to be a diagnostic tool to assist mine operators to meet their obligations to ensure the system is effectively controlling risk to an acceptable level.

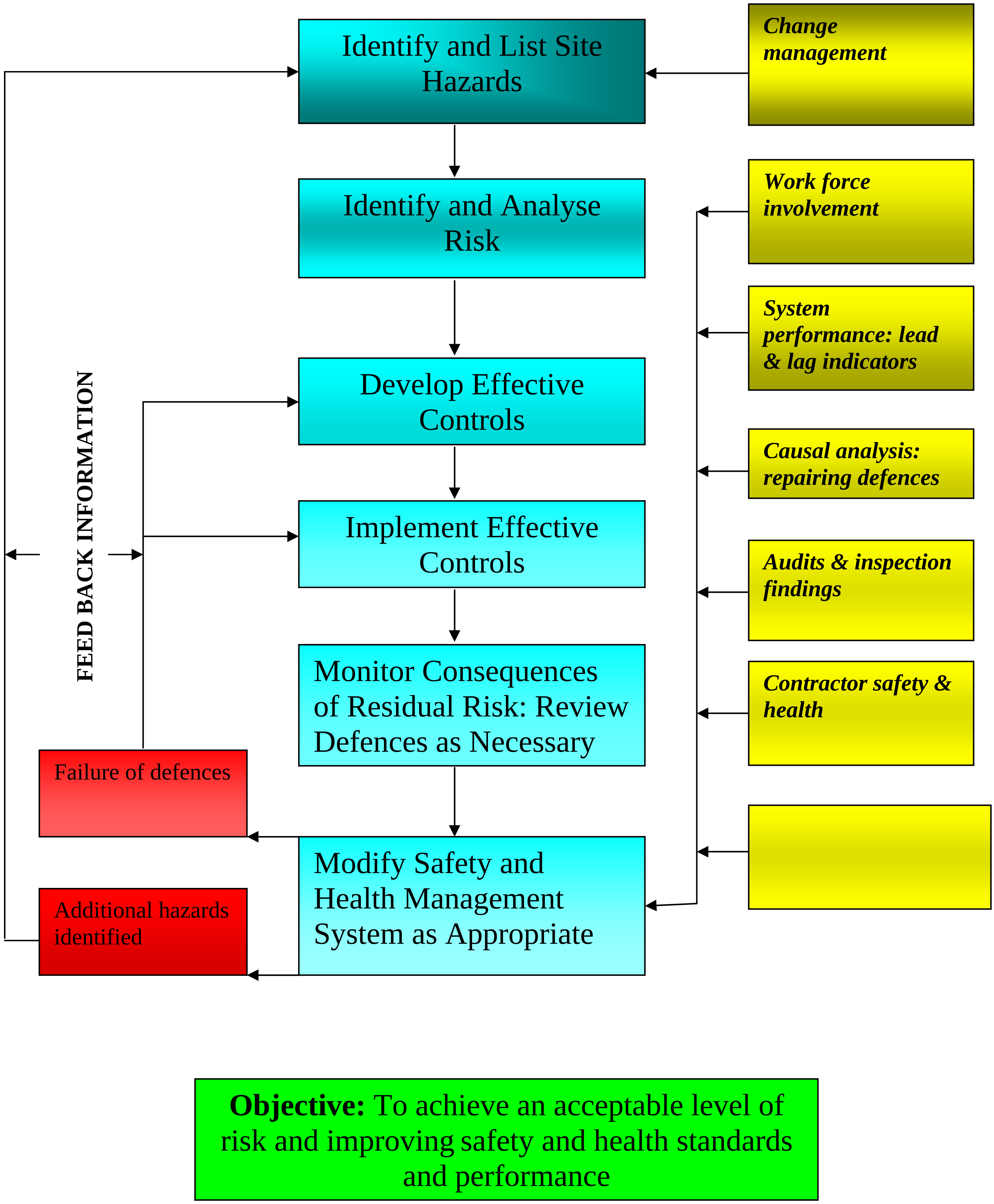
The nature of a safety and health management system and its dynamic subsystems is illustrated in the flow sheet titled "Safety and Health Management System", page 8. The operation of such a system and its subsystems is discussed and particularly how the various dynamic subsystems contribute to keeping risk within an acceptable level.

The system is examined with respect to the two requirements: to achieve a level of risk within acceptable limits; and as low as reasonably achievable.

Subsystems identified include:

- *Change management*
- *Work force involvement*
- *System performance: lead and lag indicators*
- *Causal analysis: repairing defences*
- *Audit and inspection findings*
- *Contractor safety and health*
- *Chronic exposures causing incapacity*

4 Safety and Health Management System



5 Obligations of operators and site senior executives

Confusion has arisen over whether the obligation of an operator to review the effectiveness and implementation of a mine safety and health management system can be discharged by the operator delegating this duty to the site senior executive. This approach introduces doubt as to whether operators have indeed met their obligations under the legislation; the legislation quite specifically precludes the transfer of an obligation from one person to another[6].

It would be expected that once a site senior executive developed and implemented a safety and health management system at a mine, some form of auditing would be undertaken on behalf of the site senior executive to ensure the system is working as intended. However any auditing controlled by the site senior executive would not be considered to meet the obligations placed on the operator to review the effectiveness and implementation of the system.

Doubt regarding the discharge of the operator's obligations will be greatly reduced, if not eliminated, if the review of a mine's safety and health management system is undertaken by suitably competent people, engaged by the operator, who are independent of the site senior executive and the mine being audited**.**

The intervals of the review should be determined by the results of previous reviews and recent safety performance of the mine. It is suggested that decisions on who should conduct the review, and at what intervals the reviews be carried out, are made at corporate level.

6 Acceptable level of risk

The reason a safety and health management system exists is to ensure the risk to mine workers safety and health is maintained at an acceptable level. A secondary but important objective is to generate ongoing improvement to safety and health standards at a mine.

To do this effectively a system must contain, in addition to the mechanisms to identify and analyse the risks and develop controls, adequate subsystems to detect weakness (accidents and high potential incidents etc) in existing controls and allow corrections. The subsystems must also allow for the monitoring of any site changes that affect risks and allow the development of appropriate controls to control these risks.

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[6] *Coal Mining Safety and Health Act 1999*: section 36 "Persons not relieved of obligations"; *Mining and Quarrying Safety and Health Act 1999*: section 33 "Persons not relieved of obligations"

An acceptable level of risk is defined in the legislation[7] as within acceptable limits and as low as reasonably achievable. The requirement for the system to be dynamic cannot be over emphasised. An effective safety and health management system will soon become ineffective if the subsystems cannot detect and repair weaknesses to the existing system or accommodate site changes.

In summary, the subsystems labelled as dynamic in the diagram "Safety and Health Management System" (Part 3) have two important functions; they manage change and monitor the effectiveness of existing system.

The effectiveness of a safety and health management system is to a large extent dependent on the effectiveness of these dynamic subsystems and a review of a safety and health management system to determine effectiveness must closely examine these subsystems to ensure they are effective.

6.1 Risk within acceptable limits

To achieve a level of risk within acceptable limits a mine must have processes which form part of the safety and health management system to:

1. Identify hazards including principal hazards[8] on site, identify and analyse any associated risks and develop and implement controls. In developing controls the hierarchy of risk controls should be applied as appropriate to the level of risk determined.
2. Identify new hazards created on site as a result of change, identify and analyse any associated risks and develop and implement controls.
3. Monitor and record the consequences of residual risk.
4. Use the information obtained by 1 to 3 above to review the safety and health management system including, principal hazard management plans, standard operating procedures, standard work instructions, investigation techniques, risk management procedures etc and modify these as appropriate.

By their nature, principal hazards are associated with potential multiple fatalities, and care needs to be taken to ensure that they are properly audited and appropriately reviewed to ensure any audit recommendations are processed, i.e. adopted or rejected after analysis.

6.2 Risk as low as reasonably achievable

To ensure that risk is as low as reasonable achievable, the safety and health management system should include for the following:

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[7] *Coal Mining Safety and Health Act 1999*: section 29 "What is an acceptable level of risk"; *Mining and Quarrying Safety and Health Act 1999*: section 30 "Risk management"

[8] Where a hazard is a principal hazard -*Coal Mining Safety and Health Act 1999*; section 20 " Meaning of principal hazard"- the safety and health management system must include specific principal hazard management plans to address these hazards- *Coal Mining Safety and Health Act 1999;* section 20 "Safety and health management system", paragraph (3)(d);

1. Holding regular safety meetings to provide and obtain information from the work force on safety matters and minute proceedings and recommendations. Where a number of major contractors work on a site the safety and health information from these contractors needs to be co-ordinated. One method being used to do achieve this requirement is for the site senior executive (or delegate) to attend regular meetings with contractor's safety and operational personnel to review contractor safety performance and ensure contractor's ongoing compliance with the mine's safety and health management system.
2. Ensuring that incidents and accidents are reported, monitored and properly analysed to identify immediate and underlying causes. An indication of an ineffective system is one in which incidents with the same underlying or root cause reoccur.
3. Monitoring and analysis of contractor safety and health performance. See section 10: "Contractor Safety Performance", for this important aspect of safety and health management in the mining industry
4. Carrying out regular safety observations, inspections and appropriate audits and establishing programs to address issues raised in these activities and monitor corrections.
5. Implementing requirements resulting from statutory inspections.
6. Using the information obtained from 1 to 5 above review the safety and health management system.

7 Workforce involvement

The workforce is the focus of the safety and health management system; the term is inclusive and involves all mine workers on site. As mentioned in 5.2(1), above regular safety management meetings involving the integration of contractor's employees are a necessity if risk as low as reasonable achievable is to be achieved.

However workforce participation goes much further than regular safety meetings at which safety issues are raised, analysed and acted on. A mine should have a system that describes how workforce participation is achieved on site including the workforce of contractors.

An operator's review would assess the effectiveness of the system developed on site to involve the workforce.

8 System performance: lead and lag indicators

An effective safety and health management system should have built into the system indicators to allow the detection of system malfunctions and allow the ongoing performance of the system to be assessed. For this purpose the system should include:

1. A suite of lead indicators
2. A suit of performance indicators measuring safety and health standards and performance (lag indicators)
3. Provision for the regular monitoring of lead indicators and review of performance indicator trends.
4. Provision for the regular examination of the information obtained from 1 and 3 above to determine safety performance.
5. Provision for reviewing and modifying the system when safety performance is deteriorating or not improving.

An effective safety and health management system contains both lead and lag indicators; lead indicators indicate whether the system is working effectively; lag indicators provide information on the results being achieved by the system.

The Chamber of Minerals and Energy of Western Australian “Guide to Positive Performance Measurement in the Western Australian Mineral and Resources Industry” provides excellent information on developing lead indicators and can be down loaded from the Western Australian Chamber of Mines and Energy web site www.cmewa.com.au ; go to “Occupational Safety and Health”, and select the guide from the publications list.

Lag indicators are important because, if recorded with integrity, they measure the success or otherwise of the safety and health management system in delivering and improving safety and health standards at the mine.

9 Causal analysis: repairing defences

The activities at a mine site involve people, materials and machines. It is the purpose of mine management to organise these factors of production in the most economically efficient manner to undertake the activities.

The Queensland mining legislation places legal obligations on all people involved in mining activities to ensure that these activities are carried out with an acceptable level of risk. However the site senior executive and the mine operator carry the principal obligation to ensure that a system is in place to control risk.

The legislation requires that the management system monitor levels of risk and adverse consequences of retained residual risk[9].
The inevitable incidents that will occur are an indication that the level of residual risk may not be acceptable. Some of the defences may be less than ideal or become inappropriate as the task changes over time. An effective safety and health management system must be adjusting, modifying and creating new defences as analysis of accidents and incidents reveals that existing defences are inadequate.

There are a number of causal analysis tools available to determine both immediate and underlying causes of events occurring on site and identify any problems which need to be addressed. An effective safety and health management system will contain a subsystem to obtain this information and act on it. The operators review should assess whether this is been done and if so is it being done in an effective manner.

It is expected an appropriate subsystem would deliver:

1. Factual reporting of all accidents and incidents at the mine

2. Causal analysis of the events (accidents and incidents) identifying immediate and underlying causes including absent, failed or ineffective defences

3. A system for reviewing underlying causes to detect any repetitious events or general failure types

4. A process of ensuring the information derived from the subsystem is acted on to create, modify, or adjust defences.

10 Audit and inspection findings

Any review on behalf of the operator must examine previous audit, inspection and review findings to make sure that problem areas in the safety and health management system previously identified have been addressed.

Audits would include compliance audits against legislation and corporate standards; inspections would include inspections by the legislator as well as the results of internal inspections.

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[9] *Coal Mining Safety and Health Act 1999*: section 30 “How is an acceptable level of risk achieved,” subparagraph (2) (c); *Mining and Quarrying Safety and Health Act 1999*: section 27 “Risk management,” subparagraph (2) (c).

11 Contractor safety performance

With the extensive use of contractors within the mining industry it is particularly important that any review of the effectiveness a mine's safety and health management system examines the effectiveness of the system maintaining contractor safety and health standards.

The adoption by site senior executives of the safety systems of large corporations working as contractors on site needs careful assessment. It is the site senior executive who has the obligation to develop and implement a safety and health management system for the mine[10] controlling activities on site, including the activities of contractors.

The contractor's obligation is to ensure compliance with the Act and any applicable parts of the mine's safety and health management system[11].

When contractors bring safety and health procedures onto a mine site these procedures need to be mapped for consistency against any procedures existing at the mine before being adopted into the mine's safety and health management system. Particular attention needs to be given to the need for contractors to adhere to procedures developed on site in response to legislative requirements i.e. standard operating procedures and standard work instructions. This examination of the contractor's procedures should included measurement against any requirements in the legislation for the development of those procedures. This task should be completed before the contractor begins work on site and should be documented.

It is advisable to ensure that procedures across site are consistent, particularly when a number of contractors are working on the same site. Any review should detect and correct inconsistent safety procedures that may exist on site.

An operator's review should address the effectiveness of the subsystem for managing contractors. It would be expected that such a system would be extensive, commencing with principles for assessing suitable contractors, stating requirements for adoption of the mines safety and health management system.

[10] *Coal Mining Safety and Health Act 1999*: section 42 "Obligations of site senior executive for coal mine," subparagraph (1) (c); *Mining and Quarrying Safety and Health Act 1999*: section 39 "Obligations of site senior executive for mine," subparagraph (1) (c).

[11] *Coal Mining Safety and Health Act 1999*: section 43 "Obligations of contractors"; *Mining and Quarrying Safety and Health Act 1999*: section 34 "Obligations of contractors".

It is suggested that an operator's review of this subsystem would be assisted by the existence of a comprehensive report of the work undertaken to ensure that the mines' safety and health management system included the work of the contractor and the steps taken to ensure that this was fully understood by the contractor. It would be useful if the report also contained the process by which the ongoing adherence of the contractor with the mine's system was to be monitored. The more extensive the work undertaken at the mine by a contractor the more such a document would assist the operator's reviewing the effectiveness of control over contractor's activities.

12 Chronic exposures causing incapacity

Each year a number of persons leave the industry because of incapacity to carry on working in the industry. For a number of these people service in the industry has either been the cause of their medical condition or a major contributing factor towards it.

An effective safety and health management system should have provision to identify mine workers who fall into this category and to examine each of these cases to identify whether they are attributable to any chronic (long term) exposure to low level hazard.

This is an important issue as causes of the incapacity may be due to exposure to a chronic substandard condition rather than a single incident eg whole of body vibration over a period of time rather than a fall or other traumatic event.

As with all investigations, records of the results of the investigation and the causes of the injury or illness should be kept and reviewed so that safety and health management system can be modified as a result of lessons learnt to prevent future occurrences.

13 Definitions

Audit
"A systematic examination against defined criteria to determine whether activities and related results conform to planned arrangements and whether these arrangements are implemented effectively and are suitable to achieve the organisation's policies and objectives."

Source AS/NZS 4801: 2001 "Occupational health and safety management systems – Specification with guidance for use".

See Appendix B for alternative but complementary definition - AS/NZS/ISO19011: 2003 "Guidelines for quality and /or environmental management systems auditing".

Review
In the context of this Guidance Note "review" means a critical re-examine of the system with the intention of determining whether the effectiveness of the safety and health management system- see below.

Effective
In the context of this Guidance Note effective means that a safety and health management system reduces the level of risk to safety and health of persons affected by the operations of a mine to within acceptable limits and as low as reasonably achievable. It is considered that achieving this goal would result in continuous improvement of safety and health standards and performance.

Residual Risk
Risk after controls have been implemented; reviews and causal analysis may reveal that residual risk is not at an acceptable level

Operator
Is the person or entity appointed as the operator by the holder of the mining tenure or when no other operator is appointed: *Coal Mining Safety and Health Act 1999*; section 21: "Meaning of coal mine operator"; *Mining and Quarrying Safety and Health Act 1999*; section 21: "Meaning of operator".

Site Senior Executive
Is the person appointed by the operator as required by the *Coal Mining Safety and Health Act 1999* section 41: "Obligations of coal mine operator", subparagraphs (1) (c) and the *Mining and Quarrying Safety and Health Act 1999* section 38: "Obligations of the operator", subparagraph (1) (c).

14 References

- *Coal Mining Safety and Health Act 1999*
- *Coal Mining Safety and Health Regulation 2001*
- *Mining and Quarrying Safety and Health Act 1999*
- *Mining and Quarrying Safety and Health Regulation 2001*
- *AS/NZ 4801 Occupational health and safety management systems*
- *AS/NZS: 4804: Occupational health and safety management systems – General guidelines on principles, systems and supporting techniques.*
- *AS/NZS/ISO19011: 2003 Guidelines for quality and /or environmental management systems auditing*
- *AS/NZS 4360: 2004 Risk Management*
- *Guide to Positive Performance Measurement in the Western Australian Minerals and Resources Industry (The Chamber of Minerals and Energy Western Australia web site www.cmewa.com.au)*

Appendix A: Relevant Sections of Mining Safety and Health Legislation

Coal Mining Safety and Health Act 1999

62. Safety and health management system

(3) *The safety and health management system must be adequate and effective to achieve an acceptable level of risk by –*

(a) defining the coal mine operator's safety and health management policy; and

(b) containing a plan to implement the coal mine operator's safety and health management policy; and

(c) stating how the coal mine operator intends to develop the capabilities and support mechanisms necessary to achieve the policy; and

(d) including principal hazard management plans and standard operating procedures; and

(e) containing away of –

a. measuring monitoring and evaluating the performance of the safety and health management system; and

b. taking the action necessary to prevent or correct matters that do not conform with the safety and health management system; and

(f) containing a plan to regularly review and continually improve the safety and health management system so that risk to persons at a coal mine is at an acceptable level; and

(g) if there is a significant change to the coal mining operations of the coal mine – containing a plan to immediately review the safety and health management system so the risk to persons is at an acceptable level.

Mining and Quarrying Safety and Health Act 1999

55. Safety and health management system

(3) *The safety and health management system must be effective to achieve and acceptable level of risk by -*

(a) defining the mine operator's safety and health management policy; and

(b) containing a plan to implement the mine operator's safety and health management policy; and

(c) stating how the operator intends to develop the capabilities and support mechanisms necessary to achieve the policy; and

(d) including procedures for the operations of the mine and standard work instructions

(e) containing away of –

a. measuring monitoring and evaluating the performance of the safety and health management system; and

b. taking the action necessary to prevent or correct matters that do not conform with the safety and health management system; and

(f) containing a plan to regularly review and continually improve the safety and health management system so that risk to persons at a mine is at an acceptable level; and

(g) if there is a significant change to the mining operations of the mine – containing a plan to review the safety and health management system so the risk to persons is at an acceptable level.

Coal Mining Safety and Health Act 1999

42 Obligations of site senior executive for coal mine

A site senior executive for a coal mine has the following obligations in relation to the safety and health of persons who may be affected by coal mining operations–

…

(c) to develop and implement a safety and health management system for the mine;

…

Mining and Quarrying Safety and Health Act 1999

39 Obligations of site senior executive for mine

(1) *A site senior executive for a mine has the following obligations in relation to the safety and health of persons who may be affected by operations–*

…

(c) to develop and implement a safety and health management system for the mine;

Coal Mining Safety and Health Act 1999

41 Obligations of coal mine operators

(1) *A coal mine operator for a coal mine has the following obligations –*

…

(f) to audit and review the effectiveness and implementation of the safety and health management system to ensure the risk to persons from coal mining operations is at an acceptable level

Mining and Quarrying Safety and Health Act 1999

38 Obligations of mine operator

. ***(1)*** *A mine operator for a mine has the following obligations –*

…

(e) to audit and review the effectiveness and implementation of the safety and health management system to ensure the risk to persons from operations is at an acceptable level

Appendix B: Notes on Audits

The latest Australian definition of an audit, given in AS/NZS/ISO19011: 2003 Guidelines for quality and/or environmental management systems auditing, states: **"Systematic, independent and documented processes for obtaining audit evidence and evaluating it objectively to determine the extent to which the audit criteria are fulfilled**."
where:

- "**audit evidence**" means "records, statements of fact or other information, which are relevant to the audit criteria and verifiable, and
- **"audit criteria"** means "sets of policies, procedures or requirements."

Another less recent but similar definition of an audit is given in AS/NZS 4801: 2001 Occupational health and safety management systems – Specification with guidance for use, and is as follows:

"A systematic examination against defined criteria to determine whether activities and related results conform to planned arrangements and whether these arrangements are implemented effectively and are suitable to achieve the organization's policy and objectives."

Whatever definition of an audit a mine decides to adopt, the following guidance is given so that an audit represents the current state of affairs and is a useful tool for confirmation of best practice and action for improvement.

The audit criteria, (defined criteria in AS/NZS 4801), should always include the legislative compliance requirements of a safety and health management system as described in the *Coal Mining Safety and Health Act 1999* and the *Mining and Quarrying Safety and Health Act 1999*.

In addition, there are four key aspects to an audit on a safety and health management system and all aspects should be included:

1. Determine how the safety and health management system is intended to ensure the risks to persons from operations at the mine are at an acceptable level

2. Establish whether the safety and health management system is implemented and effective in ensuring the risks to persons from operations at the mine are at an acceptable level.

3. Examine whether the safety and health management system is suitable for ensuring the risks to persons from operations at the mine are at an acceptable level.

4. Use of an evidence-based approach where audit evidence is verifiable. The audit should be based on samples of the information available.

Persons competent in auditing protocols and familiar with the relevant AS/ANZ and ISO standards should carry out the audit. An audit report and conclusion on the safety and health management system should include evidence of how well the planned arrangements have been implemented, how ***effective*** they are and how suitable they are.

The results of the audit will contain information on where risks are being well managed and identify opportunities for improvement. The auditing process should include a method for identifying and making improvements; ideally with linkage back to the mine's safety and health management system.

***

Guidance Note

QGN10

Handling Explosives

in Surface Mines and Quarries

Explosives Act 1999

Mining and Quarrying Safety and Health Act 1999

Coal Mining Safety and Health Act 1999

October 2008, Version 4

Queensland the Smart State

Queensland Government
Department of Mines and Energy

GUIDANCE NOTE – QGN08

Handling Explosives In Surface Mines And Quarries

This Guidance Note has been issued by Safety and Health of the Department of Natural Resources and Mines to provide guidance in the use of out of service procedures to manage the risk associated with unserviceable plant.

This Guidance Note is not a Guideline as defined in the *Mining and Quarrying Safety and Health Act 1999* and the *Coal Mining Safety and Health Act 1999*. In some circumstances, compliance with this Guidance Note may not be sufficient to ensure compliance with the requirements in the legislation.

Guidance Notes may be updated from time to time. To ensure you have the latest version, either check the Department of Mines and Energy website or contact your local inspector of mines.

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FOREWORD

QGN10 - HANDLING EXPLOSIVES IN SURFACE MINES AND QUARRIES

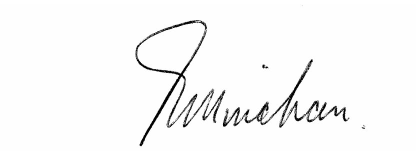
The Queensland mining and quarrying industries are Australia's largest users of commercial explosives at approximately 500 000 tonnes each year. Explosives have been the primary method of breaking and loosening rocks since the introduction of black powder. Today's wide range of commercial explosives are safer to use but still represent a major hazard due to the enormous amount of energy that can be rapidly converted into gases at high temperature and pressure.

This document, *Guidance Note for Handling Explosives in Surface Mines and Quarries*, covers an important aspect of safety and health in the mining and quarrying industries. We have entered a new era with heightened international terrorist activity necessitating changes to our approach to explosive use. This component of our industry has been subject to extensive change to ensure appropriate standards exist for the safe handling and use of explosives. We have seen crucial changes to explosives in the way of increased security requirements for storage, transport and use.

These changes have been implemented to restrict explosives and explosives activities in the community and to advise of best practice, management and control of hazards associated with explosives. Many of these innovations bring advantages to the operator and worker alike, in the way of improved operating procedures and blast results.

This document was prepared to assist mines and quarries in identifying the hazards and implementing the necessary controls to ensure the safety and health of all persons involved in the processes of storage, use and transport of explosives, and provide information on the methods available to achieve an acceptable level of risk. Mines in Queensland should use this Guidance Note in conjunction with the relevant legislation dealing with explosives:

- *Mining and Quarrying Safety and Health Act 1999* or
- *Coal Mining Safety and Health Act 1999*, and the
- *Explosive Act 1999*.



Peter Minahan
Chief Inspector of Mines

Bob Sheridan
Chief Inspector of Explosives

1 PURPOSE AND SCOPE

This Guidance Note QGN10 is provided to assist competent persons in the safe and secure storage, use and transport of explosives within the Queensland mining and quarrying industries. The note provides information to be considered during the risk management process to assist in determining acceptable surface blasting practices. The information contained within is not merely limited to use in conducting job safety analyses but can be used when implementing safe operating procedures and safety and health management systems. The risk management process should be conducted with persons experienced and with content knowledge of explosives and familiar with Australian Standards:

AS 2187: Explosives – Storage and use, and

AS/NZS 4360: Risk management.

The principles stated in this document are intended as general guidance for the assistance of surface mining and quarrying operations using explosives. Persons responsible for the storage, transport and use of explosives at mining or quarrying operations should consider their site circumstances and their training and experience when assessing or reviewing safety standards using accepted risk management procedures.

This Guidance Note is aimed to promote consistency of best practice in safety and health in the mining industry. In addition the document provides information and reference for the identification, assessment and control of hazards associated with explosives storage, transport and use.

The State of Queensland and its agents will not be held liable for any loss or damage whatsoever (including liability for negligence and consequential losses) suffered by any person acting in reliance or purported reliance upon this Guidance Note.

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2 SURFACE MAGAZINES

2.1 LOCATION OF MAGAZINE

2.1.1 Public Risk

When siting a magazine the risk management process can be carried out to identify hazards that may arise from its proximity to public installations, facilities and roads. Risk acceptability should be evaluated based on the quantity of explosives stored in the magazine (magnitude of the hazard) and the possible consequences of an unplanned explosive incident.

2.1.2 Proximity to other Magazines

The separation distance of magazines in proximity to each other should be determined based on the quantity of explosives stored and the magazines used. Further guidance can be attained from AS2187.1 – Table 3.3.3.2 in relation to distances from protected works and separation distances from other explosive magazines and ammonium nitrate storage.

2.1.3 Proximity to Ignition Sources

When siting the magazine the risk management process can be carried out to identify hazards that may arise from its proximity to likely ignition sources. Such sources arise from proximity to refuelling depots, vegetation, rubbish or mineral matter. Magazines are required to have the immediate and adjacent area cleared of any substance likely to cause sparks or catch fire, and to establish an acceptable firebreak around the magazine. **Note:** Guidance on the width of the firebreak can be attained from local fire fighting authority, or Queensland Fire and Rescue Service.

2.1.4 Vehicle Access Routes

When siting the magazine a risk management process can be carried out to identify hazards that may arise from proximity to vehicular access routes and roadways used on site. The number of access routes to the magazine and the types of vehicles and the frequency of their proximity to the magazine should be considered (AS 2187.1). Best practice is ensuring that all vehicles perform at least one 90 degree turn to access a magazine location thus reducing the risk of an out of control vehicle having direct route into the storage area.

2.1.5 Activities within site

When siting the magazine a risk assessment can be carried out to identify hazards that may arise from proximity to other activities on site. Mining activities that involve employees and equipment should be at a safe distance in the event of an explosive incident occurring (AS 2187.1).

2.1.6 Weather Protection

When siting the magazine, it should be located as to provide all-weather access. This includes adequate drainage to prevent deterioration of the access roadway and prevent water entering into the magazine (AS 2187.1). In conditions where adequate drainage cannot be provided catchment tanks such as that shown below in Figure 1 can be utilised to protect the magazine from water ingress.

Figure 1: Water catchment on the side of a magazine

2.1.7 Use of Natural Ground Features

When siting the magazine, the use of natural ground features should be considered to enhance physical protection of employees and the public. Alternatively, mounds can be built around the magazine to provide additional protection (AS 2187.1).

Figure 2: Relocatable magazine protected by earth mounds

2.1.8 Security

When siting the magazine, do not make it easy for unauthorised personnel to locate or access the magazine. If possible it should be located on site in a position that is not viewable from outside the mine or quarry. Adequate security installations should be in place to prevent accidental or unauthorised disclosure of the magazine location (AS 2187.1).

2.1.9 Licences

A person is required to hold an authority to store explosives for a quantity of explosive of 10 kg or more.
Quantities of less than 10 kg are exempt from a license to store, however a person licensed to use explosives is the only person allowed to possess such explosives.

2.2 FABRICATION REQUIREMENTS

2.2.1 Portable Magazines

All portable magazines have to be constructed in accordance with specifications given in AS 2187.1, or with a system of at least equivalent safety and security approved by the Chief Inspector of Explosives.

2.2.2 Relocatable Magazines

Relocatable magazines have to be constructed in accordance with specifications given in AS 2187.1, or with a system of at least equivalent safety and security approved by the Chief Inspector of Explosives.

Explosives in excess of 10kg may only be stored in a relocatable magazine by a person who holds an authority to store and who stores the explosives in accordance with the licence, conditions imposed, and applicable regulations (*s44 Explosives Act 1999*).

2.2.3 Fixed or Permanent Magazines

Fixed or permanent (non-relocatable) magazines located above ground are to be constructed in accordance with specifications given in AS 2187.1, or with a system of at least equivalent safety and security approved by the Chief Inspector of Explosives.

Explosives in excess of 10kg may only be stored in permanent magazines by a person who holds an authority to store and who stores the explosives in accordance with the licence, conditions imposed, and applicable regulations (*s44 Explosives Act 1999*).

2.2.4 Bulk Explosive Storage

Storage tanks used for bulk explosives such as ANFO and bulk emulsions are to be constructed in accordance with specifications given in AS 2187.1 and the Australian Explosives Manufacturers Safety Committee (AEMSC) Code of Practice for the Precursors for Explosives, or with a system of at least equivalent safety and security approved by the Chief Inspector of Explosives.

All bulk explosive storage facilities require that a person holds an authority to store and stores the explosives in accordance with the licence, conditions imposed, and applicable regulations (*s44 Explosives Act 1999*). Security and safety considerations given to bulk explosive storage facilities need to be equivalent to that of explosive magazines.

2.2.5 Magazine Exteriors

Persons and machinery approaching any magazine should be able to clearly distinguish the magazine. Magazines should be painted in a light colour to maximise light reflectance and be protected against corrosion to prevent structural damage and deterioration (AS 2187.1).

2.2.6 Magazine Interiors

Certain explosives are susceptible to initiation from friction and sparks caused by metal installations. Where exposed metal is present in the interior of the magazine an inner lining should be utilised. The inner lining should be free of iron or steel and be of close jointed construction (AS 2187.1).

2.3 SECURITY

2.3.1 Remote Security

To enhance the security of a surface magazine consideration can be given to incorporating either a camera or alarm system with the required door and locking devices specified in this Guidance Note. All alarm and camera fittings and installations inside the explosive storage area are required to comply with AS 3000 for electrical equipment in hazardous locations (refer to Section 1.6.2.2).

2.3.2 Locking devices

Locking devices for all magazine types are required to be in accordance with AS 2187.1, or with a system of at least equivalent security. As specified in AS 2187 the door or lid of every magazine needs to be fitted with a six level ‘safe lock’. Where a padlock is used it shall have a hardened shackle and pad constructed to provide a high level of resistance to fracture and rupture. It shall also have a key system known as a ‘restricted system’ if the padlock is of the pin-tumbler type. Where the padlock is of the lever type, there shall be a minimum of five levers.

2.3.3 Holding Down Bolts

Where there exists the possibility of the magazine being removed by unauthorised persons a provision should be made for holding-down bolts or another equivalent method to protect external portable and relocatable magazines (AS 2187.1).

Figure 3: Relocatable magazine fixed in cement to prevent unauthorised removal

2.3.4 Perimeter Fences

A perimeter fence should be installed around the magazine for additional security purposes. In determining whether fencing is required, consideration should be given to the magazine's location and security requirements. It should be noted that a perimeter fence is not intended to provide complete security of explosives, but act as a deterrent to unauthorised access. Guidance on the fabrication of the fencing can be found in AS 2187.1.

Figure 4: Magazine with chain and barbed wire fencing

2.3.5 Door Hinges

It is important that the integrity of the door hinges and hinge lugs match the integrity of the lock provided. In the past illegal access to explosives has been gained through using a hacksaw blade on the hinges of the magazine. To prevent such access to the hinges the construction of the hinge lugs on the door should be in accordance with requirements in Australian Standard 2188. The integrity of the weld used to join the hinge lug to the door is also to be of a satisfactory standard to prevent the lug from detaching from the magazine, in the event of a forced entry. The strength of these welds should be monitored at each inspection or audit. Any non-compliance found during an audit or an inspection should be fixed as soon as practicable.

2.4 MARKINGS

Every magazine is to be marked on the door or lid with either the word 'EXPLOSIVE' or 'DETONATOR,' as appropriate. The markings are required in red lettered characters on a white background and sized to make them clearly defined. In addition an explosive hazard class diamond is required on the magazine door. A clearly defined 'NO SMOKING or NAKED FLAMES' sign should be positioned at the entrance of the magazine to warn persons entering the magazine area.

A sign is also required at the entrance of the magazine to warn persons at the magazine of their liability to penalty for an offence if reasonable precautions and reasonable care is not taken to prevent an explosives incident at the magazine *(s48 Explosives Act 1999).*

Figure 5: Explosive hazard class diamond

2.5 SEGREGATION

Storage sites for the explosive magazine and detonator magazine shall be located as to reduce to acceptable levels the risk of sympathetic detonation between the different storages. The separation and segregation distances specified in AS 2187.1 are based on international testing and need to be observed as a minimum, however this minimum distance can be increased to further reduce the risk.

2.6 UTILITY REQUIREMENTS

2.6.1 Water Installations

If water is required within the vicinity of the magazine, the location of the installation needs to be so as to prevent water coming into contact with the explosives. It should be positioned as to not cause erosion or degradation to the access or foundations of the magazine. If necessary, a sump should be used to prevent water from accumulating in areas.

2.6.2 Electrical Installations

2.6.2.1 Lighting

Lighting in magazines may be either natural or artificial. Electrical fittings inside the magazine should be avoided, however if no alternative option is available, wiring should be suitable for electrical equipment in hazardous areas (AS 3000). Explosion protection for electrical equipment should be provided according to the classification of the hazardous area. A list of explosion-protection techniques and their applicable standards can be found in ESC-1 'Electrical Installations and Equipment in Hazardous Areas at Explosives Manufacturing Facilities and Storage Areas.' Alternatively, lighting can be located outside the magazine and arranged to shine into the magazine.

2.6.2.2 Electrical Equipment

Electrical equipment and installations should be avoided if possible, due to the inherent risks associated with their presence. Electrical arcing of equipment can produce an ignition source that is capable of initiating certain explosives. If electrical wiring or installations are necessary inside the magazine it needs to be in accordance with electrical equipment for hazardous areas (AS 3000). Professional advice should be sought before installing electrical equipment in magazine areas.

2.7 ENVIRONMENTAL CONDITIONS

2.7.1 Ventilation

Ventilation should be adequate to ensure that with the magazine doors closed there is no accumulation of dangerous vapours or excessive heat build up (AS 2187.1). If inhaled certain explosives such as primers can be toxic to persons. There is additionally an explosive risk when explosives are exposed to high temperatures. Air vents should be suitably designed to provide sufficient fresh air circulation and protection from the weather as well as prevent access of persons and foreign objects.

2.7.2 Shade Roof

The magazine should be designed and kept within the prescribed temperature storage range outlined by the explosives manufacturer. Explosives and initiators are at risk of burning or exploding at elevated temperatures as initiation sensitivity increases with temperature. Physical properties (firmness, plasticity, etc) may also change, and storage life/sleep time can be reduced for some explosives. Where the external environment conditions are likely to cause excessive internal temperature fluctuations, a shade roof or similar device should be provided (AS 2187.1).

Figure 6: Shade roof on a steel relocatable magazine

2.8 EMERGENCY INSTALLATIONS

2.8.1 Lightning Protection

2.8.1.1 Vertical Conductors

The need to protect structures and buildings containing explosives within the vicinity or inside the magazine from lightning, can be determined in accordance with AS 1768 – Section 2. Magazines or structures with explosive contents need to be protected from lightning.

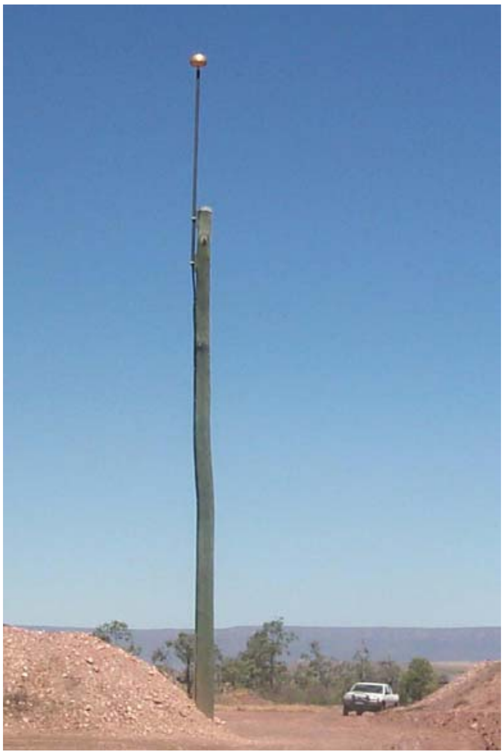

Figure 7: Vertical conductor used to protect relocatable steel magazines

2.8.1.2 Earth Terminations

Where earthing terminations are required for lightning protection or the control of undesirable extraneous electricity they need to be in accordance with AS 2187.1. The number of earthing termination for magazines is as follows:

(a) For a portable magazine – one.
(b) For a modular steel or concrete relocatable magazine – at least two at diagonally opposite corners
(c) For a tank magazine – at least two at diagonally opposite corners.

Figure 8: Earthing terminations on a steel relocatable magazine

2.8.2 Fire Fighting Equipment

As required, fire hydrants and on site fire installations should be positioned at the magazine access or immediately inside the magazine. It should be noted that in the case of an actual explosive burning no attempt is to be made to fight the fire. Fire fighting equipment is located in the magazine to prevent the possible spreading of a fire to an explosive. Selection of suitable fire extinguishers and hydrants is dependent on the hazards present within the magazine area. The suitability of an extinguisher for uses on fires that involve paper, wood, liquids or electrical equipment can be determined in accordance with AS 1850 e.g. dry powder, water. Fire hydrants should be clearly marked and have a service tag. Best practice is to advise the local fire brigade and other emergency services of the magazine's location.

Figure 9: Fire fighting equipment clearly accessible inside the magazine perimeter

3 EXPLOSIVES ARRIVAL ON SITE

3.1 ARRIVAL POINT OF EXPLOSIVES

A risk assessment is to be carried out to identify hazards that may arise with the arrival of an explosives vehicle onsite. Explosives vehicles should arrive on site in a location that ensures the magnitude of the hazard and nature of the consequences are reduced to an acceptable level. Safe allocated stopping areas are required to reduce the vehicles proximity to populated areas, ignition sources and staff working areas. The requirements for the transport of explosives by road and rail can be attained from the Australian Explosives Code 2000.

3.2 EXCESS EXPLOSIVES

The carrier bringing explosives to the site may have explosives onboard, and in transit, that are to be delivered to other mine sites. These excess explosives represent an additional hazard and the site senior executive is responsible for the additional risk, whilst the explosives are on this mine. Best practice is for an exact record of all explosives in the consignment to be provided to the site senior executive before entry to the mine site is authorised.

4 TRANSPORT TO THE MAGAZINE

4.1 COMPETENCY OF PERSON

The person who accompanies or escorts the explosive suppliers vehicle to the magazine is obligated to identify the safest and most direct route to be travelled on the mine site. Best practice is for the person escorting the explosive suppliers vehicle to use a selected high frequency radio channel to broadcast to other personnel and mobile equipment the explosives vehicles selected route to the magazine. It is recommended that a vehicle carrying explosives should not come closer than three meters to any type of radio or radio- wave emitting source.

4.2 ROUTE SELECTED

The route selected should take into account the explosive vehicle's ability to travel on unsealed surfaces. Certain explosives are at a risk of explosion by friction, shock or impact. The road base should be suitable to ensure that the movement of the explosives within the vehicle is kept to a minimum.

4.3 ACCESS TO MINING AREA

The explosives should be promptly secured in the magazine and inventory confirmed unless the site safety and health management system or procedure provides otherwise.

In instances where delivery is to be made to the charge area the vehicle driver shall be accompanied or escorted by a competent person and given a direct and safe route and precise instructions of where unloading is to take place.

The vehicles used to transport the explosives are typically only for highway use. Consequently, such a vehicle attempting to access pit areas or steep gradients that mining equipment utilise presents an additional risk. Other vehicles, or equipment should never be used to push explosive trucks.

5 M ANAGEMENT OF THE MAGAZINE

5.1 STOCK CONTROL

5.2 Person in Charge of Magazine

A person in charge of the magazine will demonstrate competency and be assessed in the storage and handling of explosives before being appointed. The duties of the person appointed to be in charge of a magazine are given in Section 4 of AS 2187.1 and include the following.

5.2.1.1 Access to Magazine

The person appointed in charge of the magazine is obligated to ensure that only authorised persons have access to the magazine. The person needs to also ensure that the magazine is secured at all times and the magazine key is in the care of an authorised person or locked in a secure location (AS 2187.1).

5.2.1.2 Explosive Limits

The person appointed in charge of the magazine needs to ensure that the explosives stock levels in the magazine are within the licensing limits. For determining the quantity of explosives that can be held within a specific magazine refer to AS 2187.1. Best practice is for a record of the licence to store to be kept at the magazine location. This will ensure that all authorised personnel with access to the magazine are aware of the explosive capacity of the magazine.

5.2.1.3 Stacking Packages

The person appointed in charge of the magazine is obligated to check that the packaging for the explosives, to be stored in the magazine, is of such construction strength and character that it cannot break or open accidentally and are required to be stacked to a height no greater than that recommended by the explosives manufacturer.

If the person in charge of the magazine is not satisfied with the condition of packaging supplied there is no obligation to store the product in the magazine.

To ensure adequate ventilation, an air space is to be maintained between the explosives and the magazine walls and ceilings (AS 2187.1).

5.2.1.4 Rotation of Stock

The person appointed in charge of the magazine needs to ensure that the explosives stock is rotated on a regular basis and that the explosives are within the expiration dates indicated by the manufacturer. Explosives that are more than one year old should not be used without first contacting the explosives manufacturer (source: Orica Explosives).

Figure 10: Explosives stacked with their labelling towards the access way for easy identification.

5.2.1.5 Record Keeping

The person appointed in charge of the magazine is required to keep a record of incoming and outgoing stocks. These records need to be kept for a period of not less than five years (AS 2187.1). The record is to include the date of receipts and the quantities received, the date and quantity booked out and a balance of all explosives stored at the magazine. Every attempt has to be made to account for individual explosive items that are distributed collectively. Best practice is for a second record of the explosive stock levels to be kept in a separate location. An audit and inspection of the magazine, its contents and surrounds needs to be conducted and recorded frequently, preferably monthly and usually not more than every three months.

5.3 HOUSEKEEPING

5.3.1 Magazine Rules

Magazine rules for the operation of the magazine are to be displayed inside the magazine in a prominent position (AS 2187.1 – Appendix J). These rules should include explosives quantities and segregation requirements for correct storage, security procedures, housekeeping rules and whom to contact for maintenance work approval.

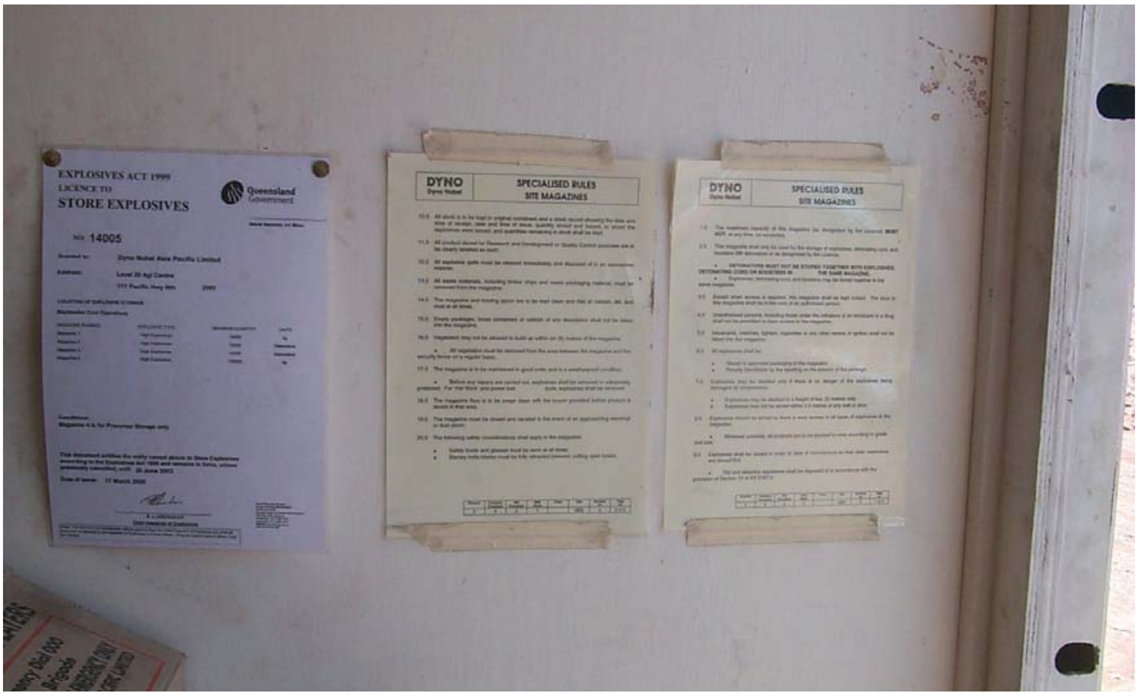

Figure 11: Magazine rules displayed in an easily viewable position inside the magazine

5.3.2 Prohibited Articles

Articles that are likely to cause fire or explosion such as cigarettes, matches, radio transmitters, mobile phones or rubbish of any description shall not be taken into the magazine (AS 2187.1). A receptacle should be provided at the magazine compound for discarding of such items before entering the magazine.

5.3.3 General Tidiness

The floor of the magazine should be kept clean of dirt, empty packaging and explosives. Floor mats, dustpans and brooms should be provided in the magazine to clean up. Spillages of explosives should be cleaned up and properly disposed of immediately (AS 2187.1). It is the responsibility of the magazine keeper to maintain the magazine in correct condition.

5.3.4 Opening Packages

Free flowing or friction/impact sensitive explosives should not be opened or left in the magazine in a condition that could instigate premature ignition. Only suitable tools appropriate for the opening of explosives shall be used to open packages (AS 2187.1). Explosives such as detonating cord and primers are at risk of explosion by friction and packages should be open using non-sparking tools.

5.3.5 Safety Equipment

Where appropriate safety equipment should be provided for all persons entering the magazine. This may include personal protective equipment such as anti-static footwear; fire retardant clothing, eye protection and gloves. Appropriate personal protective equipment signs should be displayed at the magazine entrance.

5.4 PROCEDURES

5.4.1 Theft or Loss of an Explosive

A system or written procedure is required to manage the situation following any attempted forced entry, theft or unaccountable shortage of an explosive (AS 2187.1). On detecting a theft or loss of an explosive, the authority holder, who is the person licensed to use or store explosives, is required to immediately give the Chief Inspector of Explosives written notice of the loss (*s55 Explosives Act 1999).* The site senior executive then needs to further notify an inspector of mines, district worker representative and the police *(s195 Mining and Quarrying Safety and Health Act 1999* and *s198 Coal Mining Safety and Health Act 1999).*

5.4.2 Accountability of Explosives

Sections 79 and 79A of the *Mining and Quarrying Safety and Health Regulation 2001* detail the regulatory requirements for dealing with the theft or loss of explosives and for personal accountabilities.

Every person who has immediate custody or control of any explosives, or a mine, has an obligation to account for and accurately detail what happens to the explosive when it leaves that person's custody or control.

5.4.3 Maintenance

A system or written procedure should be in place to inspect and maintain the magazine installations to the required standard. Any maintenance work is to be authorised in writing by the person appointed in charge of the magazine. Where any activity that is likely to generate heat is to be undertaken inside or on the outside of a magazine the contents of the magazine are to be emptied and cleaned (AS 2187.1). For hot work, a permit system is required, that includes a fire watch to be conducted extending at least one hour after the completion of the maintenance work.

5.4.4 Fire

An appropriate fire emergency procedure should be in place to deal with fire at or near the magazine. It should address evacuation of all personnel to a safe location and securing access to the magazine. The person in charge of the magazine in conjunction with the local emergency services should develop an emergency procedure.

In the case of a magazine fire if the explosive is not burning, carefully remove as much explosive as possible to a safe distance. However, if explosive is burning evacuate the area and do not attempt to fight the fire.

5.4.5 Thunderstorm and Dust Storms

A system or written procedure should be in place to deal with atmospheric electrical activity or a dust storm approaching a magazine area. The procedure should include provision for all uncharged explosives to be placed in the magazine, the magazine secured and any mobile manufacturing units should be relocated to a area that has been predetermined for such an event. All personnel are to be withdrawn to a designated safe area and no person should return until an authorised person determines that it is safe to do so.

6 TRANSPORT OF EXPLOSIVES

6.1 GENERAL VEHICLE REQUIREMENTS

For the safe and secure transport of explosives all vehicles should adhere to the following general requirements:

- be in sound mechanical condition and repair.
- provide adequate segregation of detonators from other explosives.
- all explosives to be transported in a safe and secure manner either in securely attached containers or other fit for purpose means.
- where packaged explosives may be in contact with interior surfaces, the surfaces should be kept in a clean condition and free from any projections that are likely to cause damage.
- before vehicles are serviced they needs to be thoroughly cleaned, and inspected by a person who has the necessary competence and then certified in writing by that person to be free of explosive residues.

6.2 HIGHER RISK TRANSPORT OF EXPLOSIVES

The degree of risk and subsequent requirements for vehicles carrying explosives on a mine site should be managed based on the types and quantities of explosives carried and the suitability and condition of the vehicle. Where large quantities of explosives are transported together there exists the possibility of sympathetic detonation. For the safe and secure transport of explosives, the vehicles used can reduce the risk associated with the function by implementing the following controls:

<u>Hazard – Fuel fire</u>

- Use a diesel engine vehicle in preference to petrol since petrol has a very low flash point.

<u>Hazard – Electrical fault</u>

- Have electrical wiring protected with conduit and also have a battery isolation switch located in an accessible position.

<u>Hazard – Exhaust flames/sparks</u>

- The vehicle should be fitted with a spark arrestor in accordance with AS 1019.

Hazard – Stray radio current

- Electrical detonators should not be transported in a vehicle with a radio transmitter unless the radio is capable of being isolated, locked out or the radio wattage is sufficiently below the required initiation power. This is to prevent blasting circuit being energized by the electric field produced by radio transmitters.

Hazard – Vehicle fire

- The vehicle should be fitted with a dry-powder fire extinguisher with a rating not less than 40 B(E), as specified in AS 1850. Alternatively, or in addition, an automatically operated AFFF (Aqueous Film Forming Foam) system can be utilised for a fire under the bonnet. Fire extinguishers are to fight a fire on the vehicle. However in the event of the explosive on fire do not attempt to extinguish the fire, retreat a safe distance from the vehicle.

Figure 12: Explosives vehicle at a mine site with separate explosives receptacles and fire extinguishers.

6.3 SECURITY AND SAFETY WHILE IN TRANSPORT

The following general precautions should be taken to ensure the security and safety of explosives during transport:

- Before leaving the magazine, the vehicle operator needs to ensure that all explosives are securely stowed and the quantity and type of explosives recorded.
- Explosives should be kept in their original boxes where possible to facilitate ready identification and containment.
- The transport route between the magazine and shot area should be pre-planned and all relevant mine personnel notified.
- No smoking or naked flames allowed within the vicinity of the vehicle. If any ignition sources are required they should be carried in a sealed container in an appropriate section of the vehicle.
- If the vehicle is unavoidably left unattended (e.g. emergency), it should be parked in an appropriate area with all receptacles and the vehicle locked.
- Where a vehicle is parked on a slope it should be suitably located to avoid the possibility of unplanned movement.

6.4 VEHICLE MARKINGS

Vehicles, that are used to carry explosives, need to be identifiable. This is to be achieved by being fitted with appropriate signs. Additionally, vehicles carrying explosives at mine sites are to be easily identified other than by signs, for example a flashing light of a distinctive colour is required, and this enables, in the underground environment, to show that explosives are being transported on the vehicle.

6.5 COMPETENCY OF PERSONS

Every person required to transport or handle explosives should be authorised. The *Mining and Quarrying Safety and Health Regulation 2001* requires that such persons be authorised in writing by the site senior executive.

6.6 VEHICLE ACCESS TO EXPLOSIVE STORAGE SECTION

Where vehicles have access to the explosives storage section of the magazine (e.g. forklifts), they need to have the necessary modifications for operation within the vicinity of an explosive area. The following requirements are specified in AS 2187.1 and are applicable to all powered vehicles:

- The vehicle shall not be started inside the explosive storage section of the magazine.
- The vehicle shall not be stored in the explosive storage section of the magazine.
- The vehicle shall not be refuelled, maintained or left running unattended within the vicinity of the magazine.

6.6.1 Internal Combustion Engines

Every internal combustion engine that powers a vehicle that accesses the explosive storage section is required to be equipped with suitable safety modifications for operation within an explosive area (AS 2187.1). The vehicle should be designed to protect the explosives against accidental ignition from heat, friction, pressure, incompatible materials, sparks and extraneous electricity. These hazards can be controlled as outlined in Section 5.1 and 5.2 of this Guidance Note.

6.6.2 Electric Motors

Every electric engine that powers a vehicle that accesses the explosive storage section is required by AS 1915, to be designed to the specifications for electrical equipment used in explosive atmospheres (AS 1915). This requirement is to protect the explosives against accidental ignition from heat, friction, pressure, incompatible materials, sparks and extraneous electricity. These hazards can be controlled as outlined in Section 5.1 and 5.2 of this Guidance Note.

6.7 MATERIALS HANDLING EQUIPMENT

6.7.1 Pumps

Where pumps are used for the transfer of bulk explosives there is a potential risk of an explosion initiated from heat, friction, sparks or electricity. The pump being fabricated from non-ferrous and non-combustible materials and electrical wiring being protected by conduit can largely control these hazards. Further guidance for the requirements of pumps in explosive areas can be attained from AS 2187.1.

6.7.2 Miscellaneous Equipment

Where miscellaneous equipment such as pallet trucks, trolleys or lifting appliances is used in the magazine there is a potential risk of an explosion initiated from heat or sparks. The equipment should be fabricated from non-ferrous and non-combustible materials and suitable for use within an explosive environment. Further guidance for miscellaneous equipment in explosive areas can be attained from AS 2187.1.

7 DRILLING BLASTHOLES

The main explosives risks associated with the drilling of blastholes are residual explosives from previous blast being initiated and poorly drilled holes creating an unsafe situation during firing. Blast geometry and design is imperative to create safe discharges and blast results required for mine operating parameters. Blasthole diameter, angle and length are required be adequately designed for the selected drill pattern. Correct drilling of blast designs will ensure that safety hazards such as overbreak, fly or airblast overpressure are significantly reduced. The following standards and procedures should be in place to ensure holes are drilled safely and create a safe discharge:

- The drilling site is prepared and drill holes marked out prior to drilling.
- Drilling is not carried out on any face or bench until it has been examined for misfires and suitably treated (refer to Section 9 of this Guidance Note for the treatment of misfires).
- The driller is provided with a drill design that specifying hole and collar lengths, direction and any expected geotechnical conditions.
- The driller records any unusual events during the drilling, for example cavities, soft rock, or an inability to drill designated holes.
- When positioning the drill rig along the edge of the bench the drill rig should be positioned so that the operator has a clear view of the edge at all times and is protected from falling.
- Whilst drilling near the bench edge the drill rig should be orientated so as to reduce the risk of the drill rig toppling.
- Drilling is not carried out in a hole where any part of it is considered within an unacceptable distance from a hole containing explosives.

Note: If it is essential to drill in, or relatively close to, an old hole or butt, it should be carried out only with remote-controlled drilling equipment (AS 2187.2). The operator and all personnel need to be withdrawn a safe distance from the old hole or butt.

8 EXPLOSIVES USE

8.1 RECORDS

8.1.1 Authority to use Explosives

In the “Foreword” to AS 2187.2 it states “it is a fundamental requirement that persons are competent and authorized by their employer to handle and use explosives. Competence, with respect to handling and use of explosives, is recognized through compliance with relevant legislation and by having documentation confirming one or both of the following:
Current and valid shot firing ticket or licence applicable in the relevant State or Territory.
Currency with relevant competencies or qualification, attained through a national training package (i.e. endorsed by Australian National Training Authority).
Employers of persons who handle and use explosives also have responsibilities with regard to the safe and secure management of explosives by ensuring that systems are in place through legislation and their management plan (if required) to provide a safe place of work. From a security viewpoint, the presence and security of explosives on a worksite is the ultimate responsibility of the employer.”

Under section 64 of the *Mining and Quarrying Safety and Health Regulation 2001*, the appointment should be authorised by the site senior executive and recorded in the mine record. Note that a person is considered competent if:

1. That person holds a current shotfirer’s license under the *Explosives Act 1999* that is applicable to the mine’s operations; or
2. The authorising person is satisfied the person has the competency accepted by the Advisory Council as qualifying the person to carry out the handling activity or has satisfactorily completed a competency based training program for carrying out the handling activity and is competent to carry it out.

For surface coalmines a shotfirer's licence under the *Explosives Act 1999*, is required for the person in charge whilst others involved in storage, handling or use of explosives are required to be competent in accordance with the relevant competencies in MNC04, the National Coal Training Package.

8.1.2 Blast Design

Blasts should be planned and designed by persons qualified or deemed competent to ensure required blast results. A suitable blast design should be provided to the shot firer or produced by the shot firer before charging. The blast timing should be designed to ensure a suitable explosive weight per delay to minimise vibration and fly and produce the required blast results.

8.1.3 Blast Parameters

Blasting records including all key parameters such as hole specification, burden and spacing, quantities of explosives used, tie-in pattern and number of delays should be documented in a manner consistent with Appendix A of AS 2187.2.

8.1.4 Charging Over Shifts

Where charging is conducted over several shifts there needs to be a written procedure in place for communication between shifts. This should include communicating from one shift to another, information about charging and blasted locations, holes loaded and any unique hazards or unusual circumstances associated with the shot.

There are many recorded incidents of persons driving both heavy equipment and other vehicles over unattended charged blastholes, both on surface and underground. There are many ways to control this hazard, but an exclusion barricade with signposting is usually effective.

8.2 SAFETY PRECAUTIONS

8.2.1 Safety Equipment

As required safety equipment is to be utilised whilst using explosives. The potential risks should be identified and suitable equipment selected for the procedure. This may include personal protective equipment such as fire retarding clothing, gloves, goggles and in some instances, anti-static footwear.

8.2.2 Handling of Explosives

Explosives are to be handled in a manner that prevents operations that could lead to ignition or initiation of explosives. Mishandling of explosives such as throwing of primers can result in ignition caused by impact with the ground.

8.2.3 Activities in Proximity

There should not be any activity undertaken within the proximity of the shot that could generate heat or sparks. This includes smoking, naked flames or operation of machinery. Unauthorised personnel and machinery not involved in the blasting operation needs to be removed a safe distance from the area (AS 2187.2).

8.2.4 Mobile Equipment on Non-electric Blast

Where mobile equipment is used on non-electric blasts there is a premature explosion hazard or misfire hazard due to running over of detonators. In addition a premature explosion hazard due to tensile (pulling) failure of signal tube resulting in "Snap, Slap and Shoot" phenomenon. Mobile vehicle access to the shot should be via clearly defined access routes and a spotter should be used to control vehicle movements in areas of restricted visibility.

8.2.5 Signage

Charging areas shall be clearly marked by appropriate warning signs. Where charged holes are to be left to sleep over night suitable warning signs and lighting is to be utilised. Approaching machinery and person needs to be able to clearly identify the charge area. If further warning is required an overnight guard can be utilised to direct persons and mobile equipment around the shot area.

8.2.6 Communication Devices

When using electric initiation, there is a possibility of the blasting circuit being energized by the electric field produced by radio transmitters, mobile telephones two ways, etc. Safe distances for electric detonators subject to radio frequency radiation can be determined from AS 2187.1 – Appendix I, however such devices should never be carried whilst holding or connecting electric explosives.

8.3 EXPLOSIVES SELECTION CRITERIA

8.3.1 Ground Conditions

When selecting a combination of explosives to be used for the ground conditions present, the objective is to ensure reliability and safety. Each blasthole that contains water should be carefully measured and recorded for specific treatment. To avoid the risk of a misfire wet blastholes should be charged with an explosive with the appropriate water resistant properties. Before using ANFO in damp blastholes the effect of water on the explosive column should be considered. If damp blastholes are required to sleep, an explosive with some water resistant properties is required. A clear identification system is required to ensure appropriate priming and charging of wet blastholes. For example spray painting the depth of water next to the hole.

8.3.2 Blasting in Hot Material

Hot material is a substance that exhibits a temperature between 55°C and 100°C. Explosives may detonate prematurely if exposed to high temperatures. Temperature measurements should be taken where hole temperatures are expected to exceed 55°C. It is not possible to recommend a safe exposure time for explosives at various temperatures, because of the wide range of products available and ground conditions encountered. There needs to be a written procedure for blasting in hot ground and guidance for this procedure should be sought from the explosives manufacturer and reference to AS 2187.2.

8.3.3 Blasting in Oxidizing / Reactive Ground

Both sulphide minerals and coal oxidise rapidly when broken and exposed to air. In operations where such minerals become dispersed as dusts, sparks or heat flash from blasting can initiate an explosion. The explosives to be used and the charging practices to be adopted should be developed in consultation with explosive manufacturers. There needs to be a written procedure for blasting in oxidising or reactive ground and guidance for this procedure should be sought from the explosives manufacturer and the following general precautions should be considered:

- Sheathing of ANFO explosives to inhibit exothermic reaction between the explosives and the material to be blasted.
- Wash down all exposed surfaces within the blast vicinity to make fuel unavailable for a secondary explosion.

- Use adequate stemming in all blastholes to inhibit the development of a flame front at the collar of a blasthole.
- Detonating cord is capable of raising and igniting a dust therefore low explosive strength detonating cord that is not in contact with rocks or dust should be used.

Selection of the correct stemming for such conditions is most important; usually a clay-cock stemming is preferred.

8.4 CHARGING OPERATIONS

8.4.1 Clearing and Measuring Blastholes

All blastholes should be checked prior to loading to ensure they are clear and drilled to the correct depth. Any blocked holes should be cleared with a charging pole or steel bar. All blastholes should have their depth measured and recorded immediately before charging. Short holes can lead to overcharging and digging problems, while overcharged blastholes can cause fly and airblast hazards.

8.4.2 Distribution of Pegs and Primers

The pegs should be positioned in a standardised pattern in relation to each hole so that when the hole is stemmed, the loader can work in a uniform manner. The peg needs to be securely placed in the drill cuttings so that down lines are not drawn into the hole. Explosive accessories should be distributed and placed along side the peg near the hole. They should not be placed in the drill cuttings or in a position where a vehicle could possibly run over a primer causing an unplanned explosion.

8.4.3 Priming

Primer cartridges should be handled carefully and the down line used to form the primer of suitable explosive strength (AS 2187.2). The primer should be located in the hole without using undue force and care taken to avoid the presence of extraneous matter between cartridges. The following general precautions should be taken whilst priming blastholes:

- Check explosives for damage.
- Any damaged explosive is to be disposed of appropriately and reported to the shotfirer (refer to Section 10).

- Down line securely tied to a peg to avoid primer being drawn into the hole (slumping).
- Ensure that the tails of the down lines are neatly placed at the base of the peg so that they are secure and away from any vehicle movements.
- If a down line or primer is lost down the hole the shotfirer should be notified and the loss recorded and the hole reprimed.
- Never remove a jammed primer by applying excessive force. Multiple priming should be used if original primer cannot be removed.

8.4.4 Bulk Explosives

Care is required in the loading of free flowing granular explosives and pumpable explosives to avoid damage to down lines or allowing them to be pulled into the hole (AS 2187.2). The following general precautions should be taken whilst using bulk explosives:

- The shot should be loaded such that the holes furthermost from the access point are loaded first.
- Charging should be done as to prevent damage to the down lines and excessive spillage around the hole.
- The product should be regularly sampled for quality and density to avoid the possibility of desensitisation by compression (dead pressing).
- Where the truck empties during the charging of a particular hole, the hole should be suitably identified to ensure that the loading is completed prior to firing.

8.4.4.1 Mobile Manufacturing Vehicle

Where a mobile manufacturing unit is used to pump the explosive into the borehole, the vehicle is required to have the necessary specifications as outlined in AS 2187.2 and Section 5 (Transport of Explosives) of this Guidance Note. The following general precaution should be taken while using bulk explosives vehicles:

- A pre start check needs to be conducted to ensure that the vehicle is in sound condition and repair.

- All personnel operating the mobile manufacturing unit need to be competent to monitor any support equipment associated with the delivery of the explosives e.g. pump pressure gauges, emergency shut off.
- The mixing and delivery system needs to be conducted so that the operator either has full view of explosives delivery points, or has adequate communication with another operator who does have such a view.
- Mobile vehicle access to the shot should be via clearly defined access routes designated by the shotfirer and a spotter used to control vehicle movements in areas of restricted visibility.
- When working near the edge of the bench a risk assessment should be performed to ascertain what types of hazard controlling mechanisms will be needed. From these results, it is then possible to determine if a secure harness system is needed to reduce the risk of falling.
- Before access to public roads, any explosive residue should be washed with water from pump hoses, explosive mixing receptacles etc.

8.4.4.2 Pneumatic Charging

Where pneumatic charging devices are used, they shall be effectively earthed. All charging hose are required to be semi-conductive and have a resistance of not less than 15000 ohms/m and not more than 2 mega ohms for its total length (AS 2187.2). Best practice for operation of a pneumatic charging is for antistatic footwear to be used and for the operators to remove their gloves and earth themselves before touching any electric detonator.

8.4.5 Sleep Time in Blastholes

Sleep time is defined as the time between charging and firing the shot. The sleep time of an explosive is important because explosive can often deteriorate under unfavourable conditions. Conditions such as heat, cold, humidity and water cause the explosive to deteriorate possibly causing failure of the explosives. Product deterioration may result in a charge, or part of a charge, failing to explode or misfiring. Best practice is for explosives to be charged and fired at the earliest practicable time. In large shots, load-and-shoot firing eliminates a number of possible processes of deterioration. In the *Coal Mining Safety and Health Regulation 2001*, surface coal mining operations should include in their safety and health management system the stated allowable period for the explosives to remain in the ground before being detonated.

8.5 STEMMING

Care should be taken to ensure that the down line connected to the primer is not damaged during the placing of stemming material (AS 2187.2). The following general precautions should be taken whilst stemming blastholes:

- A check should be conducted to ensure that the hole has been loaded with explosives and that the collar length is correct.
- The tension on the down lines should be checked to determine whether the primers are in the product.
- Ensure that the stemming material is of a suitable quality and does not contain large fragments of rock that may cause damage to down lines.
- If loading with a front-end loader the operator should ensure that the bucket approaches the hole from the side opposite to the peg securing the initiating line (refer to section 7.5.2).

- Blastholes charged with gassed bulk explosives should be left unstemmed for the recommended time to allow for gas bubble expansion.
- All loaded holes should be stemmed prior to the end of the shift. In cases where this is not possible consideration should be given to blocking the hole with a gasbag or covering it with drill cuttings.

8.5.1 Tamping Rods

Only wooden or other non-metallic rods are to be used when tamping to prevent the possibility of an explosion from shock, friction or impact. Take care and ensure that the safety fuse, lead wires, detonating cord or signal tube connected to the primer are not damaged during the tamping process (AS 2187.2). **Note:** A primer should never be tamped due to the risk of explosion caused by impact.

8.5.2 Front-End Loaders

Where loaders are used for the loading of stemming into charged holes the vehicle is required to have the necessary modifications for operation within the vicinity of an explosive area (AS 2187.1). Stemming should be completed as soon as possible and care should be taken to ensure that down lines are not accidentally run over or caught up in the loader (snap, slap, shoot phenomenon). A spotter should be used to control vehicle movements in areas of restricted visibility.

8.6 INITIATION

The following procedures should be considered as hazard controls whilst tying up of shots using non-electric, detonating cord or electric initiated systems:

- Initiation tie-in should not commence until all operating equipment has completed operations in that section of the blast area and the section to be tied-in has been clearly isolated and defined.
- Personnel carrying out the tie-up should have a tie-up plan.
- The tie-in should be conducted in a planned methodical and approved manner.
- After tying up the shot, the tie-up should be checked to confirm that it is correct. The shotfirer is ultimately responsible for the tie-in and is obligated to personally check the tie-in before firing.

- In the event of a possible electrical storm developing during the tie-in the person in charge has to assess the immediacy of the storm and decide to fire or disconnect the control row and clear the blast area. **Note:** High-energy discharges of electricity are capable of detonating various forms of non-electric signal tube.

8.6.1 Non-Electric Firing

A procedure should be in place that provides a safe system of hook-up of non-electric explosives. Connections and detonating cord charge weight (grams of explosives per metre) should be in accordance with manufacturers instructions (AS 2187.1).

8.6.2 Electric Firing

Electric detonators are susceptible to accidental initiation by sources of stray extraneous electricity (AS 2187.2). To reduce the risk of accidental ignition the following controls need to be addressed and maintained:

- Keep wire ends, connectors and fittings, shorted (twisted) until immediately prior to use.
- Do not use electric detonators near power lines or other potential sources of electric current.
- Cease all surface charging operations if an electrical storm is imminent. Lightning detector devices can be used to track storms and lightning strikes giving greater determination of whether surface charging operations should be ceased. The type of detector selected should be appropriate for the type of charging operation, and use of a detector needs to be in accordance with site and manufacturers instructions
- Keep detonators clear of the ground until charging commences.
- Never hold an electronic delay detonator while it is being tested or programmed.
- Do not use plastic liners in blastholes unless they are genuinely and permanently conductive.

8.6.2.1 Exploders

Only exploders suited to the task should be selected by the shotfirer. Exploder’s are preferably stored in a clean dry place and the shotfirer is required to ensure that exploders are maintained in correct working order (AS 2187.2).

8.6.2.2 Circuit Testers

Before connecting the firing circuit, the detonating circuit and firing circuit shall be checked to ensure continuity of the circuit. It should be assumed that when testing an explosion might occur and appropriate precautions are required to clear the blasting area and choose a safe location for testing. The shotfirer is responsible to ensure that the circuit tester used is maintained in correct working order (AS 2187.2).

8.6.2.3 Electric Firing Circuits

Where a shot firing cable is used to initiate a blast, the person who uses the cable should ensure the cable is adequately protected and insulated for the conditions under which the blasting is to be carried out. Adequate precautions are essential to prevent the cable from coming into contact with electrical installations, metal object and areas where possible damage can be caused to the insulating cover.

The cable is to be kept short-circuited at each end during the charging operation and at the power end while the leads from the detonators are being connected to each other or to the firing cables. The short circuit at the power end should not be opened for connection to the source power until all persons have been withdrawn from the blasting area. As soon as the blast has been fired the short circuit has to be re-established by physical disconnection from the exploder.

9 FIRING

9.1 BLAST PERIMETER

The person responsible for the firing of the shot is the person who has to determine the exclusion zone and the location or distance from the shot of the guards. This should be determined from a risk assessment taking into consideration technical concerns or known hazards in the shot.

9.2 WARNING PROCEDURES

9.2.1 External Parties

It may necessary to pre-notify certain external parties before conducting blasts. This may be adjoining mines, residences or such things as warning air traffic controllers against low flying aircraft movements.

9.2.2 Withdraw of Personnel

Persons in the vicinity of the blasting area need to be warned and withdrawn to a safe area outside the exclusion zone before firing the shot. They should not return until the 'all clear' signal is given (AS 2187.2). Each person involved in firing the blast has to be able to reach a predetermined safe position, by walking at normal pace, before the blasting happens.

9.2.3 Audible Warning device

An audible warning device can be used to indicate that a blast is going to take place. The device should produce a sound that is clearly identifiable from any other sound, which might be used for warning or operational signals on the site (AS 2187.2). Signs should be provided indicating the audible warning device is a signal that blasting is taking place.

9.2.4 Radio Signal

Where a radio is used to give an audible signal all personnel onsite should clearly understand the implication of the signal. Whilst the signal is audible all personnel should maintain radio silence, except for extraordinary circumstances.

Where there is more than one radio channel used on a site, best practice is to select a blasting radio channel that is always used for this purpose.

Where there are likely to be users of other channel in the blast locality, then the firing warning should be broadcast simultaneously on all those channels.

9.2.5 Access Guards

Adequate roadblocks or warning signs or, where necessary guards shall be placed along drives to prevent unauthorised machinery or people entering the blast area or exclusion zone (AS 2187.2). All means of entry to the blasting area need to have guards to prevent unauthorised access or effective barricades erected across each place of entry.

Figure 13: Access guard with signage

9.2.5.1 Competency of Guard

The blast guard is required to understand where their expected location is and the sequence of events that will take place while the shot is being fired. They should park their vehicle at approx. 90 degrees to prevent the flow of traffic and have suitable markings. If someone does drive past the blast area they shall notify the person in charge of the blast i.e. the shotfirer, immediately.

9.2.5.2 Guard Location Sheet

Where there are numerous guards required, best practice is for a guard location and radio procedure record to be kept by the shotfirer. This document can include the blast guards' names and responsibilities. A pre-firing security check is then to be undertaken by the shot firer using the radio and a map of the blast area to confirm the guard's locations. This record alleviates the possibility of a blast guard not being involved in the final check by the shot firer prior to firing.

9.3 BLASTPED FIRING

The BlastPED EXEL System allows remote, centralised blasting using a radio based link between the shot firer and blast site. Where a BlastPED is used for remote firing the user needs to ensure that the remote receiver is on and the signal tube connected to the 'sparker' only immediately prior to firing. Once the area has been cleared of personnel and permission to fire received, the master control operator can turn the controller on (from a remote and safe location), enter their PIN, and check the status of the receiver via the encoded radio link between the units. The 'arm and blast' commands can then be transmitted.

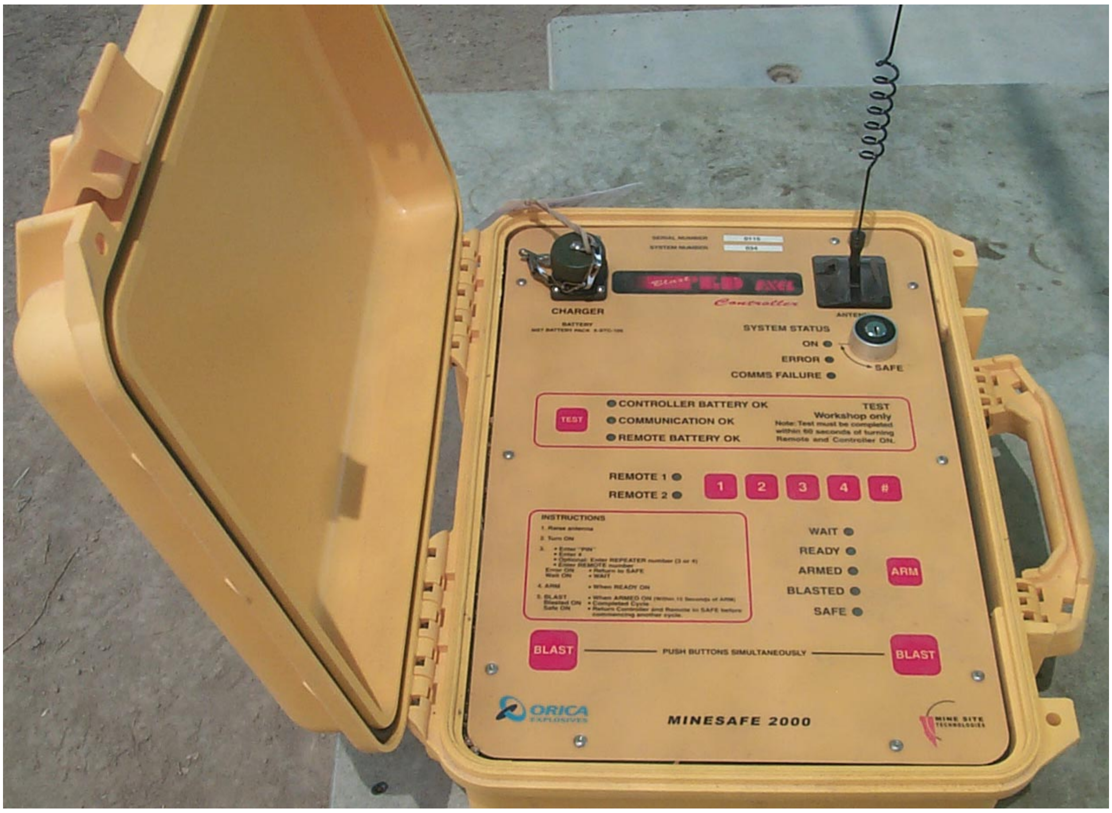

Figure 14: Master Control Unit used in BlastPED Excel remote firing

9.4 BLAST MONITORING

Where blasting is conducted in close proximity to buildings or structures, ground vibration and airblast overpressure needs to be monitored to record the blast characteristics and in the longer term provide help to ensure that the probability of damage or human discomfort is kept to a minimum. Where protection from fly is necessary, precautions such as the use of blasting mats or other suitable cover and limiting the explosive weight per delay can be used.

10 POST- FIRING

10.1 EXAMINATION OF SHOT

The shot firer is responsible for examining the site to ensure that no unfired explosives or additional hazards have been created and that it is suitable for work to commence again. Before examining the shot, consider the potential for hazards such as noxious fumes to be present and the ground integrity of the immediate and surrounding area. In surface blasting these hazards can be effectively controlled by using sight and smell for determination of risk acceptability. If no misfires are evident, the 'all clear' signal can be given and the blast guards dismissed.

10.2 MISFIRES

A written procedure or standard work instruction is required that provides a safe system of entry and inspection for misfires and their treatment. It is to include the method used for the detection of a misfire. The precautionary interval allowed before the shotfirer can conduct an examination of the site and the recording and treatment of misfires. A written record of the location and details of the misfired shot is to be kept.

By definition in *the Explosives Act 1999* an "explosive incident" is an event, including a misfire, with the potential to cause death or injury to persons or unexpected damage to property and as such is required to be reported to the Chief Inspector of Explosives *(s55 Explosives Act 1999*).

10.2.1 Determination of Misfires

Every hole that has been charged with explosives is considered a misfire until proven otherwise. Methods used to determine if a misfire has occurred are based on many factors, including appropriate training, standard operating procedures and guidance from AS 2187.2. There are certain events that indicate a misfire has occurred, these include:

(a) If using safety fuse, the number of shots counted is less than the number of holes fired or a disagreement on the count of shots fired.

(b) If damaged safety fuse, detonating cord, lead wires or unfired signal tube is exposed in a hole that has been fired.

(c) Evidence of cutoffs, butts or remaining portions of holes (e.g. boulders with drill holes) that are suspected of containing explosives has been shown to be free of explosives.

(d) Holes that have slumped between charging and firing due to dispersion of the explosive from water ingress or through joints and fissures.

(e) If during the normal excavation of the blasted ground, uninitiated or residual explosives are found or the load out machine encounters poor ‘diggability’ of the blasted ground.

The shotfirer should conduct a careful examination amongst the debris for explosives, which if present shall be removed to a safe place and disposed of in accordance with Section 10.1 of this Guidance Note.

10.2.2 Treatment of Misfires

The method used to treat a misfire should be based on a risk assessment and a combination of other factors, including appropriate training, standard operating procedures and information in AS 2187.2. The following methods can be utilised for the treatment of potential and determined misfires:

(a) To remove the hazard of residual explosives and blasting gases trapped within the blast it is best practice to use water sprinklers on the shot area immediately after firing.

(b) Stemming may be removed by applying water under pressure, compressed air, or a mixture of water and compressed air through a non-ferrous blowpipe. After removal a fresh primer can be inserted and the blasthole stemmed and fired. **Note:** The use of compressed air alone is not encouraged. Where it is used, special precautions should be taken to minimise the dangers from static electricity and impact (AS 2187.2)

(c) If the down lines are considered to be in good condition, an attempt may be made to refire.

(d) Drilling a relieving hole parallel to the original blasthole and charging and firing.

(e) If a misfire is suspected at any time during mining operations, the operations have to cease and a detailed inspection conducted by a shotfirer, or competent person.

11 DISPOSAL OF SURPLUS AND DEFECTIVE EXPLOSIVES

11.1 EXPLOSIVES

Explosives that are considered unsafe to transport or for storage are required to be destroyed in a safe manner in compliance with AS2187.1 – Section 8. Explosives are not to be thrown away, buried or placed with garbage but treated in the following approach:

(a) Explosives other than detonators can be disposed of by burning, detonating (providing a fresh charge is used and no detonators are inserted into deteriorated explosives) and by dissolving in water.

(b) Detonators and detonating relays may be disposed of by either detonation or burning in a furnace specially constructed and approved for the purpose.

11.2 EXPLOSIVE PACKAGING

Best Practice for the disposal of explosives is for a system to be in place so that empty explosive packaging is double checked by independent people before disposal. In instances where explosive packaging is to be used for other applications the labels should be clearly marked as to not create uncertainty of the packagings contents. Disposing of the explosives in a separate container from normal waste will ensure that discrepancies resulting from accidental disposal can possibly be traced.

12 LIST OF REFERENCED DOCUMENTS

Australian Standards

AS 1019	Internal combustion engines – Spark emission control devices
AS 1768	Lightning protection
AS 1850	Portable fire extinguishers – Classification, rating and performance testing
AS 1915	Electrical equipment for explosive atmospheres – Battery-operated vehicles
AS 2187.0	Explosives – Storage, transport and use Part 0: Terminology
AS 2187.1	Explosives – Storage, transport and use Part 1: Storage
AS 2187.2	Explosives – Storage and use Part 2: Use of explosives
AS 2188	Relocatable magazines for storage
AS 3000	Electrical equipment in hazardous locations
AS 4360	A basic introduction to managing risk

Other Publications

1) Australian Explosives Code 2000 – Australian Code for the Transport of Explosives by Road and Rail

2) ESC-1 Electrical Installations and Equipment in Hazardous Areas at Explosives Manufacturing Facilities and Storage Areas

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ORDER

COAL MINERS' HEALTH SCHEME

The Queensland Coal Board,
Brisbane, 8th December, 1982.

THE Queensland Coal Board acting in pursuance of authority vested in it under the *Coal Industry (Control) Act* 1948-1978, hereby makes the following Order, the provisions of which are to come into force on and from the first day of January, 1983.

P. J. CRANITCH, Secretary.

An order for the compulsory medical examination of new entrants to the Coal Mining Industry and for the medical examination of employees of the Coal Industry under certain circumstances, made in accordance with the authority granted to The Queensland Coal Board by the *Coal Industry (Control) Act* 1948-1978.

The Queensland Coal Board pursuant to the authority granted to it by the *Coal Industry (Control) Act* 1948-1978 hereby orders as follows:—

Medical Examination of New Entrants—

All new entrants to the coal mining industry must be medically examined and certified fit for employment by an examining Medical Officer approved by The Queensland Coal Board before they are permitted to work in the industry.

This examination is compulsory for all workers before being employed in or about a coal mine engaged in mining operations.

The term "new entrant" means a person who has not previously worked in the industry, or who has not worked in the industry during the previous (2) years.

Other Definitions—

Authorised Employment Officer.—An officer of the colliery appointed by the Colliery Company to act on their behalf in employment matters.

Examining Medical Officer.—A medical practitioner nominated by the Colliery Company and approved by The Queensland Coal Board to carry out medical examinations in accordance with this order.

1. Procedure. When it is desired to employ a new entrant, the colliery management shall hand him a letter requesting an approved medical officer to examine him for employment in the coal mining industry.

The applicant is to be also handed a copy of the "Identification Card" which must be signed by him in the presence of the authorised employment officer of the colliery who must also affix his signature on the card.

The applicant must present this card to the authorised examining Medical Officer and again sign the card in his presence.

The card is to be completed by the examining Medical Officer and returned by registered mail in the envelope supplied with the card to—

The Secretary,
The Queensland Coal Board,
G.P.O. Box 384,
Brisbane, Q., 4001.

2. Result of Medical Examination—Issue of Medical Certificates. A person found fit by the authorised examining Medical Officer is to be given a letter on the letterhead of the examining Medical Officer in the following form:—

I have examined the bearer (*Name of Bearer*) and advise that I certify him fit for duty on a mine site.

Signed: Authorised Medical Officer.
Date:

The Certificate may be posted to his home address unless the applicant makes other arrangements.

A duplicate of the Certificate is to be forwarded both to the authorised employment officer of the colliery and to the Secretary, The Queensland Coal Board, together with the Identification Card.

NOTE.—The Medical Certificate so issued is of indefinite currency so long as the holder is employed in the coal mining industry and remains in employment in the coal mining industry without a break of continuity of more than two (2) years.

If a new entrant is found to be UNFIT for employment in the industry, he will be so informed by the examining Medical Officer and a letter advising of his unfitness will be sent to the colliery manager who referred him for medical examination.

The examining Medical Officer may find that an applicant is fit for light or specified limited duties and he may advise both the applicant and the colliery of his opinion.

If the manager of the colliery desires to employ such a person then the procedure for the issue of Restricted Medical Certificates shall apply.

The Restricted Certificate shall be issued in letter form in duplicate —one copy for the applicant and one for the colliery.

Restricted Medical Certificates—

Where a new entrant on examination is found to have a defect such as should render him unfit in accordance with the medical standards required by the Board, he may, in the case of certain types of defect, at the express request of a colliery manager, be issued with a "Restricted Certificate". Such a certificate will be endorsed with a notation that he is fit only for a specified range of duties and only at the particular colliery referring him for examination. The endorsement may also restrict the currency of the certificate, so that he will be required to present himself for further examination at intervals recommended by the examining Medical Officer for its renewal.

It is emphasised that such a restricted certificate will only be issued *at the express request of the colliery manager,* e.g. in the case of an office employee or a skilled tradesman or someone required for a particular type of duty. Colliery Managers are requested to state on the letter referring such a person that he is "particularly required for a specific job or range of jobs even though suffering from some minor defect". If this has not been done, and the new entrant when advised of his rejection states that he is required for a key position at the colliery, the matter may be referred back to the manager for further recommendation.

3. (a) Payment of Medical Examination Expenses. All costs are to be met by the colliery proprietor.

(b) Payment of Travelling Expenses for Medical Examination. The colliery proprietor will pay reasonable travelling expenses to cater for any out of town expenses to the applicant or provide the transport and other facilities by arrangement.

4. Medical Examination. The examining Medical Officer shall be versed in the fitness needs for employees in most job functions of the colliery for whom the examination is being made and the need to recognise that the employee may be required to serve in the more arduous areas must be understood.

All forms numbering Form No. 4 to Form No. 6 inclusive are to be completed. Examining Medical Officers are to take note of Form No. 1—Queensland Coal Board Pre-employment Medical Examination for the coal mining industry in Queensland and its attachment Form No. 2—Queensland Coal Board—Medical Examinations Guidelines, when carrying out their examinations.

Form No. 4 to Form No. 6 inclusive are to be coded for identification and (See requirement for Form No. 3 Section (1) Procedure) together with the large Chest X-ray are to be forwarded to—

The Medical Records Officer,
The Queensland Coal Board,
G.P.O. Box 384,
Brisbane, Q., 4001.

(Note.—Please ensure the X-ray is packaged to avoid folding or damage. Should the Medical Officer elect to receive only the X-ray report then the Radiographer should be requested to send the X-ray to the above shown address.)

If it can be shown to the Board's satisfaction that a mine worker examined as a new entrant misled the Bureau Medical Officer, at that examination, concerning his state of health, the Board may take action to withdraw his Certificate of Fitness and advise to that effect the colliery management currently employing him and the union concerned.

5. Issue and Handling of History of Employment and Medical Examination Card (Form No. 7). (a) On sighting of the Certificate of Fitness the manager of the colliery shall forthwith issue the applicant with a History of Employment and Medical Examination Card (Form No. 7).

The manager shall certify that the applicant is the holder of a Certificate of Fitness and shall show the date of commencement of employment.

(b) An employee is required to present his card to the employer—

(i) when ceasing employment at a colliery. Managers are requested to insert the date on which employment is terminated and return the card immediately to the employee;

(ii) when commencing employment at another colliery. The card is to be sighted by the manager, and the date of commencement inserted, after which it should be returned immediately to the employee. The employee will be required to produce the card for endorsement at each subsequent medical examination.

(iii) The colliery manager shall advise The Queensland Coal Board of the names and addresses of all terminating employees and all employees who are holders of a current Certificate of Fitness.

(c) Lost Certificates—Lost cards may be replaced on completion of a written declaration by the man concerned to the manager of the colliery at which he was last employed or is currently employed.

6. Medical Examination of Mineworkers Already in the Industry. (a) A mineworker may for good cause shown, request the manager of a colliery to arrange a full or partial medical examination. The manager of the colliery on being assured that the request is not of a frivolous nature and has likely bearing on his employment of the applicant shall make the necessary arrangements. Similarly, the manager of a colliery may require a mineworker to undergo a medical examination by an authorised examining Medical Officer and make all necessary arrangements.

(b) An employee who has not been given a pre-entry medical examination shall be deemed to be the holder of a Certificate of Fitness. However, such employee may be required to undergo an equivalent examination to provide health data.

(c) A colliery manager shall have the right to decide if medical examinations are to be carried out on employees. Such examinations may be repeatable approximately every five years and the costs are to be met by the colliery proprietor in accordance with the system laid down in Section 3.

The Secretary, The Queensland Coal Board, shall be notified of the intention to institute such examinations prior to implementation.

(d) An employee is to be given not less than two weeks notice of his requirement to attend for medical examination. The colliery management shall be responsible for making the necessary appointments and arrangements.

(e) The examining Medical Officer is required to return completed Forms No. 4 to No. 6 inclusive to The Queensland Coal Board and as for pre-entry examination the colliery management will issue Form 3 to the employee after deleting the words New Employees. Subsequently, the procedure for Form No. 3 as previously set out for pre-entry shall prevail to ensure privacy.

7. Reports of Medical Examinations. Following medical examinations the individual concerned, his doctor, or with his written permission some other agent, will be notified on requests of the results of his examination.

8. Abnormalities Involving Safety Found at Medical Examinations. Where the examining Medical Officer is of the opinion that an abnormal condition exists which when taking into account the mineworkers classification, would involve a serious risk to the safety of the mineworkers himself and/or his fellow workers if he were to continue at work or in his particular classification at a colliery, the examining Medical Officer shall inform the mineworker of his diagnosis and the danger involved and, at the same time, shall forthwith notify details of the danger involved, having regard to the man's classification to the colliery manager who shall immediately confer on the matter with the person concerned. Where medical evidence is such that the danger arising from the man's condition does not apply to all classifications at the colliery, every effort shall be made by both parties to see that suitable employment at the colliery is found.

9. Payment for Attendance for Medical Examination. For the purposes of payment for working time lost for such examinations the attendance shall be regarded as equivalent to time worked.

If the employee is examined when on a rostered day off or during the day when on afternoon or night shift and does not lose working time, he will be paid for time occupied with a maximum of one shift.

Payment is to be made by the employer at the rate the employee would have received had he attended for work.

10. Confirmation of Certificate. An authorised employment officer of a colliery is entitled to request of the Board, confirmation that a Certificate of Fitness exists.

11. Request for Copy of Medical Records. An approved examining Medical Officer may request from the Board a copy of previous medical examinations of a person, provided he submits an authority for such request signed by that person or alternatively has good medical reason to the satisfaction of the Board for the making of the particular request.

Medical records which the Board may have in its possession from time to time in pursuance of the operation of this order shall be classified as confidential by the Board.

An officer or employee of the Board shall not reveal any personal details of any medical record without the authority and consent of a Member of the Board.

12. Reciprocity—Joint Coal Board. The holder of a current Certificate of Fitness issued by the Joint Coal Board shall be regarded as the holder of a Certificate of Fitness pursuant to the respective Order of The Queensland Coal Board.

13. Form No. 1 to Form No. 8 are to be construed as being part of this Order.

The Official Seal of The Queensland Coal Board was hereto affixed on the nineteenth day of October, 1982, by Patrick John Cranitch, Secretary to the Board, the officer designated to affix such seal, in the presence of Jack Tunstall Woods, Mervyn Lewis Noume, and William James Platt.	J. T. WOODS, Chairman. M. L. NOUME, Member. W. J. PLATT, Member.

P. J. CRANITCH, J.P., Secretary.

Form No. 1

THE QUEENSLAND COAL BOARD

PRE-EMPLOYMENT MEDICAL EXAMINATION FOR THE COAL MINING INDUSTRY IN QUEENSLAND

To The Examining Medical Officer,

Dear Doctor,

I am advised that you have agreed to carry out pre-medical examinations of applicants seeking entry into the coal mining industry of Queensland. It will be necessary for you to familiarise yourself with the procedures required by The Queensland Coal Board as set out in the accompanying copy of the Order of the Board covering the Coal Miners' Health Scheme.

Certain health standards are needed to qualify for entry, these having been agreed upon by Colliery Proprietors, Mining Unions and The Queensland Coal Board.

A document has been prepared for your guidance in carrying out these medical examinations and copy is attached as also are symptom and industrial history questionnaires, and medical examination sheet. The symptom questionnaire is self explanatory and mainly can be completed by a tick in the appropriate yes or no column.

Under "Industrial History" since some of the applicants may have a mining past, it is desirable that the total number of years so employed be mentioned and if it can be ascertained—the length of time at the coal face, either underground or on the surface. All other jobs and length of time in them are to be listed.

The clinical examination is standard and if possible under respiratory function test a peak flow or F.E.V. should be recorded.

The full programme of examination involves a large chest X-ray to the appropriate standards and it is recognised that these may not be readily available at your centre. The Queensland Coal Board on the advice of the Director of Tuberculosis has approved the following X-ray clinics as capable of providing acceptable X-ray pictures:—

*
*
*
*

Obviously if the clinical examination reveals that the applicant is unfit there may be no need for the X-ray examination.

Any X-ray examination will only be carried out when authorised by you in the normal way. However, your referral should indicate that the X-ray is required for "a coal industry applicant". The colliery proprietor will make any special transport arrangements and pay the X-ray account.

Again an audiogram to prescribed standard is required. The colliery management will arrange for this to be done and a copy forwarded to you if you do not have the facilities yourself. A copy of the audiogram must be kept by the colliery and is to be provided should you carry out the examination.

As it is intended to avoid embarrassment to both the applicants and their prospective employers your co-operation is requested.

It is important that the applicant record his signature on the special "Identification" forms provided for future identification. All other records to be forwarded to the Board are to be code numbered to preserve privacy. The code number applied to those documents for any particular applicant shall match that given by the examining Medical Officer to the Identification Card.

It is strongly recommended that the coding system adopted by you be agreed with The Queensland Coal Board.

A simple suggested code would be—

First two letters from the name of the town in which you reside.

Next two letters from your name.

A number in sequence starting at 100 for each applicant.

For example—

Town	—	Blackwater
Officer's Name	—	John Smith
Applicant was the 22nd examined		
Code would be	—	BL JS 122

(Signed)
Secretary
The Queensland Coal Board

Form No. 2

THE QUEENSLAND COAL BOARD

MEDICAL EXAMINATIONS GUIDELINES

This document has been prepared as a guide for examining medical officers and indicates the main areas for rejection on medical grounds. It is emphasised that the finding of temporary disability in any of the areas which can be effectively treated may be grounds for suggesting that the applicant seek such treatment before re-applying for a vacancy.

If the temporary disability can be effectively treated forthwith and in the opinion of the examining medical officer that the disability or the treatment is not a barrier to employment then under such circumstances he may recommend accordingly.

Reference is also made to the paragraph dealing with Restricted Medical Certificates detailed in the Procedure Instructions Schedule. In the examination it would therefore seem reasonable to apply these guidelines with the examining officer using his own judgment on the applicant's suitability for the particular position.

It is emphasised that a medical examination should not be a mode for rejection, but rather the establishment of fitness for duty.

Guidelines are:—

(a) Any evidence, clinically or radiologically of present or past pulmonary disease. This includes a history of asthma necessitating appreciable loss of time from work.

The main concerns here are tuberculosis and pneumoconiosis, the latter being particularly important for men who have spent a number of years in coal or other mines. A history of asthma or established chronic bronchitis will render unacceptable.

(b) Cardiac disease—including hypertension and accept an upper limit of resting diastolic pressure as 100 mms. of mercury (90 mms. for men under 40 years of age). Hypertension requiring continued treatment for control may render unacceptable.

(c) Defective vision. There must be reasonable vision with each eye without the use of correction. The minimum standard is:—

(i) Uncorrect vision: Not less than 6/24 in one eye and not less than 6/60 in the other.

(ii) Corrected with glasses: Not less than 6/12 in both eyes.

If glasses are required, vision should comply with both the above standards. Loss of one eye rejects.

(d) Hearing—inability to hear ordinary conversation or with audiometry a binaural loss of 20% or greater will reject. Chronic otorrhoea is unacceptable.

(e) Epilepsy or a history of "fits"—self explanatory.

(f) Disability resulting from previous injury or disease with special attention to the back. A history of disc lesion causing loss of time or a previous laminectomy will reject.

This covers a wide variety of conditions. Amongst them are significant locomotor defects such as major amputation or if unable to wear heavy boots, work in cramped positions, kneel, stoop or crawl. A good hand grip is needed for efficient use of tools, manipulation of levers or controls. Under diseases we include diabetes, renal disease, anaemia, mental defect or hernia.

Diabetes—diabetics treated with diet alone or with oral blood sugar agents are generally capable of performing any job. Diabetics treated with insulin should not work underground or where an unexpected insulin reaction might cause injury to themselves or others. There is also the time distance problem to obtain assistance.

Control of diabetes must be acceptable to the examining medical officer.

(g) Should have reasonable general physique.

This is concerned mainly with ability to undertake a fair amount of physical exertion without severe strain.

(h) Any extensive chronic dermatitis which could be aggravated by dust, damp or perspiration—self explanatory.

(i) Any infection or venereal disease—this may involve temporary unfitness only.

(j) Glycosuria or albuminuria pending investigation—this may involve temporary unfitness only.

(k) Demonstrable hernia—self explanatory. However, a successful operation would be grounds for review.

It is suggested that where there are doubts concerning the fitness of a new entrant, consultation with a colleague, the Director of Industrial Medicine, or a consultant selected by The Queensland Coal Board should be carried out.

Form No. 3

THE QUEENSLAND COAL BOARD

IDENTIFICATION CARD—(Medical Examination—New Employees)

NAME OF COLLIERY:

Applicant's Name:

Address:

Date of Birth: Place of Birth:

Signature of Applicant:

Signature of Colliery Authorised Employment Officer:

EXAMINING MEDICAL OFFICER:

Name:

Address:

Signature of Applicant:

Signature of Medical Officer:

Code Number assigned by Examining Medical Officer for Applicant:

OFFICE USE ONLY
Code Numbers assigned by The Queensland Coal Board
No. Date

REVERSE SIDE:

This card is to be sent Registered Mail in the special envelope provided to:—

The Secretary,
The Queensland Coal Board,
G.P.O. Box 384,
Brisbane, Q., 4001.

Form No. 4

THE QUEENSLAND COAL BOARD

PRE-EMPLOYMENT MEDICAL EXAMINATION

Office Use Only

Code Number of Applicant:
(Refer Form No. 3)

Date and Place of Birth:

Name of Examining Doctor:

Previous illness—year:

Pneumonia
Pleurisy
Bronchitis
Asthma
Rheumatic Fever
Fits
Peptic Ulcer
Other

Operations—nature and year:

Injuries—nature and year:

INDUSTRIAL HISTORY

Mine and/or Locality	From Year	To Year	No. of Years	Coal Mining—Occupation			Other Mining—State Occupation and material	Non-Mining Occupation
				Face	Underground Non-face	Surface		

Form No. 5

THE QUEENSLAND COAL BOARD

SYMPTOM QUESTIONNAIRE

Examining Doctor

Date

Type of Examination
Pre
Routine
Retired or Special
(Tick to indicate)

		Answers			Code No.
		Yes	No	Other	
Cough:					
Do you usually cough when you get up, or first thing in the morning, in winter?	1				
Do you usually cough during the day and/or at night in the winter?	2				
If "Yes" to either of questions 1 and 2 or both					
Do you cough like this on most days for as much as three months of each year?	3				
Do you ever become dizzy or faint when you cough?	3a				
Have you ever fallen down when coughing? ..	3b				
Phlegm or Sputum:					
Do you bring up any phlegm when you get up or first thing in the morning in the winter? ("Yes" if estimated at least 2 cc. daily)	4				
Do you bring up any phlegm during the day, or at night in the winter?	5				
If "Yes" to either question 4 or 5 or both					
Do you bring up phlegm like this on most days for as much as three months each year?	6				
Estimated daily volume of sputum?	7				
Is it ever blood-stained?	8				
If "Yes", within the past year?	9				
Breathlessness on Exertion:					
Indicate Dyspnoea Grade at best time of day, average winter condition (1, 2, 3, 4, 5) after asking appropriate questions.	10				
Are you more breathless on waking or retiring than at any other times of day?	11				
How many pillows do you need for sleeping? ..	12				
Dyspnoea Grades					
1 = nil, 2 = on slopes, 3 = unable to keep up on level, 4 = unable to walk on level at own pace, 5 = at rest					
Wheezing:					
Does your chest ever sound wheezy or whistling?	13				
If "Yes" to 13:—					
Do you get this most days or nights	14				
At what time of day does wheezing usually occur:					
(1) Only on waking or retiring?	15				
(2) throughout day and/or night	16				
Have you ever had attacks of shortness of breath with wheezing?	17				
If "Yes" to 17:—					
Is/was your breathing absolutely normal between attacks?	18				

Form No. 5 (*Continued*)

THE QUEENSLAND COAL BOARD

SYMPTOM QUESTIONNAIRE

Examining Doctor

Date

Type of Examination
Pre
Routine
Retired or Special
(Tick to indicate)

		Answers			Code No.
		Yes	No	Other	
Effect of Weather:					
Does the weather affect your chest?	19				
Only record " Yes " if adverse weather definitely and regularly causes chest symptoms: If " Yes " to 19					
Does this weather make you short of breath? ..	20				
Specify type of weather, e.g. fog, damp, cold, hot, west winds, north-east winds, stuffy atmospheres, underground work places, other ..	21				
Nasal Catarrh:					
Do you have a stuffy nose or post-nasal discharge at any time of the year?	22				
If " Yes " to 22					
Do you have this on most days for as much as three months of each year?	23				
Have you ever had any nasal operations? ..	24				
Do you have hayfever or seasonal attacks of sneezing and nasal congestion?	25				
Chest Pain and Tightness:					
Do you have any chest pain, tightness or discomfort?	26				
If " Yes " to 26					
Does pain occur only or mainly with exertion?	27				
Does the pain cause you to cease activity? ..	28				
And then eases off?	29				
What brings it on:					
(1) gentle level walking	30				
(2) hurrying or heavy lifting, etc.?	31				
Indicate by underlining type of pain—whether characteristically anginal, doubtful anginal, dyspeptic, pleuritic or pleurodynia, muscular, neuritic or osteoarthritic, chest tightness, cough soreness, etc.	32				
Chest Illnesses:					
During the past three years have you had any chest illness that has kept you from your usual activities for as much as a week?	33				
How many times?	34				
In the past three years have you had a period of increased cough and phlegm lasting three weeks or more?	35				
How many times?	36				

Form No. 5 (*Continued*)
THE QUEENSLAND COAL BOARD
SYMPTOM QUESTIONNAIRE

Examining Doctor

Date

Type of Examination
Pre
Routine
Retired or Special
(Tick to indicate)

		Answers			
		Yes	No	Other	Code No.
Back Injury, Backstrain, Lumbago:					
In the past three years have you had any trouble with your back that has kept you off work or from usual activities?	37				
If " Yes " what did the doctor say it was? ..	38				
Have you lost more than two weeks work or activity with this back trouble on any occasion during the past three years?	39				
Did you receive Workers' Compensation for any such absence from work?	40				
Tobacco Smoking Questionnaire:					
Do you smoke? (" Yes " or " No ")	41				
Do (did) you inhale?	42				
(If " No " to question 41 ask:—)					
When did you stop? (Never started, less than 2 years ago. Two or more years ago)	43				
If ever smoked, ask 44 and 45					
For how many years have you been a smoker? (Under 10 years. 10 to 20 years. Over 20 years)	44				
How much do you smoke? No. of cigarettes per day					
(average including week-ends):	45				
gm. of tobacco per week (hand-rolled) ..	45a				
gm. of tobacco per week (pipe)	45b				
Cigars per week	45c				
Alcohol:					
What do you drink? (T.T., Beer, Spirits, Wine)	46				
Are you a regular daily drinker?	47				
If " No " week-ends regularly?	48				
Occasional only?	49				
Average consumption per week? (grams alcohol)	50				
If " No " to question 47 and 48					
Were you ever a regular drinker?	51				

FOR INFORMATION

Tobacco

1 cigarette is taken as equivalent to 1 gm. tobacco
1 small cigar approximately = 2 gms. tobacco
1 large cigar approximately = 5 gms. tobacco

Alcohol

Beer equivalent:—1 ounce of beer	=	1 gm. alcohol
Light beer equivalent	=	2/3 beer equivalent
1 nip of spirits	=	approximately 10 gms. alcohol
1 glass of table wine	=	approximately 17 gms. alcohol
1 ounce measure of liqueur	=	approximately 17 gms. alcohol

Form No. 6

MEDICAL EXAMINATION

General Appearance

Cyanosis Finger-clubbing

Height: Cms. (ft. ins.) Weight: Kgms. (st. lbs.)

Vision (uncorrected) Distant: VR VL Near: Colour Vision:

If wearing constant correction VR VL

Hearing and ears (Refer Form 8)

CAL % Loss Right ear Loss Left ear Binaural

Dental Condition

Respiratory System

Shape of thorax

Wheeze: at rest on forced breathing

Resonance: increased impaired dull site

Breath sounds Adventitiae

Respiratory Function: (Vitalograph)

	Predicted (L)	Observed (L)
Forced Exp. Vol. 1 sec FEV_1 (L)		
Forced Vital Capacity FVC (L)		
Vital Capacity VC (L)		
FEV_1/VC %		

Cardiovascular System

Pulse rate regular irregular

Blood pressure Position of apex beat

Cardiac dullness: normal increased diminished

Heart sounds Murmurs

Oedema

Central Nervous System

Pupils Superficial reflexes

Tremor Other

Hernia *Varicose Veins*

Skin

Musculo Skeletal System (N.B.: spine)

Urine *Albumen* *Sugar*

Comments (where applicable)

X-ray Report: ILO Pneumoconiosis Classification: 0/-, 0/0, 0/1, 1/0, 1/1, 1/2, 2/1, 2/2, 2/3, 3/2, 3/3, 3/+

Fit Fit restricted duty Unfit

Signature

Order—Coal Miners' Health Scheme 15

Form No. 7

HISTORY OF EMPLOYMENT AND MEDICAL EXAMINATION CARD

I certify I have sighted the Certificate of Fitness issued to—

Name:

Address:

Date of Birth:

Place of Birth:

by

Examining Medical Officer

On

(Date)

Employment commenced at

Colliery on

day of 19 .

Signature of Manager:

Name of Colliery:

EMPLOYMENT RECORD

Colliery	Ceased Employment	Commenced Employment

RECORD OF MEDICAL EXAMINATIONS

Date	Signature of Medical Officer

Signature of Holder:

---

16 *Order—Coal Miners' Health Scheme*

Form No. 8 (See Reverse)

THE QUEENSLAND COAL BOARD

Operator: Colliery:

Name: Date:

Address: Age: Date of Birth: / /19

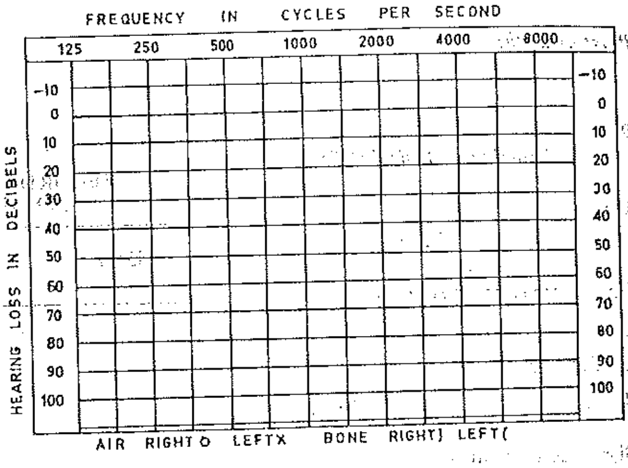
HEARING LOSS %

(C.A.L. SCALE)

R %

L %

OPINION



NOTE.—(1) Where this examination is carried out by a person other than the Examining Medical Officer, a copy shall be provided for that Examining Medical Officer.

(2) A copy shall be provided to and retained by the Colliery Company.

(AID SHEET FOR REVERSE SIDE OF FORM No. 8)

1. *Audiogram*:

Frequency	500	1000	1500	2000	3000	4000
Left ear						
Right ear						

2. *Presbyacusis Adjustment*: Subtract 0.5 decibel for every year above 50 years of age.

Frequency	500	1000	1500	2000	3000	4000
Left ear						
Right ear						

3. *Percentage Loss of Hearing*: Obtained from N.A.L. Monaural Tables.

	Left Ear		Right Ear	
	HL	PHL	HL	PHL
500				
1000				
1500				
2000				
3000				
4000				
		_____ %		_____ %

4. *Binaural Percentage Loss of Hearing:*

$$\frac{4 \times \% \text{ loss better ear} + \% \text{ loss of worse ear}}{5}$$

$$\frac{(4 \times \qquad) + \qquad}{5} = \qquad \%$$

———

ORDER

COAL MINERS' HEALTH SCHEME

The Queensland Coal Board,
Brisbane, 8th December, 1982.

THE Queensland Coal Board acting in pursuance of authority vested in it under the *Coal Industry (Control) Act* 1948–1978, hereby makes the following Order, the provisions of which are to come into force on and from the first day of January, 1983.

P. J. CRANITCH, Secretary.

An order for the compulsory medical examination of certain employees in the Coal Mining Industry, made in accordance with the authority granted to The Queensland Coal Board by the *Coal Industry (Control) Act* 1948–1978.

The Queensland Coal Board pursuant to the authority granted to it by the *Coal Industry (Control) Act* 1948–1978, hereby orders as follows:—

All employees in the coal mining industry who are or who have been engaged in mining or associated operations shall have a chest X-ray—the X-ray being carried out by employees of the Department of Health under the auspices of the Director of Tuberculosis.

In conjunction with the X-ray examination there shall be a check for Emphysema.

Advice will be given to each colliery manager some six (6) weeks in advance of the programmed time of arrival of the X-ray mobile unit.

The colliery manager shall give adequate forward advice to all employees eligible for X-ray of the time table arrangements and shall be responsible for the rostering of employees to allow all those eligible to be surveyed, and the colliery proprietor shall be responsible for all the costs of and any resultant or associated costs of those operations.

Employees will be contacted by the Department of Health if any follow up examination or further medical examination is necessary.

Should the Department of Health advise accordingly, The Queensland Coal Board will order a follow up X-ray and Emphysema check within five (5) years for the workforce or for such section or for such members of the workforce as necessary.

The manager of a colliery will issue to the eligible employees an X-ray identification voucher in a form approved by the Department of Health. The voucher will entitle the holder to a free X-ray and must clearly state the name, address, age and history of employment—particularly in the mining industry. Some questions on medical history also must be answered.

The Queensland Coal Board from its special fund is to meet the wage costs and travelling allowances of staff, running costs of the mobile unit, the costs of X-ray film, envelope packaging and storage, and a portion as agreed with the Department of Health of the cost of the X-ray mobile unit.

The Official Seal of The Queensland Coal Board was hereto affixed on the nineteenth day of October, 1982, by Patrick John Cranitch, Secretary to the Board, the officer designated to affix such seal, in the presence of Jack Tunstall Woods, Mervyn Lewis Noume and William James Platt.

J. T. WOODS, Chairman.
M. L. NOUME, Member.
W. J. PLATT, Member.

P. J. CRANITCH, J.P., Secretary.

51284—By Authority: S. R. HAMPSON, Government Printer, Queensland

CONFIDENTIAL

Name (Full Given Name(s) and Family Name)

Date of Birth

Coal Industry Employees' Health Scheme

FORM A

Pre-Employment Health Assessment

Guidelines for completing this Form

Entrant

Should read
- Explanatory Notes
- Instructions to Entrant

Must complete Section 1 on pages 1 and 2 prior to Health Assessment
Must present Form A at Health Assessment

Examining Medical Officer

Should read
- Explanatory Notes
- Instructions to Examining Medical Officer

Should attach a separate statement if space on form is insufficient
Must review Section 1 with applicant and comment on any abnormality
Must complete Section 2 on pages 3 to 5.
Do not complete Section 3
Provide a copy of Form A to entrant (if requested).
Forward Form A, completed and signed to Nominated Medical Adviser
Forward account for services to employing company (mine or contractor).

Nominated Medical Adviser

Complete Form A.1.
Forward original Form A.1 to mine.
Forward a copy of Form A and A.1 to the Queensland Coal Board.
Forward a copy of Form A.1 to employing contractor or Mines Rescue if applicable.
Provide a copy of Form A.1 to entrant (and if requested Form A).

Reprinted February 1997

FORM A

Coal Industry Employees' Health Scheme
Pre-Employment Health Assessment

Name of Nominated Medical Adviser

Mine (eg.Southern Colliery)

Proposed Position (eg. Production or Engineering)

Contractor (if applicable)

Is entrant to work underground?

Yes [ ] No [ ]

Is entrant being assessed for Mines Rescue?

Yes [ ] No [ ]

Section 1 - *Entrant to complete*

Entrant's Details

Family Name

Given Name (s)

Date of Birth

/ /

Male [ ] Female [ ]

Past Work History

Year		Job Title or Description	Employer
From	To		

Medical History

1. Have you received any medical advice, medical treatment or been an inpatient of a hospital?

   Yes [ ] No [ ]

   Doctor's comments

2. Have you ever had an illness, injury or operation which kept you off work for more than two weeks?

   Yes [✓] No [ ]

   Doctor's comments

3. Are you taking any medication?

   Yes [ ] No [✓]

   Doctor's comments

4. Do you curently smoke?

   Yes [ ] No [ ] Go to 5

   At what age did you start?
   What do you smoke?
   How much (many) per day?
   Go to 6

   Doctor's comments

5. Have you ever smoked?

   Yes [ ] No [ ] Go to 6

   At what age did you start?
   At what age did you stop?
   What do you smoke?
   How much (many) per day?
   Doctor's comments

FORM A

Section 1 - (continued)

6.- Have you ever suffered from, or do you now suffer from any of the following?

		Yes	No
6.1	Heart disease or heart surgery	[ ]	[ ]
6.2	Chest pain or angina	[ ]	[ ]
6.3	High blood pressure	[ ]	[ ]
6.4	Asthma, bronchitis or other lung disease	[ ]	[ ]
6.5	Abnormal shortness of breath or wheezing	[ ]	[ ]
6.6	Deafness, loss of hearing or ear problems	[ ]	[ ]
6.7	Blackouts, fits or epilepsy	[ ]	[ ]
6.8	Diabetes	[ ]	[ ]
6.9	Back pain, sciatica, lumbago or slipped disc	[ ]	[ ]
6.10	Neck injury or whiplash	[ ]	[ ]
6.11	Allergies	[ ]	[ ]
6.12	Dermatitis, eczema, or skin problems	[ ]	[ ]
6.13	Hernia	[ ]	[ ]
6.14	Knee problems, cartilage injury	[ ]	[ ]
6.15	Fractures or dislocations	[ ]	[ ]
6.16	Arthritis or rheumatism	[ ]	[ ]
6.17	RSI, tenosynovitis, over-use syndrome or wrist strain	[ ]	[ ]
6.18	Psychiatric illness	[ ]	[ ]

Doctors' comments on disorders

7.1 When were you last immunised against Tetanu

Year

Doctors comments

7.2 When did you last have your cholesterol tested?

Year

Doctor's comments

8. Do you have any condition which would preve you from wearing safety footwear or other personal protective equipment?

Yes [ ] No [ ]

Doctor's comments

9. Do you suffer from any allergic reaction or have you ever had a reaction to chemicals or dust?

Yes [ ] No [ ]

Doctor's comments

10. Are you aware of any reason that would prevent you from working -:

		Yes	
10.1	At height or on ladders?	[ ]	[ ]
10.2	In confined spaces?	[ ]	[ ]
10.3	Underground?	[ ]	[ ]
10.4	In wet conditions?	[ ]	[ ]
10.5	In dusty conditions?	[ ]	[ ]
10.6	Night shift work?	[ ]	[ ]

Doctor's comments

Entrant's declaration

I certify to the best of my knowledge that the above information supplied by me is true and correct.
I understand that if any of the information given is incorrect, my employment may be terminated.

Entrant's signature

Date

FORM A

Section 2 - Examining Medical Officer to complete

Clinical findings

11. Height [ ] m

12. Weight [ ] kg

Comment (if necessary)

13. Vision

Visual acuity

	Uncorrected Right	Uncorrected Left		Corrected Right	Corrected Left
13.1 Distant	6/	6/	13.3	6/	6/
13.2 Near	N	N	13.4	N	N

Colour vision

13.5 Ishiara

- [ ] Abnormal
- [ ] Normal
- [ ] Minor
- [ ] Major

Comment

14. Hearing

Audiogram

	Hertz 500	1000	1500	2000	3000	4000	6000	8000
Left								
Right								

14.1 Audiogram [ ] Outside guidelines [ ] Within guidelines

14.2 Auditory canals [ ] Abnormal [ ] Normal

14.3 Tympanic membranes [ ] Abnormal [ ] Normal

Comment on any abnormality, including past noise exposure, Workers Compensation claims and tinnitis, if the audiogram is abnormal.

15. Cardiovascular System

15.1 Blood Pressure

15.2

15.3 Blood pressure (repeated if necessary)

15.4

15.5 Pulse rate

[ ] Irregular [ ] Regular

15.6 Heart sounds [ ] Abnormal [ ] Normal

15.7 Evidence of cardiac failure or oedema [ ] Yes [ ] No

15.8 Varicose veins [ ] Yes [ ] No

15.9 Peripheral pulses [ ] Absent [ ] Present

15.10 E.C.G. (if indicated) [ ] Abnormal [ ] Normal [ ] Not indicated

Comment on any abnormality

FORM A

Section 2 - (Continued)

16. Respiratory system

16.1 Auscultation of chest ☐ Abnormal ☐ Normal

Litres	Observed		Predicted		Observed/Predicted %	
Forced exp. vol. 1 sec- FEV_1	16.2		16.5		16.13	
Forced vital capacity - FVC	16.3		16.6		16.14	
FEV_1/FVC%	16.4		16.7			

16.8 Spirometry ☐ Abnormal ☐ Normal as defined in guidelines

16.9 Chest x-ray (If indicated) ☐ No ☐ Yes

16.10 Date x-ray was taken.

16.11 Quality of film? ☐ Unsatisfactory. ☐ Satisfactory

16.12 What was the result? ☐ Abnormal ☐ Normal

Comment on any abnormality

17. Urinalysis

17.1 Sugar ☐ Present ☐ Absent

17.2 Protein/albumin ☐ Present ☐ Absent

17.3 Blood ☐ Present ☐ Absent

Comment on any abnormality

18. Blood Sugar Analysis (optional)
(use finger prick test).

☐ Abnormal ☐ Normal

Commment on any abnormality

19. Abdomen

19.1 Abdominal scars ☐ Yes ☐ No

19.2 Abdominal mass ☐ Yes ☐ No

19.3 Hernia ☐ Yes ☐ No

Comment on any abnormality

FORM A

Section 2 - (Continued)

20. Musculo-skeletal system

Spine

20.1	Mobility	☐ Abnormal	☐ Normal
20.2	Posture and gait	☐ Abnormal	☐ Normal

Upper limbs

20.3	Joint movements	☐ Abnormal	☐ Normal

Lower limbs

20.4	Joint movements	☐ Abnormal	☐ Normal
20.5	Reflexes	☐ Abnormal	☐ Normal

Comment on any abnormality

21. Skin

21.1	Evidence of eczema, dermatitis or allergy	☐ Yes	☐ No
21.2	Evidence of skin cancer or other abnormality including significant solar damage.	☐ Yes	☐ No

Comment on any abnormality

Examining Medical Officer's (Doctor's) name and address (please print or stamp)

Signed

Date / /

Section 4 - Queensland Coal Board to complete

ILO Pneumoconiosis Classification

☐ 0/-	☐ 0/0	☐ 0/1	☐ 1/1	☐ 1/2	☐ 2
☐ 2/2	☐ 2/3	☐ 3/2	☐ 3/3	☐ 3/+	

FORM A.1

Coal Industry Employees' Health Scheme
Report on Pre-employment Health Assessment

Nominated Medical Adviser to complete

Entrant's Details

Family Name | Given Name (s) | Mine

Proposed Position (eg. Production or Engineering)

Is the entrant to work underground? Yes [ ] No [ ]

Contractor (if applicable)

Examination Details

Date of Examination by EMO / /

[ ] The entrant is fit for any position

[ ] The entrant is fit for the proposed position

[ ] The entrant is fit for the position of .... as required by the Coal Mining Act or Approved Training Schemes

[ ] The entrant has a condition which results in the following restrictions

Unsuitable for duties that involve

- [ ] A Heavy, manual handling
- [ ] B Working on markedly uneven terrain
- [ ] C Working from ladders and scaffolding
- [ ] D Exposure to dusts, fumes and gasses
- [ ] E Contact with skin irritants
- [ ] F Operating heavy mobile equipment passenger carriers, cranes and hoists
- [ ] G Working around rotating and/or moving machinery
- [ ] H Shift work
- [ ] I Working Underground
- [ ] J Reliance on colour discrimination
- [ ] K Wearing of protective equipment *(comment*

Suitable for

- [ ] L Sedentary / office work only
- [ ] Other work only *(specify job)*

Should wear

- [ ] N Corrective spectacles for close/distance work
- [ ] O Hearing aid
- [ ] P Other *(comment*

[ ] The entrant is unfit for the proposed position

Was a Chest X-ray taken? No [ ] Yes [ ] Date of X-ray

For Mines Rescue Use Only

[ ] The entrant has no condition which precludes participation in Mines Rescue activities. (See Medical Guidelines)

Mines Rescue Station

Signed

Nominated Medical Adviser's name and address (stamp required)

Distribution of Form A.1

(a) Original to Mine Manager
(b) Copy to Queensland Coal Board
(c) Copy to Entrant
(d) Copy to Employing Contractor (if applicable
(e) Copy to Mines Rescue Station (if applicable

FORM B

Coal Industry Employees' Health Scheme

Periodic Health Assessment

Name of Nominated Medical Adviser

Name of Mine (e.g. Southern Colliery)

Contractor (if applicable)

Section 1 - *Employee to complete*

Employee Details

Family name

Given name/s

Date of birth

Occupation - Award Category/main duty - indicate surface or underground

Medical history

1. Have you had a Coal Miner's Medical Examination since May 1993?

   Yes ☐ ▶ please give date of examination

   No ☐ ▶ you are also required to complete the Supplementary Questionnaire (enclosed) and submit with this form

   Examining Medical Officer's comments

2. Have you received any medical advice, medical treatment, or been an in-patient of a hospital?

   Yes ☐ No ☐

   Examining Medical Officer's comments

3. Have you suffered any illness or injuries that prevented you attending work?

   Yes ☐ No ☐

   Examining Medical Officer's comments

4. Are you taking any medication?

   Yes ☐ No ☐

   Examining Medical Officer's comments

5. Have you any recurrent chest pains?

   Yes ☐ No ☐

   Examining Medical Officer's comments

6. Do you currently smoke?

   Yes ☐ No ☐

   When did you start?

   What do you smoke? (e.g. type of cigarettes, pipe)

   How many/how much per day? ▶ Go to 8

   Examining Medical Officer's comments

7. Have you ceased smoking since your last Health Assessment?

   Yes ☐ No ☐

   When did you stop?

   Examining Medical Officer's comments

8. Have you ever noticed ringing noises in your ear/s?

   Yes ☐ No ☐

   Examining Medical Officer's comments

9. Do you have any difficulty hearing a conversation or have any other problem with your hearing?

   Yes ☐ No ☐

   Examining Medical Officer's comments

N.B. If space insufficient for comments, attach a separate statement

FORM B

Section 1 - (Continued)

10. Do you wear hearing protection in noisy areas?

Yes [ ] Plugs [ ] Muffs [ ] Both [ ]

No [ ]

Examining Medical Officer's comments

11. Have you suffered from dermatitis or a skin problem?

Yes [ ] No [ ]

Examining Medical Officer's comments

12. Have you had any back or neck pain that has kept you off work?

Yes [ ] No [ ]

Examining Medical Officer's comments

13. Have you ever had a shoulder, knee or any other joint injury?

Yes [ ] No [✓]

Examining Medical Officer's comments

14. When were you last immunised against Tetanus?

Year [ ] Comment [ ]

15. Do you suffer from any allergic reaction (e.g. respiratory allergy or drug reaction?)

Yes [ ] No [ ]

Examining Medical Officer's comments.

16. Are you aware of any reason that would prevent you from working -

At heights or on ladders?	Yes [ ]	No [ ]
In confined spaces?	Yes [ ]	No [ ]
Underground?	Yes [ ]	No [ ]
In wet conditions?	Yes [ ]	No [ ]
In dusty conditions?	Yes [ ]	No [ ]
Where protective equipment is required?	Yes [ ]	No [ ]

Examining Medical Officer's comments

I certify to the best of my knowledge the above information is true and correct.

Employee's signature [ ] Date [ ]

Section 2 (Optional) - *Examining Medical Officer and Employee to complete*

17. **Determining the Miner's Lifestyle**
The answers to the following questions, are voluntary and intended to assist the doctor in improving your health.

17.1 Alcohol intake

Number of standard drinks per week -

now [ ] past [ ]

A standard drink - 10g alcohol
- 1 x 10 oz regular beer
- 1 x glass wine
- 1 x nip spirit

17.2 Dietary habits

17.3 Exercise routine

17.4 Stress level

FORM B

Section 3 - *Examining Medical Officer to complete*

Clinical Findings

18. Height [ ] cm
19. Weight [ ] kg

Comment *(if necessary)*

20. Vision

Visual acuity		Uncorrected Right	Uncorrected Left		Corrected Right	Corrected Left
20.1	Distant	6/	6/	20.3	6/	6/
20.2	Near	N	N	20.4	N	N

Comments

21. Hearing

Audiogram	Hertz 500	1000	1500	2000	3000	4000	6000	8000
Left								
Right								

21.1 Audiogram ☐ Outside Standard ☐ Inside Standard - as defined in Medical Standard

21.2 Auditory canals ☐ Abnormal ☐ Normal

21.3 Tympanic membranes ☐ Abnormal ☐ Normal

Comment on any abnormality, including past noise exposure, Worker's Compensation claims, tinnitus, if the audiogram is abnormal.

22. Cardiovascular System

22.1 Blood Pressure [/]

22.2

22.3 Repeated *(if necessary)* [/]

22.4

22.5 Pulse rate [ ] ☐ Irregular ☐ Regular

The following are only required if indicated by history or examination

22.6 Heart sounds ☐ Abnormal ☐ Normal

22.7 Evidence of cardic failure, oedema ☐ Yes ☐ No

22.8 Varicose Veins ☐ Yes ☐ No

22.9 Peripheral pulses ☐ Present ☐ Absent

22.10 E.C.G. ☐ Abnormal ☐ Normal ☐ Not Indicated

Comment on any abnormality

FORM B

Section 3 - *(Continued)*

23. Respiratory system

Litres	Observed		Predicted		Observed/Predicted %	
Forced exp.vol. 1 sec. - FEV_1	23.1		23.4	/	23.16	
Forced vital capacity - FVC	23.2		23.5		23.17	
FEV_1/FVC %	23.3		23.6			

23.7 Spirometry ☐ Abnormal ☐ Normal - as defined in Medical Standard

23.8 Chest X-ray *(if indicated)* ☐ No ☐ Yes

23.9 When was it taken? / /

23.10 Quality of film? ☐ Unsatisfactory ☐ Satisfactory

23.11 What was the result? ☐ Abnormal ☐ Normal

The following are only required if indicated by history or abnormal results of investigations

23.12 Air entry ☐ Abnormal ☐ Normal

23.13 Wheeze at rest ☐ Yes ☐ No

23.14 Wheeze on forced breathing ☐ Yes ☐ No

23.15 Breath sounds ☐ Abnormal ☐ Normal

Comment on any abnormality

24. Urinalysis

24.1 Sugar ☐ Present ☐ Absent

24.2 Protein/albumin ☐ Present ☐ Absent

24.3 Blood ☐ Present ☐ Absent

Comment on any abnormality

25. Blood Sugar Analysis (use finger prick test)

☐ Normal ☐ Abnormal

Comment on any abnormality

26. Abdomen

The following are only required if indicated by history

26.1 Abdominal scars ☐ Yes ☐ No

26.2 Abdominal mass ☐ Yes ☐ No

26.3 Hernia ☐ Yes ☐ No

Comment on any abnormality

FORM B

Section 3 - *(Continued)*

27. Musculo-skeletal system

Spine

27.1 Mobility [ ] Abnormal [x] Normal

27.2 Posture and gait [ ] Abnormal [x] Normal

Upper limbs

27.3 Joint Movements [ ] Abnormal [x] Normal

Lower limbs

27.4 Joint movements [ ] Abnormal [x] Normal

27.5 Reflexes [ ] Abnormal [x] Normal

Comment on any abnormality

28. Skin

28.1 Evidence of eczema, dermatitis, allergy [ ] Yes [x] No

28.2 Evidence of skin cancer or other abnormality [ ] Yes [x] No

Comment on any abnormality

Section 4 - *Nominated Medical Adviser to complete*

Recommendation to Employee

Measures recommended to improve the employee's health

Signed

Nominated Medical Adviser's name and address *(stamp required)*

Section 5 - *Queensland Coal Board to complete*

ILO Pneumoconiosis classification

[ ] 0/- [ ] 0/0 [ ] 0/1 [ ] 1/1 [ ] 1/2 [ ] 2/1 [ ] 2/2 [ ] 2/3 [ ] 3/2 [ ] 3/3 [ ] 3/+

FORM B.1

Coal Industry Employees' Health Scheme
Report on Periodic Health Assessment

Nominated Medical Adviser to complete.

Employee's Details

Family Name ☐ Given Name (s) ☐

Date of Birth ☐ / / Mine ☐ Contractor ☐

Examination Details

Date of Examination ☐ Current position (eg. Production or Engineering) ☐ Underground Yes ☐ No ☐

☐ The employee is fit to continue in any position

☐ The employee is fit to continue in his/her current position

☐ The employee is fit for the position of .... as required by the Coal Mining Act

☐ The employee has a condition which results in the following restrictions.
(Use categories of restrictions in the Instruction Manual)

____

____

____

____

The duration of the restriction is ☐

Is a further review necessary? No ☐ Yes ☐ When? ☐ / /

Was a Chest X-ray taken? No ☐ Yes ☐ Date of X-ray ☐ / /

For Mines Rescue Use Only

☐ The employee has no condition which precludes participation in Mines Rescue activities.
(See Medical Guidelines for Mines Rescue)

☐ Mines Rescue Station

Signed

☐ / /

Nominated Medical Adviser's name and address (stamp required)

☐

Distribution of Form B.1
(a) Original to Mine Manager
(b) Copy to Queensland Coal Board
(c) Copy to Employee (if requested)
(d) Copy to Employing Contractor (if applicable)
(e) Copy to Mines Rescue Station (if applicable)

CONFIDENTIAL

COPY 93

Name

Date of Birth

Coal Industry Employees' Health Scheme

FORM A

Pre-Employment Health Assessment

Guidelines for completing this Form

Entrant

- Should read
  - Explanatory Notes
  - Instructions to Entrant
- Must complete Section 1 on pages 1 and 2 prior to Medical Examination.
- Must present Form A at Medical Examination.

Examining Medical Officer

- Should read
  - Explanatory Notes
  - Instructions to Examining Medical Officer.
- Must review Section 1 with applicant, and comment on any abnormality.
- Must complete Section 2 on pages 3 to 5.
- Do not complete Section 3.
- Provide a copy of Form A to Entrant (if requested).
- Forward completed and signed Form A intact to Nominated Medical Adviser.
- Forward account for services rendered to employing company.

Nominated Medical Adviser

- Complete Section 3 on page 5.
- Complete Form A.1.
- Forward original Form A.1 to employing company.
- Forward photocopy of Form A and Form A.1 to Queensland Coal Board.
- Provide a copy of Form A.1 to Entrant (if requested).

FORM A

Coal Industry Employees' Health Scheme
Pre-employment Health Assessment

Name of Nominated Medical Adviser

Name of Mine

Section 1 - *Entrant to complete*

Entrant's Details

Family name

Given name/s

Date of birth / /

Male Female

Proposed occupation

Past work history

Year		Job title or description	Employer
From	To		

Medical history

1. Are you being treated by a doctor for any illness or injury?

Yes No

Doctor's comments

2. Have you ever had any illness, injury or operation which kept you off work for more than two weeks?

Yes No

Doctor's comments

3. Are you receiving any medical treatment or taking any medication?

Yes No

Doctor's comments

4. Do you curr smoke?

Yes No ▶ Go to 5

At what age did you start?

What do you smoke?

How many/how much per day? ▶ Go to 6

Doctor's comments

FORM A

Section 1 - *(Continued)*

5. Have you ever smoked?

Yes No ▶ Go to 6

At what age did you start?

At what age did you stop?

How many/how much per day?

What did you smoke?

Doctor's comments

6. Have you ever suffered from, or do your now suffer from, any of the following?

		Yes	No
6.1	Heart disease or heart surgery		
6.2	Chest pain, angina		
6.3	High blood pressure		
6.4	Asthma, bronchitis or other lung disease		
6.5	Abnormal shortness of breath or wheezing		
6.6	Deafness, loss of hearing, ear problems		
6.7	Blackouts, fits, epilepsy		
6.8	Diabetes		
6.9	Back pain, sciatica, lumbago, slipped disc		
6.10	Neck injury, whiplash		
6.11	Allergies		
6.12	Dermatitis, eczema, skin problems		
6.13	Hernia		
6.14	Knee problems, cartilage injury		
6.15	Arthritis, rheumatism		
6.16	Psychiatric illness		
6.17	RSI, tenosynovitis, over-use syndrome, wrist strain		

Doctor's comments

7. Do you have any condition which would prevent you from wearing safety footwear or other personal protective equipment?

Yes No

Doctor's comments

8. Are you aware of any reason that would prevent you from working -

At heights or on ladders?	Yes	No
In confined spaces?	Yes	No
Underground?	Yes	No
In wet conditions?	Yes	No
In dusty conditions?	Yes	No

Doctor's comments

9. Have you ever had a reaction to chemicals or dust?

Yes No

Doctor's comments

10. Entrant's declaration

I certify to the best of my knowledge the above information supplied by me is true and correct and I understand if any of the information given is found to be incorrect, my employmen may be terminated.

Entrant's signature

Date / /

FORM A

Section 2 - *(Continued)*

19. Musculo-skeletal system

Spine

19.1 Mobility ☐ Abnormal ☐ Normal

19.2 Posture and gait ☐ Abnormal ☐ Normal

Upper limbs

19.3 Joint Movements ☐ Abnormal ☐ Normal

Lower limbs

19.4 Joint movements ☐ Abnormal ☐ Normal

19.5 Reflexes ☐ Abnormal ☐ Normal

Comment on any abnormality

20. Skin

20.1 Evidence of eczema, dermatitis, allergy ☐ Yes ☐ No

20.2 Evidence of skin cancer or other abnormality ☐ Yes ☐ No

Comment on any abnormality

Signed

Doctor's name and address *(please print or stamp)*

Section 3 - *Nominated Medical Adviser to complete*

Recommendation

☐ The entrant is fit for the proposed position, and fulfils the requirements of the Queensland Coal Industry Employees' Health Scheme

☐ The entrant is fit for the proposed position, subject to the following restrictions -

Unsuitable for duties that involve

☐ A ☐ B ☐ C ☐ D ☐ E ☐ F

☐ G ☐ H ☐ I ☐ J ☐ K

Suitable for

☐ L ☐ M

Should wear

☐ N ☐ O

☐ The entrant is unfit for the proposed position

Signed

Section 4 - *Queensland Coal Board to complete*

ILO Pneumoconiosis classification

☐ 0/- ☐ 0/0 ☐ 0/1 ☐ 1/1 ☐ 1/2 ☐ 2/1 ☐ 2/2 ☐ 2/3 ☐ 3/2 ☐ 3/3 ☐ 3/+

FORM A.1

Coal Industry Employees' Health Scheme

Report on Pre-employment Health Assessment

Nominated Medical Adviser to complete.

Entrant's Details

Family name

Given name/s

Examination Details

Date of examination

Proposed position

☐ Entrant is fit for any position

☐ Entrant is fit for the proposed position

☐ Entrant is fit for the proposed position, subject to the following restrictions

Unsuitable for duties that involve

☐ A Heavy, manual handling

☐ B Working on markedly uneven terrain

☐ C Working from ladders and scaffolding

☐ D Exposure to irritant dusts, fumes and gases

☐ E Contact with skin irritants

☐ F Operating heavy mobile equipment, passenger carriers, cranes and hoists

☐ G Working around rotating and/or moving machinery

☐ H Shift work

☐ I Working underground

☐ J Reliance on colour discrimination

☐ K Wearing of personal protective equipment *(comment)*

Suitable for

☐ L Sedentary/office work only

☐ M Other work only *(specify job)*

Should wear

☐ N Corrective spectacles for close/distance work

☐ O Hearing aid

☐ Entrant is fit for employment as a .... as required by the *Coal Mining Act 1925*

☐ Entrant is unfit for the proposed position

Was a Chest X-ray taken? No ☐ Yes ☐ Date of X-ray / /

Signed / /

Nominated Medical Adviser's name and address *(stamp required)*

Distribution of Form A.1

(a) Original to Employer

(b) Photocopy to Queensland Coal Board

(c) Photocopy to Entrant (if requested)