FIRE RISK ANALYSIS OF THE WORKED-OUT AREAS OF MORWELL OPEN CUT

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EXECUTIVE SUMMARY

1. INTRODUCTION

1.1 PURPOSE OF THIS PROJECT

This project aims to assess the fire risk of the worked-out areas of the Morwell Open Cut ("MOC") and ascertain whether an exemption from the Latrobe Valley Open Cuts Fire Protection Policy 1984 (hereinafter "LVOCFPP"), and specifically its sections 1.1.4 and 1.1.5, would be appropriate and justifiable.

1.2 SCOPE AND ASSUMPTIONS

1.2.1 Definition of the worked-out areas

The worked-out areas and batters considered in this study cover the mine area extending eastwards from No. 4 groyne and including the north-eastern and eastern batters.

1.2.2 Assumptions

Unless stated otherwise, it has been assumed in this study that the fire protection policy for the open cuts ("LVOCFPP") is appropriate and reasonable and that presently all fire protection systems at M.O.C. comply with the requirements of this policy.

1.3 BACKGROUND AND CONTEXT

With finite resources to be allocated to fire protection of the whole open cut, M.O.C. considers it best to direct these resources to protection of personnel and assets in operating areas of the cut on the basis that these represent a greater fire risk than the worked-out areas of the mine.

The fire risk of worked-out areas may perhaps be better mitigated by restricting access to worked-out areas and removing power poles from here, maintaining several charged water lines, and by upgrading fire protection systems for the cut as a whole (e.g. more tanker filling points).

2. CONCLUSIONS

2.1 Risk of Fire in the Worked-out Areas and Batters

The risk of fire in the worked-out areas is not minimal, because:

- there are about 20 fires a year in these areas.
- on average, their severity is similar to those fires in working areas of the mine in terms of usual extinction effort.
- these fires are located near key vulnerabilities, mostly in the dirty coal dump near the 260 series conveyors and around the production area in the North-East corner of the pit where a critical bore pump (M 2055) is placed.

2.2 Legal Liability

The CFA Act overshadows LVOCFPP, imposing a stringent requirement upon M.O.C. to adhere to practicable fire prevention and control measures. LVOCFPP is practicable.

Issues of cost and cost-benefit are not relevant to M.O.C.'s considerations of its fire protection responsibilities. Practicability is.

2.3 Policy Exemption

Exemption from sections 1.1.4 and 1.1.5 would increase fire risk in the worked-out areas and would increase SECV, and M.O.C., liability in this regard. Presently this risk is not minimal. An exemption is thus not appropriate.

Moreover, any such policy exemption or modification should not proceed until there has been a demonstrable reduction in fire risk.

2.4 Improvement to Fire Protection

Our inspections and calculations indicate the present fire water service system is quite adequate for the worked-out areas, in accordance with the policy.

M.O.C. are correct in directing their thinking towards restricting vehicle access to worked-out areas, removing assets, increasing the number of tanker filling points and so on. These strategies do focus on the fire exposures of the worked-out areas.

This suggests implementation of these preventative and control measures, reinforced where necessary by addition or modification to LVOCFPP accordingly, is the appropriate strategy.

Policy development can thus proceed following evidence of reduction in risk.

3. RECOMMENDATIONS

3.1 Fire Protection Systems

We would suggest the following recommendations based on this study:

i. Undertake a detailed engineering survey of the fire water system, and include assessment of the North-East corner coal production area in this. This survey should cover maintenance, design and pump performance aspects of the fire water system.

ii. Update the reticulation drawing and its hydraulic analysis, and ensure all appropriate personnel as necessary (eg. Fire Services) are advised of updates.

iii. Use both old clean water tanks for fire water storage and fit a tanker filling point to these (refer Figure 14). This will make a substantial quantity of water readily available for fire suppression in the worked-out areas.

3.2 Fire Prevention

i. Keep all M.O.C. fire reports on a P.C. data base and regularly review this data for causes and trends. This data analysis will assist to systematically reduce fire risks.

ii. Examine restrictions to roadways in the worked-out areas. For example, a permit system could be adopted to control access to specified roads and incorporate a check or control upon vehicle exhaust systems, at the same time.

iii. Stop dumping of dirty coal adjacent to the 260 series conveyors. Look to relocate such dumping.

iv. Relocate power feeders 15 and 16. We understand a relocation to near the 260 series conveyors is already proposed.

v. Commence a pole replacement programme for the 4, 5 and 16 power feeders, replacing timber poles with concrete ones.

3.3 Policy Revision

Suggested revisions to LVOCFPP would be:

(i) Specify number, distance, capacity requirements for Tanker Filling Points.

(ii) Automatic monitoring for fire pumps and other critical fire protection equipment, for example, by having a light and hooter alarm at the pump station to indicate loss of water pressure. This alarm would be visible from the fire detection points like Fire Service office and Production Control.

FIRE RISK ANALYSIS OF THE WORKED-OUT AREAS AND BATTERS IN MORWELL OPEN CUT

1. INTRODUCTION

1.1 PURPOSE OF THIS PROJECT

This project aims to assess the fire risk of the worked-out areas of the Morwell Open Cut ("MOC") and ascertain whether an exemption from the Latrobe Valley Open Cuts Fire Protection Policy 1984 (hereinafter "LVOCFPP"), and specifically its sections 1.1.4 and 1.1.5, would be appropriate and justifiable.

1.2 SCOPE AND ASSUMPTIONS

1.2.1 Definition of the worked-out areas

The worked-out areas and batters considered in this study cover the mine area extending eastwards from No. 4 groyne and including the north-eastern and eastern batters. These areas are shown pictorially in figures 1 to 6 inclusive.

The southern batters and the "200 series" conveyors, the power lines and feeders adjacent these on 7 level, the "20 series" conveyors along the eastern batters, and grass level outside the pit are excluded from the scope of this study. Note however that any detrimental impact on these assets that could result from fire spreading from the worked-out areas is considered.

1.2.2 Assumptions

Section 1.1.4 and 1.1.5 of LVOFCPP are reprinted opposite for ready reference.

Unless stated otherwise, it has been assumed in this study that the fire protection policy for the open cuts ("LVOCFPP") is appropriate and reasonable and that presently all fire protection systems at M.O.C. comply with the requirements of this policy.

1.3 BACKGROUND AND CONTEXT

Morwell Open Cut considers that the worked-out areas of the pit may represent a low fire risk. With finite resources to be allocated to fire protection of the whole open cut, it appears best to direct these to protection of personnel and assets in operating areas of the cut on the basis that these represent greater fire risk.

The fire risk of worked-out areas may perhaps be better mitigated by restricting access to worked-out areas and removing power poles from here, maintaining several charged water lines, and by upgrading fire protection systems for the cut as a whole (e.g. more tanker filling points).

2. METHODOLOGY

Our methodology is outlined below. It should be noted that this risk analysis provides an initial appraisal only, given the timeframe for work of 19 days. Where further work would be warranted, this has been indicated.

2.1 DEFINITION OF RISK AND RISK ANALYSIS

Three elements making up the fire risk are considered, as follows:

- the likelihood of fire occurrence in worked-out areas.
- the exposure of SECV assets such as personnel, plant and equipment within the mine as well as outside its boundaries to fire or its immediate consequences, either
  a) within the worked-out areas, or
  b) as a result of fire spreading from or through these areas.
- the consequences of any fire in worked-out areas for
  - property/asset loss
  - personnel safety
  - liabilities to SECV or its officers
  - interruption to SECV operations
  - corporate image
  - other community impact outside the mine.

The severity of potential consequences is appraised in terms of both normal loss expectancy and maximum foreseeable loss.

2.2 KEY RISK ISSUES

In summary, the following are included in consideration:

- the mandatory requirements upon M.O.C. for fire protection and suppression.
- the history of fires at M.O.C. and their consequences, and what implications they may have for the current M.O.C. fire risk.

- the current status of the worked-out areas, the nature, size and location of any specific fuels or fire hazards, like exposed coal.

- the susceptibility of key assets like conveyors and pumps to fire in or from worked-out areas.

- the current status of fire protection in these areas in terms of
  - fire prevention
  - fire detection
  - fire suppression, both for extinguishment and for restricting potential spread of fire.

2.3 DATA COLLECTION AND ANALYSIS

2.3.1 Data Collection

Data collection was based largely on review of available documentation and engineering drawings (see reference), site inspections and discussions with a number of SECV personnel. These personnel are listed in Appendix 1.

2.3.2 Data Analysis

A qualitative assessment has been made of overall fire risk and the appropriateness of policy exemption.

Quantitative evaluation has been made of -

- fire reports, obtained for the period November 1989 to April 1992.

- hydraulic performance of the fire water drenching system as applicable to the worked-out areas.

- potential frequency and severity predictions of M.O.C. fire, using a Pareto simulation technique.

3. FINDINGS

3.1 CURRENT STATUS OF THE WORKED-OUT AREAS AND BATTERS

The current status of these areas is illustrated pictorially in figures 3-13 inclusive. In particular, it was noted:

(i) there are critical assets in the worked-out areas, notably -

- 6.6 kV power feeder lines to bore pumps, clean water pumping station, fire pumps and the 20 series conveyors. These are generally on timber poles.

- critical artesian bores, especially

for M1 aquifer	:	M 2055 and M 3455
for M2 aquifer	:	M 3284, M 2443, M 3079, M 2979 and M 2196

(ii) there are critical assets (key vulnerabilities) adjacent the worked-out areas, notably the 260 series production-coal conveyors and the 20 series conveyors to MPS and briquette plant.

(iii) there is exposed coal. From site visits and after review of an aerial photograph (scale 1:2500 approx) there appear to be several sections of the worked-out area where clay covering has not yet been applied.

Our estimates of area are:

400m x 200	=	80,000
250m x 200	=	50,000
200m x 375	=	84,375
250m x 250	=	62,500
200m x 300	=	60,000
TOTAL		336,875m²

or around 8% of the total plan area of the worked-out areas.

(iv) there are specific activities which could represent a fire hazard, notably -

- traffic of vehicles without protected exhausts.

- a coal production operation (refer figure 3), providing coal quantities equivalent to MPS requirements. Note that risk appraisal of this operation was considered as outside the terms of reference for this study.

- a dirty coal dump near the southern pivot (refer figure 4).

MORWELL OPEN CUT

DECLARED PRIMARY ACCESS ROUTES

FIRE SERVICES CO-ORDINATION CONTROL

AMBULANCE PILOT POINT

NORTHERN BATTERS FIRE SPOTTERS TOWER

OVERHEAD CLEARANCE RESTRICTION 3.7m (RAILWAY)

FIRST AID

NO2 GATE

3.3m

OVERHEAD CLEARANCE RESTRICTIONS (CONVEYORS)

4.6m

4.4m

OVERHEAD CLEARANCE RESTRICTION 4.4m (CONVEYOR)

CONVEYOR CONTROL CENTRE

COAL PRODUCTION OFFICE

EASTERN BATTERS FIRE SPOTTERS TOWER

LEGEND

ROUTE 1

ROUTE 2

ROUTE 3

ROUTE 4

ROUTE 5

ROUTE 6

ROUTE 7

AMBULANCE PILOT POINT

Figure 24

MORWELL OPEN CUT FIRE INCIDENCE

WORKED OUT AREA

FOR THE PERIOD NOV '89 TO APR '92

SIZE OF 'FIRE' SYMBOL INDICATES ELAPSED EXTINGUISHMENT TIME

(v) the predominant winds are directed from the south-west and west across the mine towards the key vulnerabilities on the southern and eastern batters. Appendix 2 summarises wind details.

3.2 CURRENT STATUS OF THE FIRE PROTECTION AVAILABLE TO THE WORKED-OUT AREAS

Similarly, figures 15-20 inclusive generally indicate the present nature and scope of the fire protection, and the fire water service system in particular.

A detailed appraisal of this system's state of readiness was not made, this being outside our terms of reference.

The performance of the fire water service for the worked-out area was assessed however in terms of the policy, and details are given in Appendix 3. In summary, our findings are that the water supply to the worked-out areas appears satisfactory at present. In fact, our limited calculations suggest water supply could be, a little greater (perhaps 20% more) than policy requirement for the worked-out areas and batters. This water requirement is for the exposed coal (see 3.1 iii previous).

Table 2 opposite summarises our understanding of the fire/water tanker resources available to M.O.C. for fire control.

3.3 FIRE HISTORY AND THE LIKELIHOOD OF FIRES

3.3.1 General Overview

The broad history of fires in the Latrobe Valley and at the open cuts in particular, places SECV, and thus M.O.C., in a position of high public and political profile where fire is concerned. This context must be considered a risk factor. We have briefly summarised the outcomes of the 1944 Yallourn and 1977 M.O.C. fires and compared these with M.O.C. fire protection status as at present. This summary is given in Table 1 and "profiles" current risk in these historical/political terms. It would appear that the potential effectiveness of current fire countermeasures is somewhat greater than in 1977, based on improved communications and coordination (Displan), fire fighting technology and techniques.

Other implications from our table would appear self-evident.

3.3.2 Fire History of the M.O.C. Worked-out Areas

The results of analysis of all M.O.C. fire reports for the period 11/89 to 4/92 inclusive are illustrated in figures 21 and 22 (opposite page) and figure 23 overleaf.

Summarising these results:

(i) there have been 28 fires reported in the worked-out areas in this period. This suggests occurrence of around 11 fires per year.

(ii) primary causes are motor vehicles and burning/welding. "Unknown" causes could include bushfire spotting, lightning, electrical causes like conductor clashing on power feeders, falling power poles, etc. These have occurred in the worked-out areas.

(iii) loose coal was primarily the material burnt.

(iv) piped water was the major means of fire suppression.

(v) in terms of manhours and equipment hours reported for extinguishment, the fires in the worked-out areas are of similar severity on average to those occurring in the working areas of the mine.

(vi) the fires are most frequently located in the dirty coal dump and the coal production operation in the North East corner of the pit. Figure 24 overleaf shows locations of all fires and also indicates their relative severity.

Appendix 4 provides a summary of the fires in the worked-out areas.

3.3.3 Fire Trends

Data analysis shows -

(i) the number of fires per year increased through 1984 - 1989. Fires in 1990/91 were substantially fewer than for 87/88 and 88/89, though this may be an artefact of reporting.

(ii) as could be expected, fires are most numerous in summer (January).

Figures 25 and 26 also overleaf illustrate these trends.

Morwell Open Cut Fire Report

Method Used for Fires in the Worked Out Area

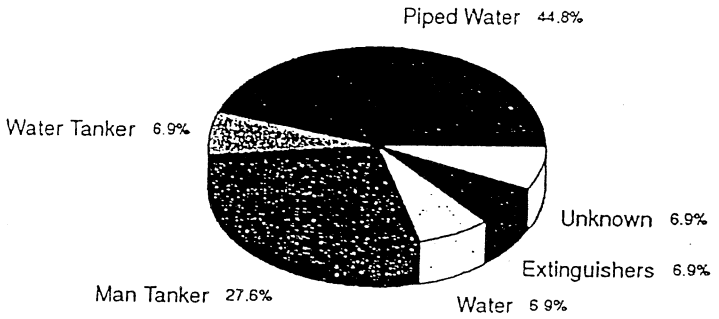

Figure 23

Morwell Open Cut Fire Report

Number of Fire Incidents

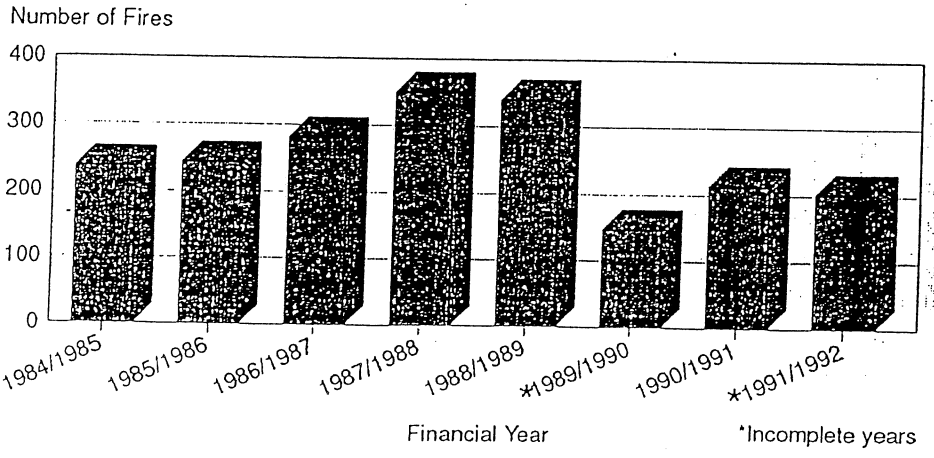

Figure 25

3.4 EXPOSURES AND VULNERABILITIES

3.4.1 Personnel Safety

This would appear a minimal risk. We understand fires at M.O.C. have not caused loss of life previously. This would not be anticipated from fire in worked-out areas.

3.4.2 Loss of Assets and Business Interruptions

As previously indicated, conveyors are vulnerable to spread of fire from the worked-out areas.

Loss of power to pumping stations or 20 series conveyor, through damage to feeders 4, 5, 15 and 16, is an evident exposure as are electrical cubicles, transformers and associated power supply cables linked to bores located in the worked-out areas.

Fire could possibly progress along the northern batters into operating levels or more likely be blown into working areas, but this would seem less likely than the abovementioned risk exposures.

3.4.3 Spread of Fire

3.4.3.1 From or Through the Worked-Out Areas

With all but about 8% of the plan area of the worked out areas and batters covered by water or clay, significant general spread of fire through the worked-out areas does not appear to be a key threat.

Rather, spread of fire may be:

i quite localised. Thus, fire immediately adjacent the conveyors, at or near pump or pole locations is relatively the greatest exposure.

ii through the worked-out batters. The policy addresses this.

iii from embers of coal or foliage fires blown by the wind.

iv from mechanical means like vehicle traffic or other work activity.

3.4.3.2 Vulnerabilities Outside the Pit

Again, the risk here is for fire to potentially spread to grass level from its initiation within the worked-out areas of the pit.

However there is substantial combustible foliage within the worked-out area and this could possibly "spot" a grass level fire. Relative to 3.4.2 above, risk of this seems less as we are led to believe fire progress from within to outside the pit has never occurred.

3.5 POTENTIAL CONSEQUENCES OF SEVERITY

3.5.1 Normal Loss Expectancy

From the results of analysis of fire reports available to this study, normal loss expectancy from fire in the worked-out areas would appear to be of order:

- average 2 manhours, 1 equipment hour per fire; maximum 18 manhours, 5 equipment hours per fire.

  These averages are similar to those for fires in the operating areas of the mine. However, for perspective, maxima reported there are 154 and 23 "hours" respectively.

- no reported asset $ loss. No reports of actual cost were found in our analysis.

On average, fire report data indicates total duration (elapsed time) of <u>all</u> fires at M.O.C. could be expected to be around 75 hours per year. This duration represents the time from initial attendance at the fire through to its extinction.

Some 255 fires per annum can also be expected on average.

3.5.2 Maximum Foreseeable Loss

An initial simulation from the available data for the <u>whole mine</u> suggests there is -

- about a 1% chance of fire severity around 3 times greater than usually experienced in recent years (1989-1992).

- a less than 0.5% chance of fire severity around 5 times greater than usual.

Furthermore, this chance represents the likelihood of at least one such fire per year. That is, there is a feasible possibility of a fire of major severity occurring each year.

Figure 27 opposite illustrates this simulation. Note however that the simulation should be regarded as preliminary.

Such a simulation for the much smaller fire data of the worked-out areas would be therefore meaningless. For the worked-out areas, our simulation at this stage simply then suggests it is important to maintain the LVOFCPP as an effective protection policy in light of possible, not necessarily probable, severity of loss from any fire initiated in and spreading from the worked-out areas or through the batters.

Should power supply be lost to critical bore pumps (e.g. M 2055 say) located in the worked-out areas as a result of fire, then SECV research suggests the theoretical possibility of heave of the mine floor after about 3 days of loss of mine dewatering. Discussion with mine hydrogeology indicated this possibility has however been contradicted in practice.

3.6 MANDATORY REQUIREMENTS AND LEGAL LIABILITY

The SECV is bound by Section 43(1)(a) of the Country Fire Authority Act to "prevent the occurrence of fires on and to minimise the danger of the spread of fires on or from any land vested in it or under its control or management ..... ".

The legal implications of any change - exemption and/or modification - to LVOCFPP sections 1.1.4 and 1.1.5 are appraised in detail in Appendix 5. In summary, key findings for M.O.C. are :

(i) the statutory requirement (CFA Act) is more strict than a duty of care, and thus own policy like LVOFCPP.

(ii) M.O.C. must take all practicable steps to prevent and suppress its fires. Because what it <u>has</u> been doing in applying LVOFCPP is practicable by definition, any change in that policy to reduce stringency of precautions would increase SECV liability. That is, the proposed exemption would increase liability (risk).

Therefore, any policy modification should aim to enhance prevention and/or suppression unless SECV (and M.O.C.) is willing to accept increased risk/liability.

(iii) questions of cost (and thus cost-benefit) are not relevant.

3.7 SECV INSURANCES

It is understood that any implications of possible exemption from LVOCFPP in this case are to be determined by SECV Risk Management and Claims Division, for example, by way of their review of the results of this report.

We would therefore simply note, further to 3.6 above, that any policy change that would be likely to increase the material risk to SECV insurers would need to be advised to those insurers for their deliberations otherwise the possibility could arise that they may void their present responsibility in event of any insured loss.

4. CONCLUSIONS

4.1 Risk of Fire in the Worked-out Areas and Batters

The risk of fire in the worked-out areas is not minimal, because:

- there are about 11 fires a year in these areas.
- on average, their severity is similar to those fires in working areas of the mine in terms of usual extinction effort.
- these fires are located near key vulnerabilities, mostly in the dirty coal dump near the 260 series conveyors and around the production area in the North-East corner of the pit where a critical bore pump (M 2055) is placed.

4.2 Legal Liability

The CFA Act overshadows LVOCFPP, imposing a stringent requirement upon M.O.C. to adhere to practicable fire prevention and control measures. LVOCFPP is practicable.

Issues of cost and cost-benefit are not relevant to M.O.C. considerations of its fire protection responsibilities. Practicability is.

4.3 Policy Exemption

Exemption from sections 1.1.4 and 1.1.5 would increase fire risk in the worked-out areas and would increase SECV, and M.O.C., liability in this regard. Presently this risk is not minimal. Thus an exemption would not appear to be justifiable nor appropriate.

Moreover, any such policy exemption, or any policy modification intended to ease fire control requirements, should not be adopted until there is evidence of a reduction in fire risk having been achieved. Such a reduction could be shown, for example, by a consistent and measurable decrease in the number and severity of fires reported in the worked-out areas.

4.4 Improvement to Fire Protection

Our inspections and calculations indicate the present fire water service system is quite adequate for the worked-out areas, in accordance with the policy.

M.O.C. are correct in directing their thinking towards restricting vehicle access to worked-out areas, removing assets, increasing the number of tanker filling points and so on. These strategies do focus on the fire exposures of the worked-out areas.

This suggests implementation of these preventative and control measures, reinforced where necessary by addition or modification to LVOCFPP accordingly, is the appropriate strategy.

Policy development can thus proceed following a demonstrable reduction in risk.

5. RECOMMENDATIONS

5.1 Fire Protection Systems

We would suggest the following recommendations based on this study:

i. Undertake a detailed engineering survey of the fire water system, and include assessment of the North-East corner coal production area in this.

This survey should consider at least the following:

- the design of anchorage points and thrust blocks.
- loadings on pipes due to ground shift or slippage.
- leakage rates and roughness coefficients to enable more accurate hydraulic calculations.
- the number and location of values to ensure these are sufficient to allow for such contingencies as loss of a critical pipe or main.

- ultrasonic testing of pipe wall thickness at a sample of points (say 50 in number) throughout the system to determine the extent, if any, of rusting of pipes especially at critical locations.

This survey will then enable any maintenance and design improvements to the fire water system to be methodically costed and scheduled.

ii. Update the reticulation drawing and its hydraulic analysis, as a result of this engineering survey. Ensure such updates to the fire water system are advised to all appropriate personnel (e.g. Fire Services Team).

iii. Use both old clean water tanks for fire water storage and fit a tanker filling point to these (refer Figure 14). This will make a substantial quantity of water readily available for fire suppression in the worked-out areas.

5.2 Fire Prevention

i. Keep all M.O.C. fire reports on a P.C. data base and regularly review this data for causes and trends. This data analysis will assist to systematically reduce fire risks. Note that we have provided the 1989-1992 data on diskette with this report.

ii. Examine restrictions to roadways in the worked-out areas. For example, a permit system could be adopted to control access to specified roads and incorporate a check or control upon vehicle exhaust systems, at the same time.

iii. Stop dumping of dirty coal adjacent to the 260 series conveyors. Look to relocate such dumping.

iv. Relocate power feeders 15 and 16. We understand a relocation to near the 260 series conveyors is already proposed.

v. Commence a pole replacement programme for the 4, 5 and 16 power feeders, replacing timber poles with concrete ones.

5.3 Policy Revision

Suggested revisions to LVOCFPP would be:

(i) Specify number, distance, capacity requirements for Tanker Filling Points.

(ii) Automatic monitoring for fire pumps and other critical fire protection equipment, for example, by having a light and hooter alarm at the pump station to indicate loss of water pressure. This alarm would be visible from the fire detection points like Fire Services office, fire towers and Production Control centre.

REFERENCES

1. ENGINEERING DRAWINGS

1. Morwell open cut division 6.6 kV distribution feeders single line diagram (reference LV43/102/007 DRG1-AR), 20 November 1991.

2. Morwell Open Cut Fire and Water Service.
   a. General Layout as at 8 August 1990 (DRG No. MS 12-2-1/5/3z).
   b. General Layout as at October 1991 (DRG No. 12-2-1/11c).
   c. Fire Service orientation plan as at November 1991 (DRG No. LV61/1-3/044M).

2. SECV REPORTS AND MEMORANDA

1. Third International Mine Water Congress Excursion E2, Latrobe Valley Victoria
   Aquifer Dewatering Operations at Morwell Open Cut pp. 1-20, G. Sherlock 1988.

2. Morwell Open Cut North Eastern Batters - Road Closures and Fire Service Pipe Removal.
   R. Supplitt (part of a value management study) 1991, 8pp.

3. Golder Associates Pty Ltd, Review of Aquifer Dewatering at Morwell Open Cut 6, July 1990.
   Report to State Electricity Commission of Victoria (report no. 90612241).

4. Memorandum 27 March 1992, Review of 1991/2
   Summer Bushfire Mitigation Performance for 1991/2 (from General Manager Production) 6 pp.

5. Morwell Open Cut Fire Protection Report by Investigating Committee, June 1964. (at 15 December 1964), 8 pp.

6. Issues Paper - Protection of SECV Latrobe Valley Assets from Rural Wildfire. R. Incoll (updated - post 1984) 54 pp.

7. SECV Production Group. Bushfire Mitigation Action Plan 1991/2 28 pp.

8. SECV - Liability Insurance Underwriting Submissions for 1989/90 and 1991/2.

9. Delaney WA. Morwell Open Cut Fire Risk Analysis. Research and Development Department Report, 30 November 1990. 33 pp.

10. Morwell Open Cut Fire 4-6 November 1977.
Summary report by Review Committee, 30 June 1978. 19 pp plus appendices.

3. OTHER REPORTS

1. L.E.B. Stretton. Report of the Royal Commission to inquire into Yallourn Fires of 14 February 1944. 13 pp.

2. Von Rothkirch, B. Water Supply system for Fire Control at Garzweiler Open-Cut Mine. in Braunkohle, 1986, 38(9), pp. 268-273.

4. POLICY REPORTS

1. Latrobe Valley Open Cuts Fire Protection Policy (revised) November 1984.
plus review of section 1.4.3 Timbered Area, December 1990.

2. Policy for the Protection of SECV Latrobe Valley Assets from Rural Fires, July 1986, 8 pp. plus attachments.

3. Draft Policy, October 1985 for Protection of SECV Latrobe Valley Assets from the Rural Fire Threat. Includes Fire Issues paper.

5. GENERAL

1. Hall, J.R. and Sekizawa, A. Fire Risk Analysis-General Conceptual Framework for Describing Models. Fire Technology, February 1991, pp 33 - 53.

CT\SECV\MORREF:mg

FIGURE 1: General view of the worked-out area of Morwell Open Cut (M.O.C.), looking at the eastern batters over No. 5 groyne in the foreground.

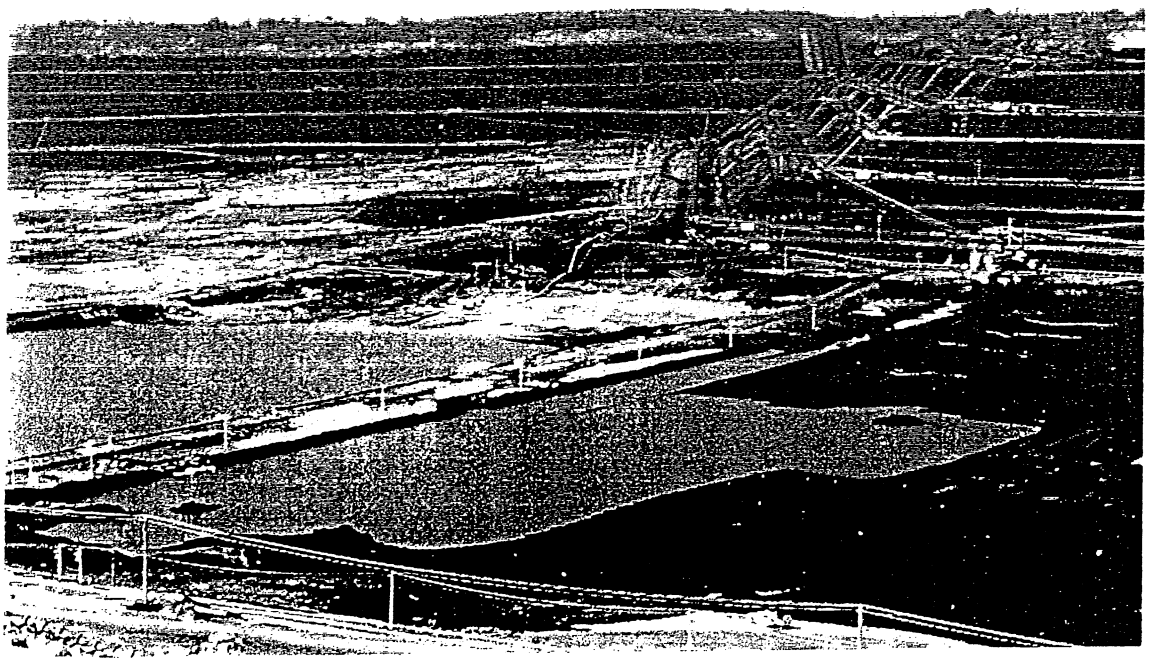

FIGURE 2: General view of the right hand portion of the worked-out area, looking east along the southern batters and the "260 series" conveyors. No. 5 groyne and the start of the present working area of the mine are in the lower half of the picture.

FIGURE 3: Coal winning operation using mobile plant and haul trucks located in north-east corner of the worked-out area.

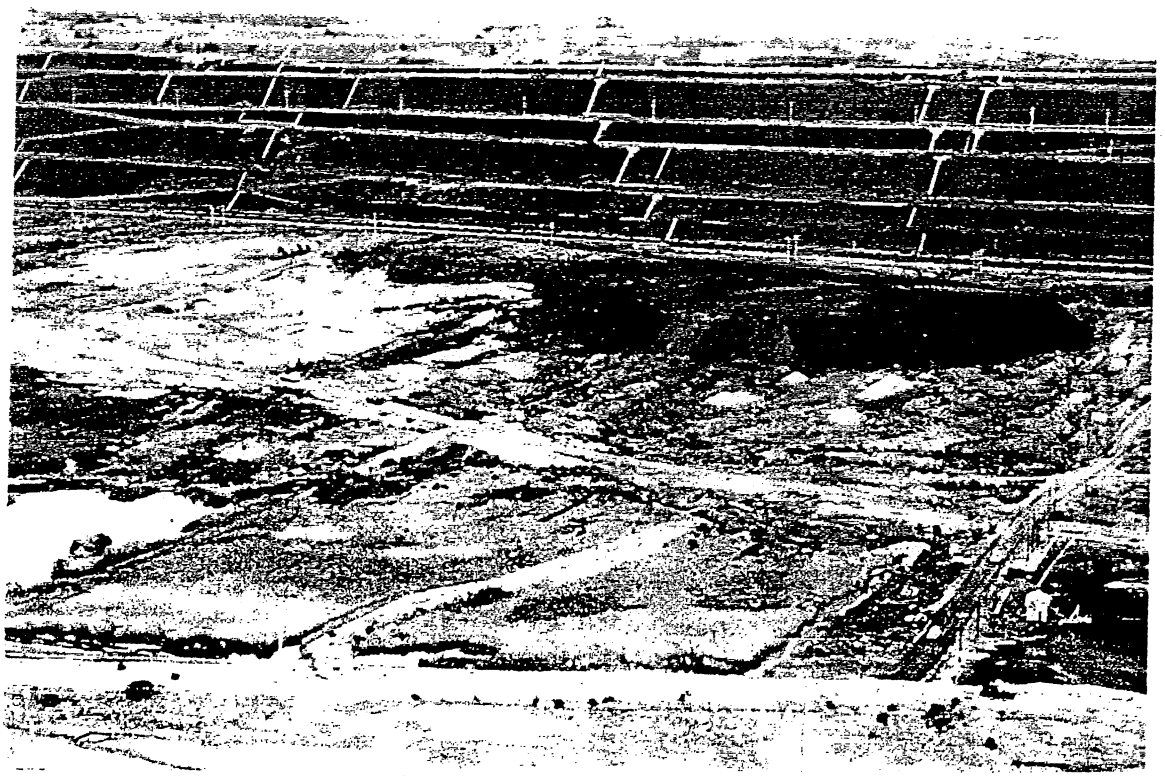

FIGURE 4: Dirty coal dump in worked-out area (looking south).

FIGURE 5: Looking north across the worked-out area along No. 4 groyne and across the dirty water reservoir.

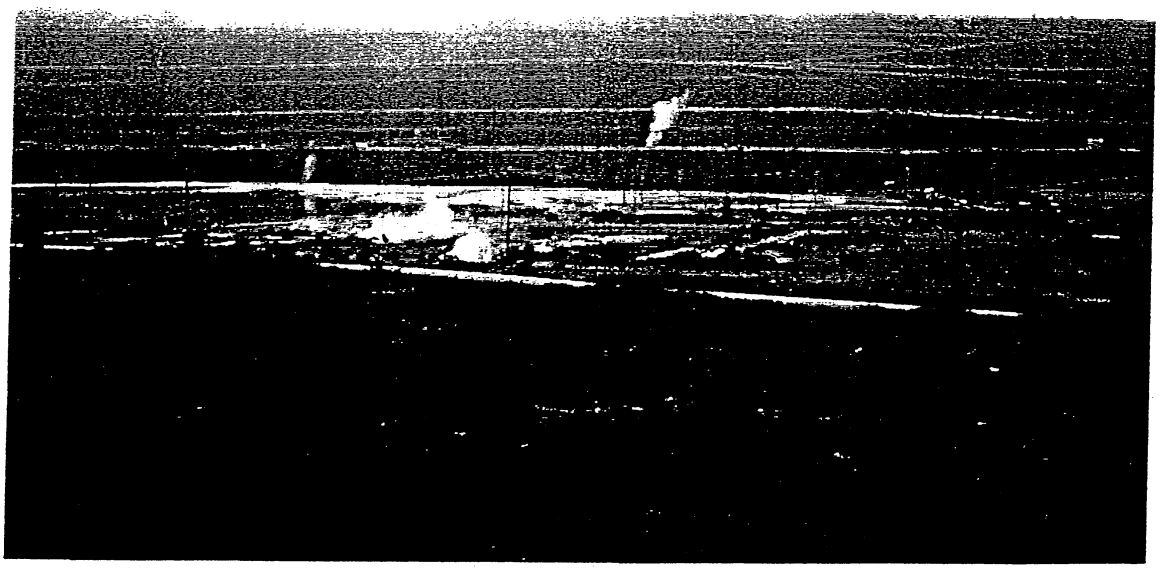

FIGURE 6: Looking north-east to the northern batters across the worked-out area (from same location as for Figure 5 above). Note foliage, vehicular traffic and the 1050 mm diameter dirty water main in mid-picture.

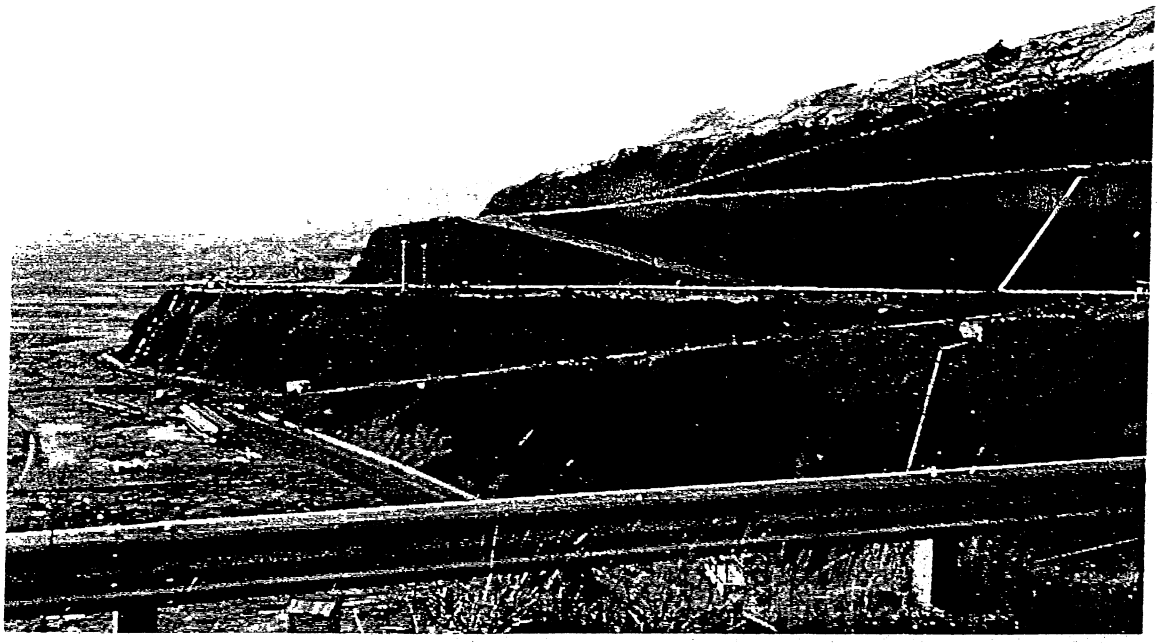

FIGURE 7: Looking generally north along the eastern batters, "20 series" conveyor in mid-picture. Note 6.6 kV power distribution feeder lines no's 15 and 16 coming down the batters on concrete poles.

FIGURE 8: Looking north-north-east down onto "20 series" conveyor, showing their power feed lines (feeders 5, 16 and 4).

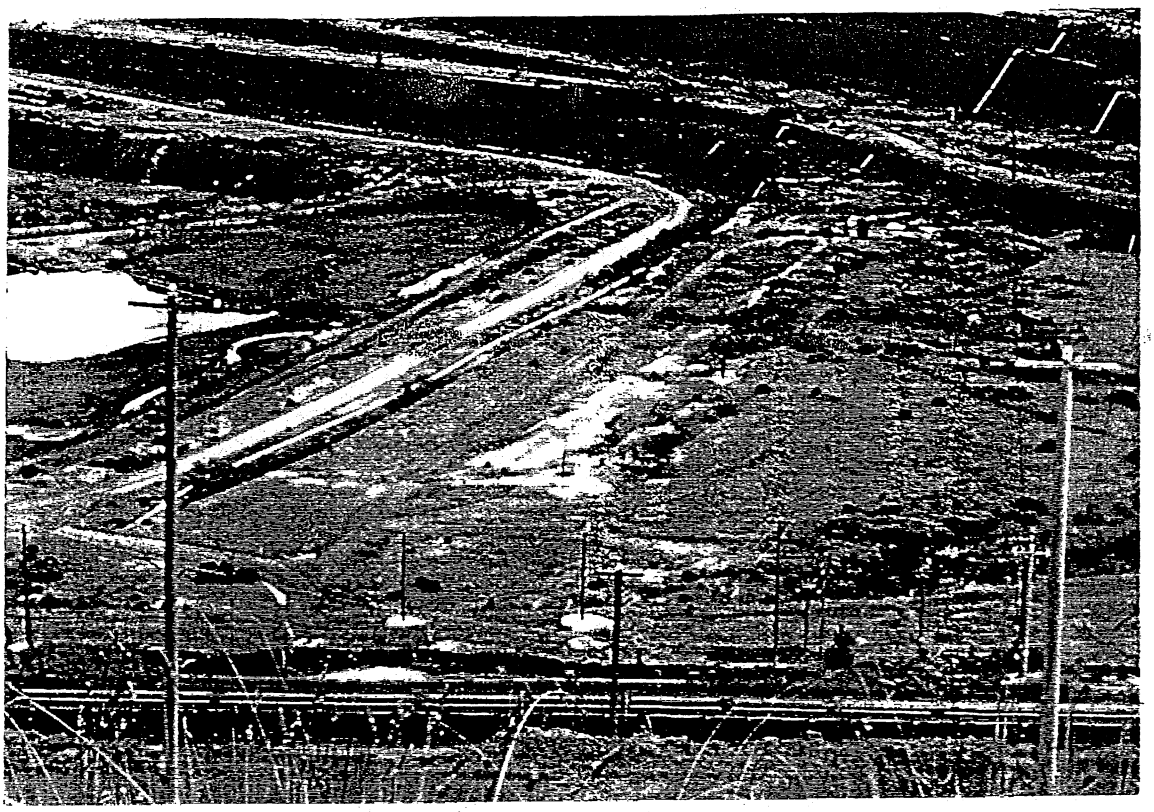

FIGURE 9: Looking north over "20 series" conveyor and along feeder lines 16 and 4 crossing the worked-out area, predominantly on timber poles.

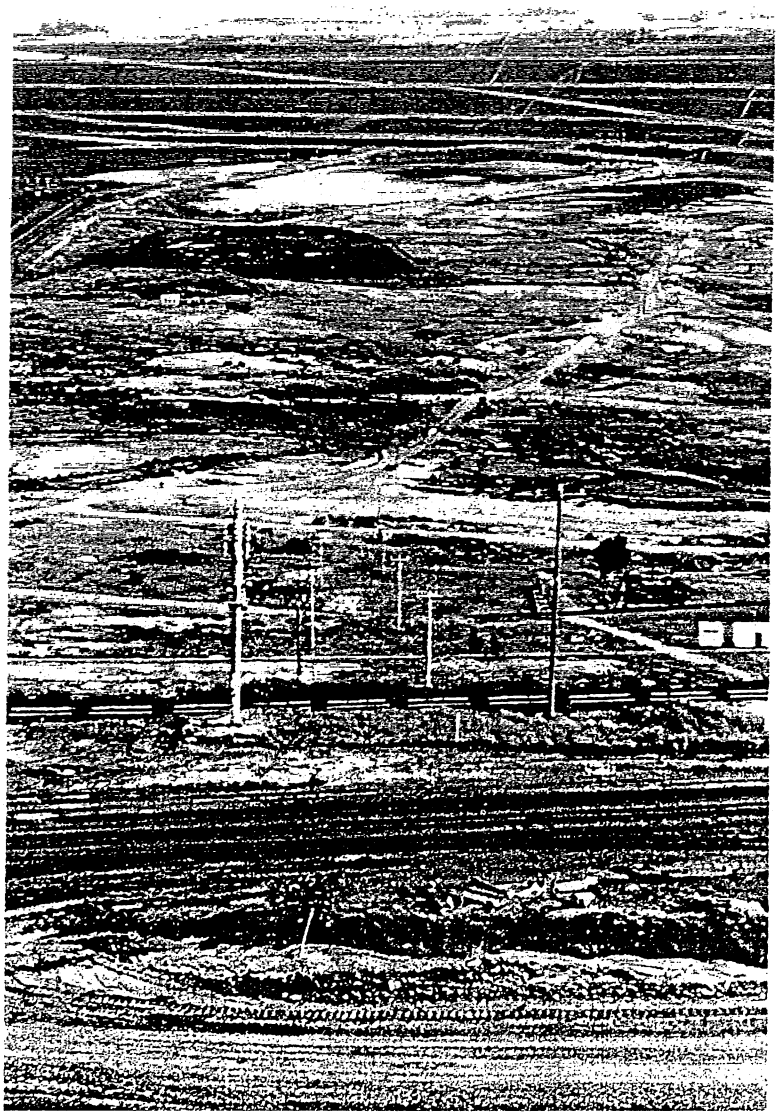

FIGURE 10: Feeders 15 and 16 coming down the eastern batters and across the worked-out area (looking west).

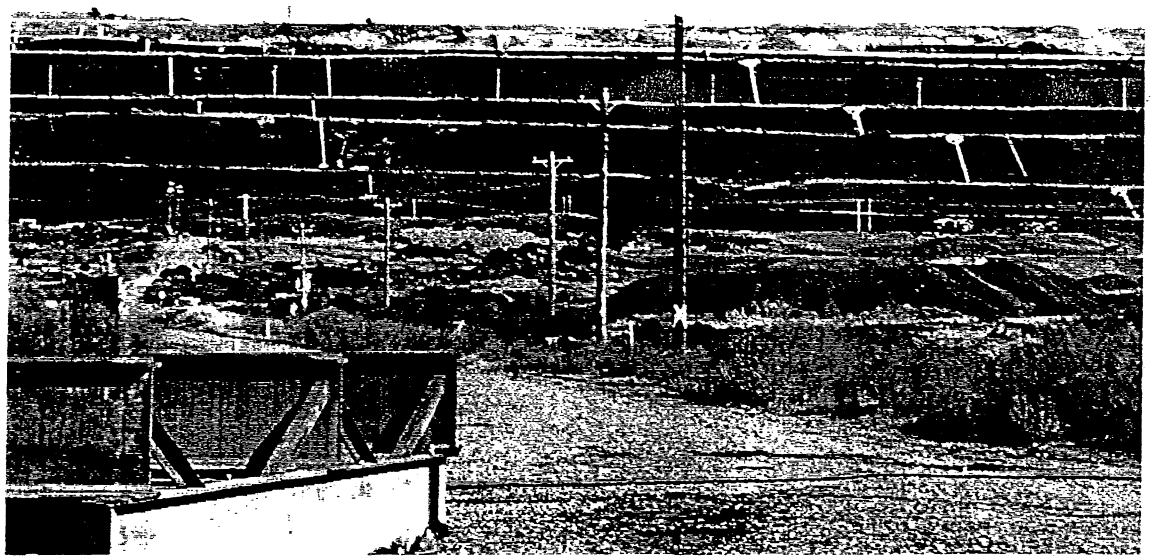

FIGURE 11: Feeders 15 and 16 crossing nearly through the middle of the worked-out area on timber poles, looking east.

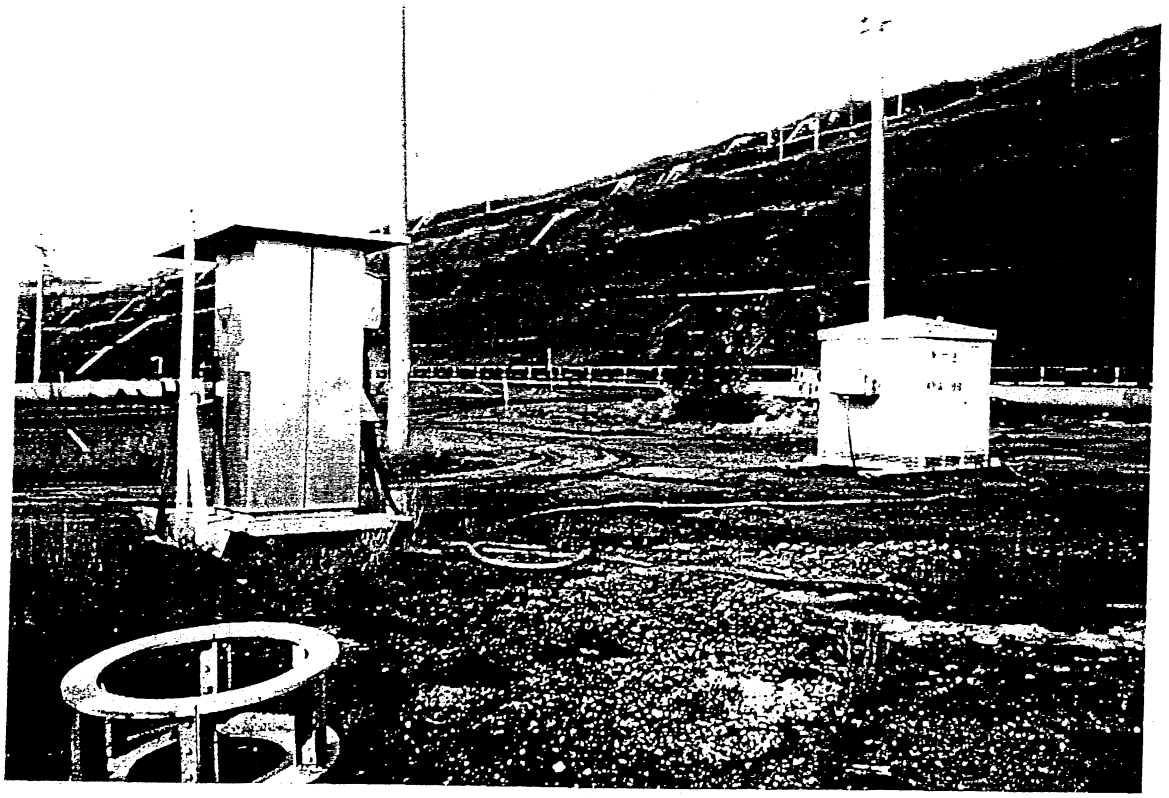

FIGURE 12: Electrical cubicle for switchgear, etc. (at left) and 300 kVA transformer (at right) to power artesian bore pump, located near southern pivot in the worked-out area.

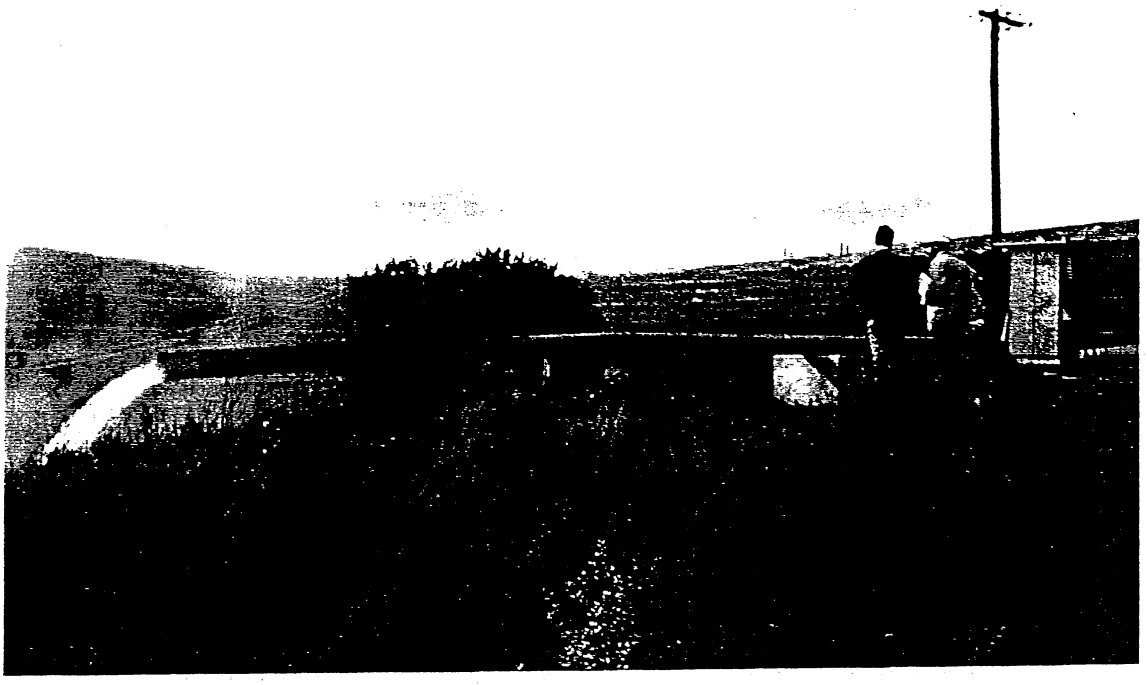

FIGURE 13: Artesian bore pump (per reference in Figure 12). Note electrical cubicle at right; foliage.

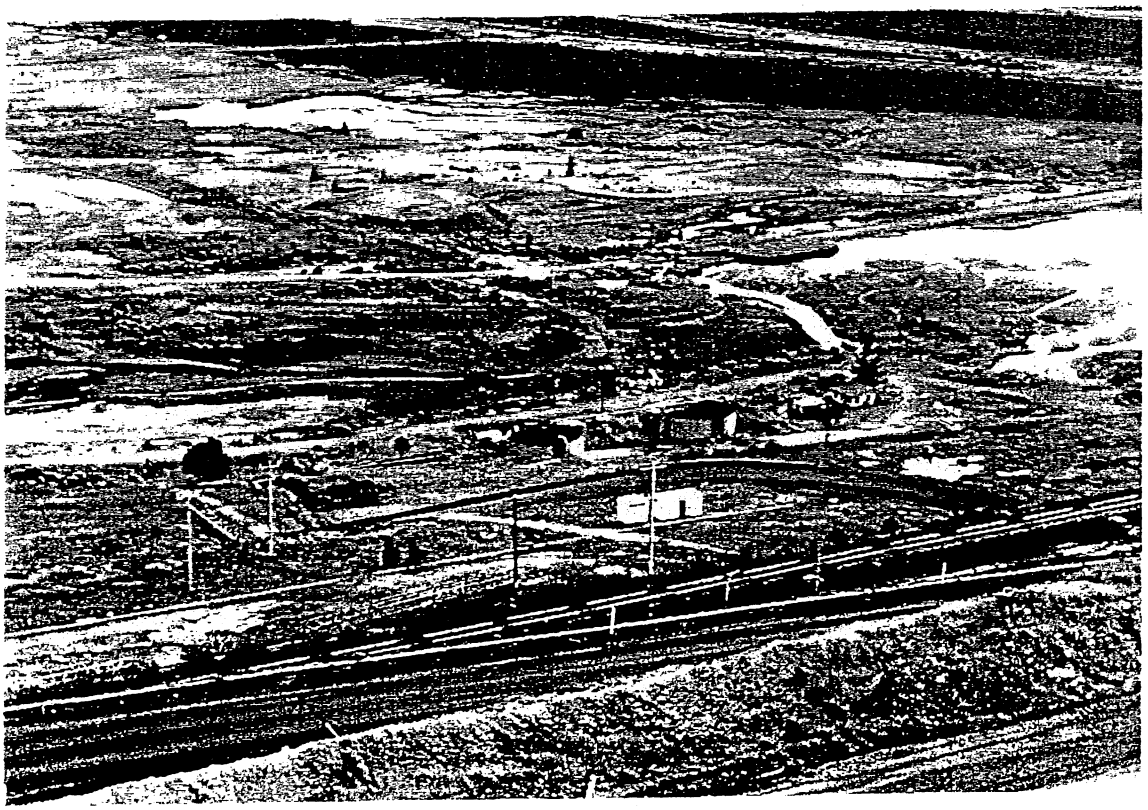

FIGURE 14: Two 100,000 gallon steel tanks, previously used for clean water storage, located on level 2 at the eastern end of the worked-out area. Viewed across "20 series" conveyor in the foreground.

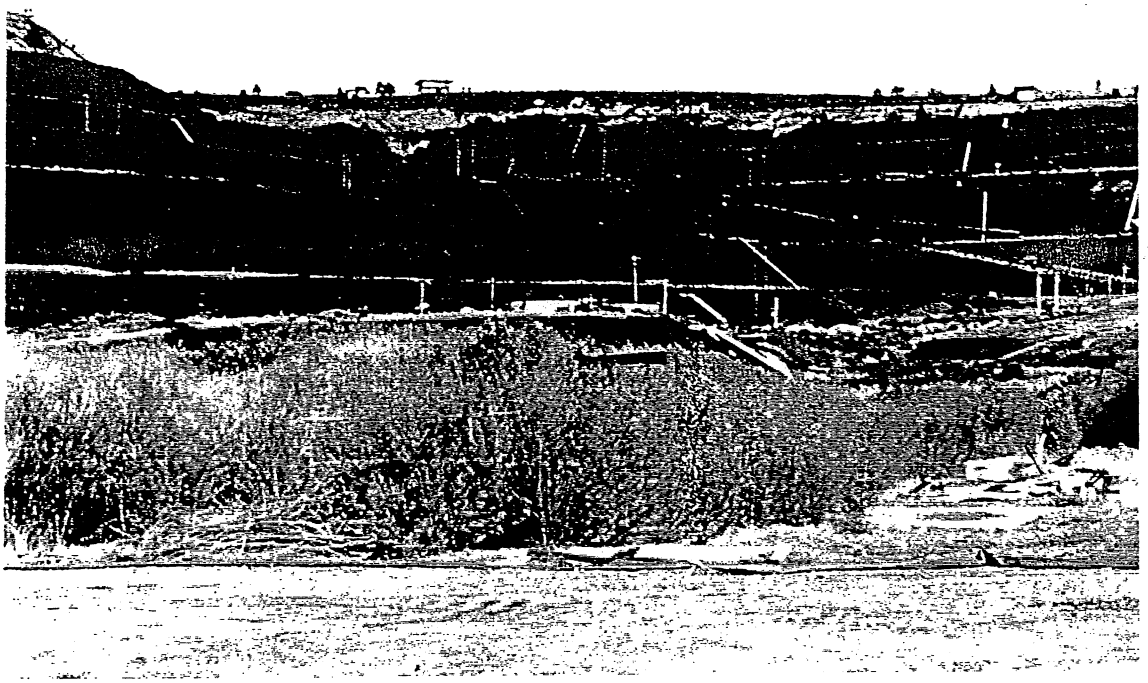

FIGURE 15: Fire detection capability indicated by view from eastern batters fire tower (extreme upper left) and control centre. Top of the two old clean water tanks (reference Figure 14) visible in mid-picture.

FIGURE 16: 100,000 gallon clean and dirty water tanks located near Hazelwood power station, for fire water storage and pressure control of the M.O.C. fire protection system.

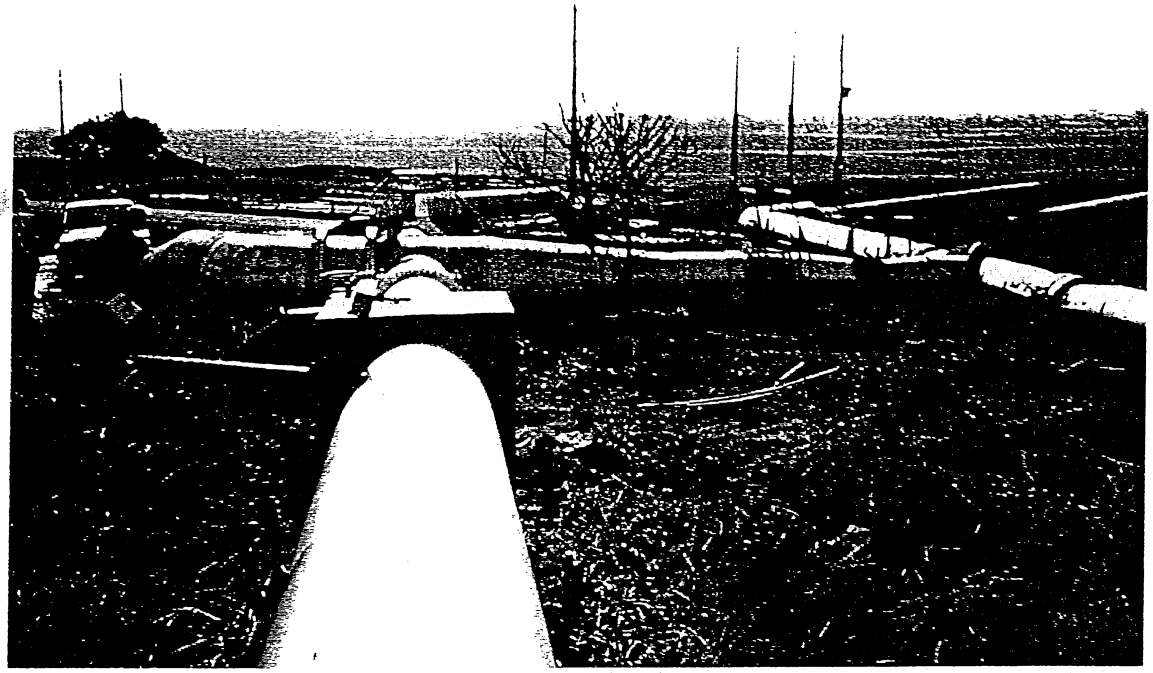

FIGURE 17: "H Section" located on grass level above the mine for valve control and mixing of clean and dirty water. Looking along the clean water line towards the mine, dirty water main on the right.

FIGURE 18: View from northern batters down onto dirty water reservoir and dirty water pumping station in mid-picture. Note clay and gravel on the bench/roadway in the foreground.

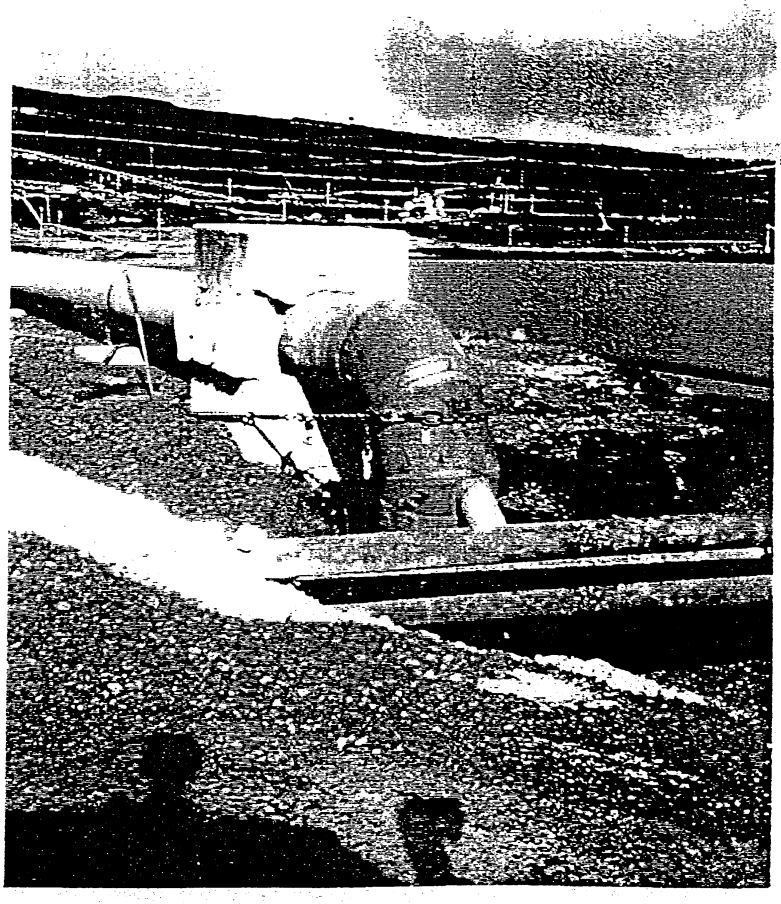

FIGURE 19:
Dirty water main at northern end of No.3 groyne adjacent dirty water pumping station. Note reinforcement of pipe elbow against water hammer and momentum.

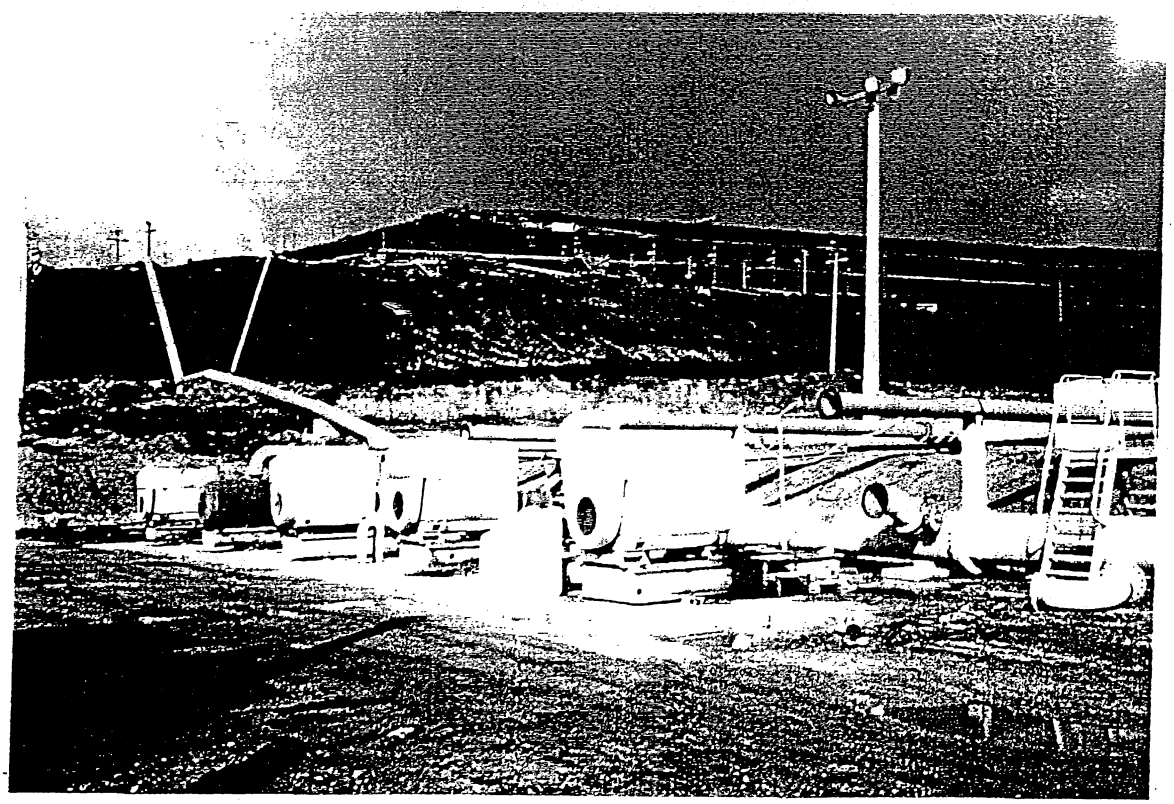

FIGURE 20: Clean water pumping station (looking towards southern pivot); three of five pumps out for repair.

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Table 1(a) RELEVANCE OF PREVIOUS MAJOR OPEN-CUT FIRES TO THE PRESENT RISK EXPOSURES OF M.O.C. WORKED-OUT AREAS

FROM 1977 MORWELL OPEN CUT FIRE REPORT		1992 - MORWELL WORKED-OUT AREAS
1.	Obtaining assistance from outside organisations: Call to CFA initiated approx. 3 hours after fire was first noticed, and had spread significantly.	Call out is now initiated by Fire Services officer upon spread of fire from point of ignition.
2.	Other SECV resources deployed from Yallourn Open Cut Fire Services and Engineering Services Forestry Group.	
3.	External services: CFA - CFA control vehicle, APM, CMF, RAAF, Regional Office of SES, Gippsland District Police.	
4.	Five large capacity water tankers obtained from various sources. Vehicle patrols used to combat spot fires, especially along southern and eastern batters.	Now have increased - refer to attached mobile equipment inventory (Table 3).
5.	600-700 personnel directly involved in fire fighting activity.	Are available in 1992.
6.	Elevating platform vehicle units used to control fires on high batters. Delay in their availability.	Are available in 1992.
7.	Interruption to power supplies for pumps and other equipment occurred due to burning cables.	Possible.
8.	Standardisation and compatibility of fire fighting equipment between SEC and those used from external sources.	Are available in 1992.
9.	Dredger fire protection required a great deal of supplementary fire fighting activity.	Possible.
10.	Coal bunker reserves were initially low - total capacity of Hazelwood Slot Bunkers was 25,000 t (had 9,400 tonnes coal). Morwell Raw Coal Bunker capacity 3,600 tonnes (had 400 tonnes coal).	Possible.
11.	Fire initiated by burning coal particles falling from vehicle exhaust.	Possible - remains a significant cause of ignition of fires in the worked-out areas.
12.	Fire initiated in a location outside the effective range of the water spray system, in a dry area.	Possible.
13.	Ring main had not been formed, less pressure than normal being available.	Possible.
14.	Shortage of effective hose application on site.	Improved.
15.	Pre-warning alerts achieved by declaring Total Fire Ban days or CFA Declared Fire Danger Period. Neither had been declared on the day of the fire.	Now use BYRAM-KEETCH DROUGHT index in addition to these indicators.
16.	Fire Service installations up to date and in line with open cut fire protection policy and progressive development plans.	LVOCFPP has been reviewed since.
17.	Difficulties in effective management and deployment of equipment and inexperienced personnel.	Fire training for SECV employees improved.
18.	Difficulty in contending with fires in high batters and for working under night conditions.	Possible. Improved fire protection equipment for extended reach hoses and reems.
19.	Road transport used to continue coal supply to Morwell Power Station.	Remains a viable alternative to coal transport by conveyor.

Table 1(a) RELEVANCE OF PREVIOUS MAJOR OPEN-CUT FIRES TO THE PRESENT RISK EXPOSURES OF M.O.C. WORKED-OUT AREAS

FROM 1977 MORWELL OPEN CUT FIRE REPORT		1992 - MORWELL WORKED-OUT AREAS
20.	All welding and flame cutting activities carried out under a permit system.	Are available in 1992.
21.	Average of 92 fires per year over previous five years from various causes.	Changed "trigger levels" for fire reports - annual average is now 300.
22.	Difficult fire suppression since: a) distance from pipelines/multiple hoses & b) reduced pressure/union bans.	Possible.
23.	Strong 75 km/h winds/direction changes.	Possible.
24.	Fire threat to: conveyors, cables, dredgers, mobile plant.	Possible.
25.	Reduced maintenance on reticulation system since work was diverted.	Possible.
26.	Appropriate check valve for LVW & SB connections for back-up water supply.	Not known.
27.	Convert critical valves to remote control and/or motorised operation.	Not done.
28.	Monitoring of operational status of critical valves (open/closed) at Open Cut Control and Fire Service Control Centres.	Not done.
29.	Enable greater use of Hazelwood Cooling Pond as a source of fire service supply.	Possible.
30.	Working party specifically and continuously allocated to maintenance and extension of fire service installations.	Not done to date.
31.	Additional water filling points for tankers. Extra hydrant manifolds near dredgers. Signposting system in the open cut.	Additional Tanker Filling Points are recommended by this report.

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Table 1(b). RELEVANCE OF PREVIOUS MAJOR OPEN-CUT FIRES TO THE PRESENT RISK EXPOSURE OF M.O.C. WORKED-OUT AREAS

	FROM 1944 ROYAL COMMISSION REPORT INTO THE FIRES AT YALLOURN	1992 - MORWELL
1.	The fire was initiated external to the mine. It spread to the mine by spotting from nearby bushfire.	Still possible - is a focus of the prevention campaign. Open cut area is increasing.
2.	Unbroken tract of timber between origin of fire and Yallourn.	Not applicable.
3.	No overall co-ordinating plan to handle the state of emergency of such magnitude.	Displan is now in place.
4.	Vaguely defined organisational structure of the general fire services.	Improved organisation within SECV and via Displan with other agencies.
5.	Separate departments were responsible for their own fire service (power station, open cut and briquette works).	
6.	Lack of co-ordination of volunteers.	Displan is now in place.
7.	Bush fire likely to originate from north or west of Yallourn.	Not applicable to this study.
8.	Engineer responsible for fire precaution not expert in the field, able to afford the role only part time attention, and used out of date techniques.	Fire prevention is now with trained firemen and Land Service personnel.
9.	Large quantities of char exhausted from stacks of power station and briquette factory and deposited upon surrounding country side. Provides additional fuel for an existing fire.	No longer takes place.
10.	Fire suppression/protection measures in the mine were not reasonably adequate.	Reticulation and pumping capacity increased from 1944 levels.
11.	Measures taken for protection during the last two or three hours before the fire started (in the mine) were not adequate; due to erroneous assumptions of winds maintaining prevailing direction.	Improved state of preparedness and improved monitoring of meteorological conditions.
12.	Water sprinklers on each berm at separation distances of 150 feet, to contain fire within compartments.	Same.
13.	Rely on use of hoses to extinguish fires.	Same. Improved design of equipment and more extensive capability.
14.	Unable to adequately fight fire on the faces of the berms: water pressure and flow rate inadequate.	Specially designed monitors are now provided.
15.	Provision for better tactical distribution of equipment to the various parts of the mine during a time of emergency.	Done.
16.	Ongoing revision of the water main and sprinkler system be made to reflect the changing needs of the mine.	Significant reviews in 1962, 1964, culminating in the LVOCFPP of 1977 and its revision in 1984.
17.	Upgrade available water pressure.	Design standard is LVOCFPP? No further information available to this study.
18.	SEC Personnel be trained in the use of equipment and fire fighting techniques.	Done.
19.	External assistance; Country Fire Brigade, Air Raids Precaution Body?, The Forest Gang, Volunteers	External agencies now co-ordinated via DISPLAN and Emergency Response plans.
20.	Improve marginal protection.	Part of Land Services fire protection.

Table 1(b). RELEVANCE OF PREVIOUS MAJOR OPEN-CUT FIRES TO THE PRESENT RISK EXPOSURE OF M.O.C. WORKED-OUT AREAS

FROM 1944 ROYAL COMMISSION REPORT INTO THE FIRES AT YALLOURN		1992 - MORWELL
21.	Engage the services of an adviser on Forest fire protection and suppression who has direct access to the board of commissioners.	Not known. Statutory authority with Dave Francis
22.	Key utility for State of Victoria.	Now a number of other power stations on the state grid - Morwell Power Station is strategically important.
23.	Several fires - multiple ignition sources.	Possible.
24.	Ignition by bushfires/flying embers.	Possible.
25.	"Wanton and illegal behaviour by persons outside SEC control."	Possible.
26.	"Fire is an almost unavoidable concomitant of brown coal open cut mining."	Possible.

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APPENDICES

APPENDIX 1

People contacted during the course of this project are indicated below:

NAME	POSITION/SECTION
John Bohan	Mine Planning & Technology - Engineer
Alan Brown	Scientific & Environmental Services
Bill Brown	Fire Services Officer M.O.C.
Rob Curtis	
Graham Dave	Fire Services Officer M.O.C.
Wal Delaney	Engineer, Applied Science Section HRL
Dave Francis	Land Services Officer
Graeme Freshwater	M.O.C. Mine Manager
Rob Gaulton	Regional Geologist
Rob Hutchings	
Bob Joynt	Head, Applied Science Section HRL
Ian Kruse	Manager, Risk Management & Claims Division
Ted Kuklinsky	M.O.C. Electrical Services
Peter Mackay	M.O.C.
David Murray	Mine Planning & Technology - Engineer
Alf Ottrey	Head, Coal Evaluation Section HRL
Darryl Patching	Scientific & Environmental Services - Applied Technology
Richard Polmear	M.O.C. Production Scheduling Supt.
Chris Salter	Latrobe Valley Systems Protection (Land Services, Manager)
Jim Somerville	Geotechnology Services
Rob Supplitt	M.O.C.
Phil Taylor	M.O.C. Electrical Services
Andy Teggart	(Loy Yang) Latrobe Valley Essential Services
Colin Young	Fire Services Officer M.O.C.

APPENDIX 2

PREVAILING WINDS DURING SPRING AND SUMMER AT MORWELL OPEN CUT

Based upon data from air quality monitoring stations located at Thoms Bridge (situated to the north of the mine) and Yinnar South (situated approximately south of the mine), the predominant winds in Spring and Summer prevail from the West and South Westerly directions and are at or above speeds of 5 m/s.

Whilst the wind information examined from these stations related only to readings taken over Spring and Summer periods, it highlight that the most common prevailing winds during the period of greatest fire danger would tend to spread a fire within the mine toward the eastern and southern batters.

Therefore, given the occurrence of a fire within the open cut, critical coal transport conveyors and equipment located along the Southern and Eastern batters of the mine becomes vulnerable to the spread of any fire under the influence of winds prevailing from the West and South Westerly directions.

Such fire could possibly initiate in, or progress through, the worked-out areas.

RICHARD OLIVER

RECORDED DATA OF WINDS PREVAILING FROM WESTERLY AND SOUTH–WESTERLY DIRECTIONS AT THOMS BRIDGE AND YINNAR SOUTH AIR QUALITY MONITORING STATIONS.

THOMS BRIDGE

FREQUENCY					
SOUTH–WEST		Spring		Summer	
	Year	3pm	All Hours	3pm	All Hours
Winds Equal to or in excess of 5m/s.	1987/88	19.5%	6.1%	21.6%	9.2%
	1988/89	12.4%	5.5%	14.0%	6.7%
	1989/90	14.1%	4.8%	12.7%	7.7%
	1990/91	9.4%	4.2%	14.8%	6.9%
Averages		13.9%	5.2%	15.8%	7.6%

FREQUENCY					
WEST		Spring		Summer	
	Year	3pm	All Hours	3pm	All Hours
Winds Equal to or in excess of 5m/s.	1987/88	31.3%	24.3%	13.4%	9.7%
	1988/89	40.4%	31.1%	19.8%	10.2%
	1989/90	30.6%	24.0%	19.0%	8.9%
	1990/91	27.1%	18.9%	29.7%	19.7%
Averages		32.4%	24.6%	20.5%	12.1%

Over ALL SPEEDS,
wind prevailing from the WESTERLY direction were most dominant.
(Also significant were winds prevailing from South Westerly direction.)

FREQUENCY					
WEST		Spring		Summer	
	Year	3pm	All Hours	3pm	All Hours
ALL SPEEDS	1987/88	36.3%	40.3%	21.7%	22.3%
	1988/89	46.1%	45.8%	22.1%	22.5%
	1989/90	38.8%	38.3%	25.3%	19.6%
	1990/91	37.6%	37.2%	32.1%	31.7%
Averages		39.7%	40.4%	25.3%	24.0%

YINNAR SOUTH

FREQUENCY					
SOUTH–WEST		Spring		Summer	
	Year	3pm	All Hours	3pm	All Hours
Winds Equal to or in excess of 5m/s.	1989/90	12.9%	4.6%	13.0%	3.4%
	1990/91	13.3%	3.9%	18.4%	6.4%
Averages		13.1%	4.3%	15.7%	4.9%

FREQUENCY					
WEST		Spring		Summer	
	Year	3pm	All Hours	3pm	All Hours
Winds Equal to or in excess of 5m/s.	1989/90	22.6%	14.8%	3.7%	0.9%
	1990/91	7.2%	4.4%	4.6%	3.3%
Averages		7.7%	5.3%	3.1%	2.1%

Over ALL SPEEDS,
wind prevailing from the SOUTH WESTERLY direction were most dominant. (Also significant were winds prevailing from Westerly direction.)

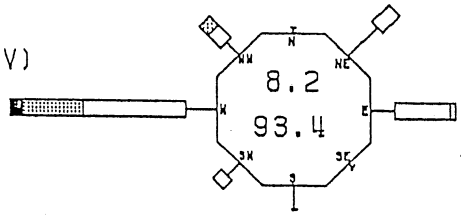
FREQUENCY					
SOUTH–WEST		Spring		Summer	
	Year	3pm	All Hours	3pm	All Hours
ALL SPEEDS	1989/90	29.0%	36.6%	33.3%	40.2%
	1990/91	39.8%	46.9%	50.6%	46.8%
Averages		34.4%	41.8%	42.0%	43.5%

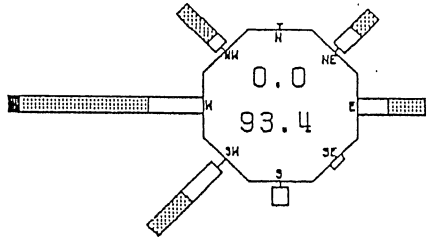
3 AM

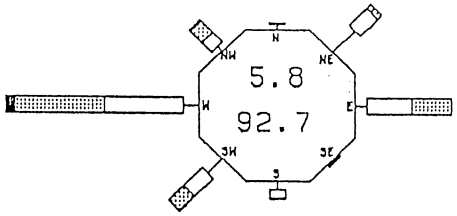
3 PM

ALL HOURS

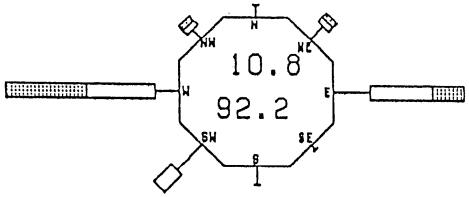
SPRING (SEP TO NOV)
1990

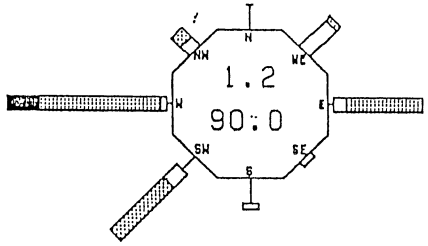


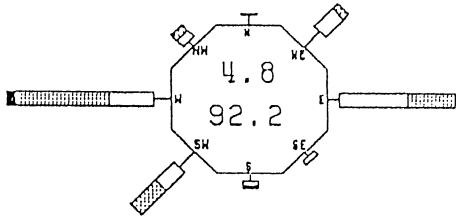




SUMMER (DEC TO FEB)
1990/91







SEASONAL WIND ROSES

STATION: 9 THOMS BRIDGE

SEASONS: SPRING & SUMMER

YEAR: 1990/91

CALMS %

OP. %

WIND SPEED CLASSES (M/S)

< 2 2-5 5-10 > 10

FREQUENCIES (%)

30 60 90

CALM: WIND SPEED LESS THAN OR EQUAL TO 0.3 M/S

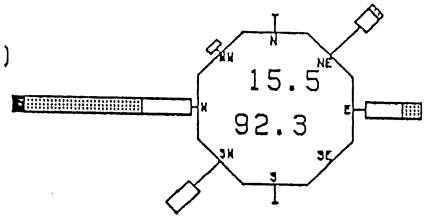
NOTE: DATA SOURCE RECORDS WIND SPEEDS TO THE NEAREST 0.1 M/S

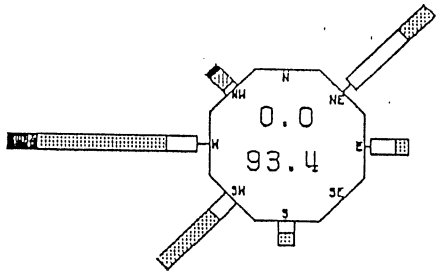
3 AM

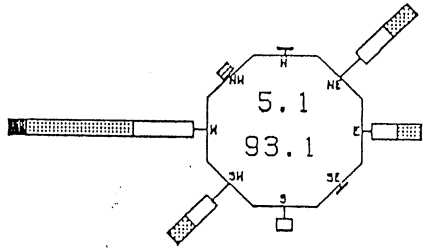
3 PM

ALL HOURS

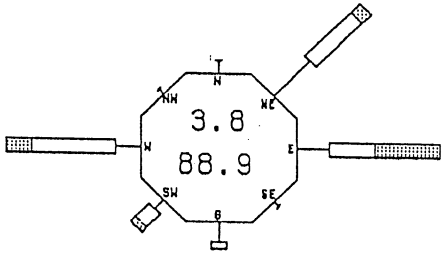
SPRING (SEP TO NOV)
1989

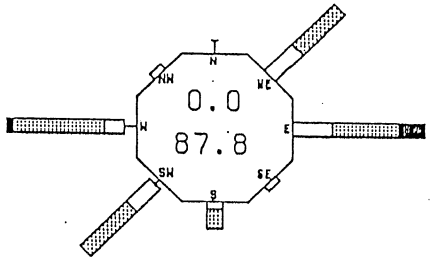


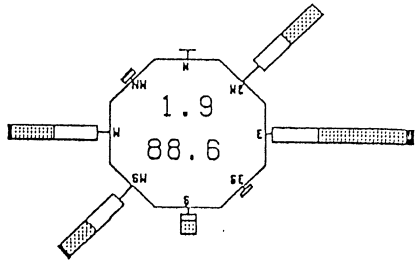




SUMMER (DEC TO FEB)
1989/90







SEASONAL WIND ROSES

STATION: 9 THOMS BRIDGE

SEASONS: SPRING & SUMMER

YEAR: 1989/90

CALMS %

OP. %

WIND SPEED CLASSES (M/S)

< 2 2-5 5-10 > 10

FREQUENCIES (%)

30 60 90

CALM: WIND SPEED LESS THAN OR EQUAL TO 0.3 M/S

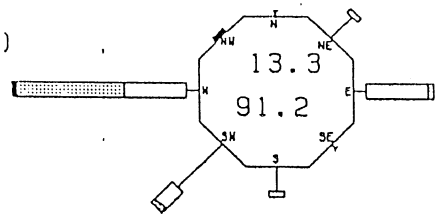
NOTE: DATA SOURCE RECORDS WIND SPEEDS TO THE NEAREST 0.1 M/S

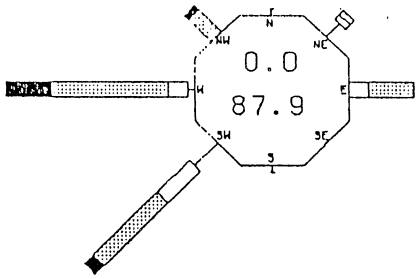
3 AM

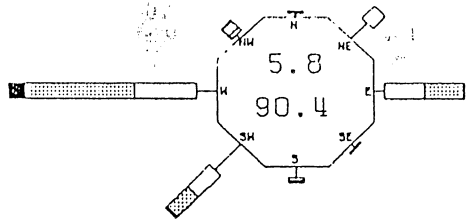
3 PM

ALL HOURS

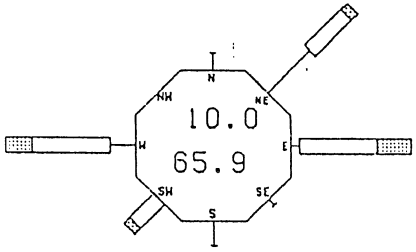
SPRING (SEP TO NOV)
1987

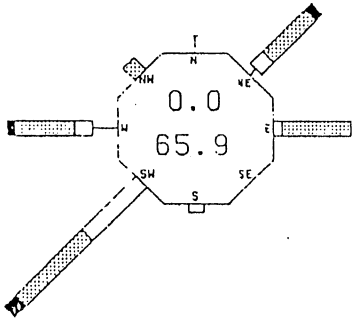


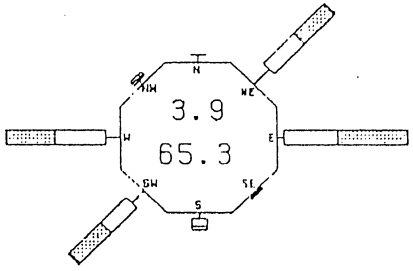




SUMMER (DEC TO FEB)
1987/88







SEASONAL WIND ROSES

STATION: 9 THOMS BRIDGE

SEASONS: SPRING & SUMMER

YEAR: 1987/88

CALMS %

OP. %

WIND SPEED CLASSES (M/S)

< 2 2-5 5-10 > 10

FREQUENCIES (%)

30 60 90

CALM: WIND SPEED LESS THAN OR EQUAL TO 0.3 M/S

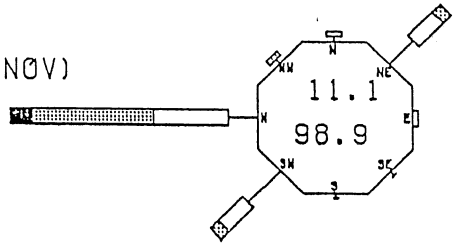
NOTE: DATA SOURCE RECORDS WIND SPEEDS TO THE NEAREST 0.1 M/S

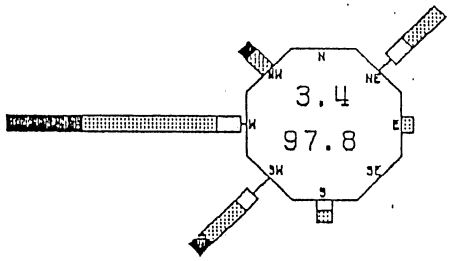
3 AM

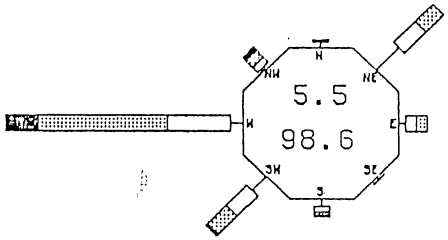
3 PM

ALL HOURS

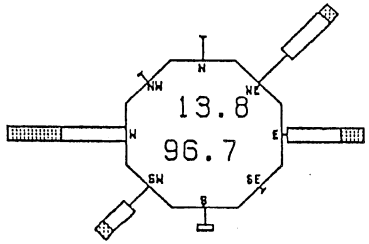
SPRING (SEP TO NOV)
1988

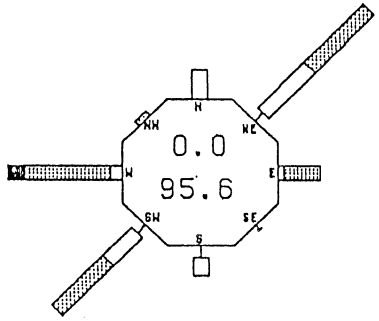


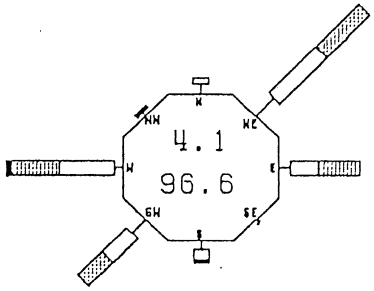




SUMMER (DEC TO FEB)
1988/89







SEASONAL WIND ROSES

STATION: 9 THOMS BRIDGE

SEASONS: SPRING & SUMMER

YEAR: 1988/89

CALMS %

OP. %

WIND SPEED CLASSES (M/S)

< 2 2-5 5-10 > 10

FREQUENCIES (%)

30 60 90

CALM: WIND SPEED LESS THAN OR EQUAL TO 0.3 M/S

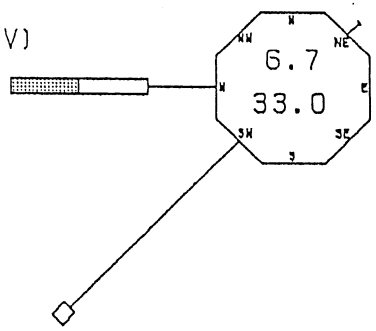
NOTE: DATA SOURCE RECORDS WIND SPEEDS TO THE NEAREST 0.1 M/S

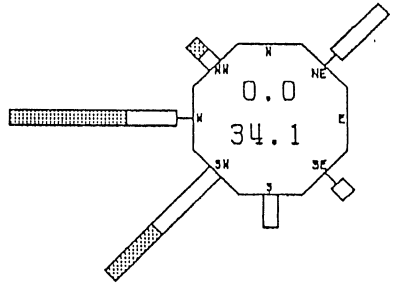
3 AM

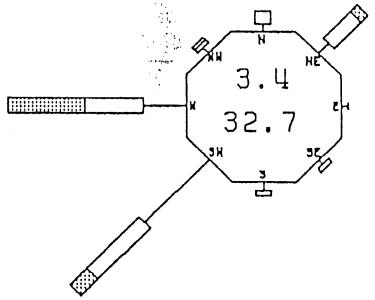
3 PM

ALL HOURS

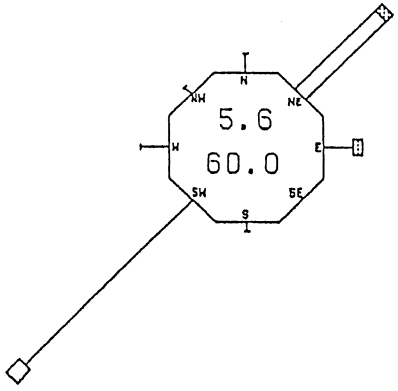
SPRING (SEP TO NOV)
1989

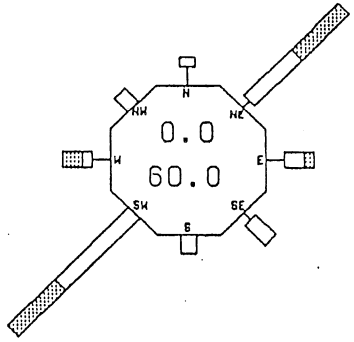


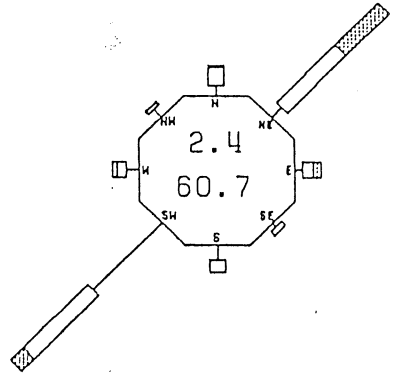




SUMMER (DEC TO FEB)
1989/90







SEASONAL WIND ROSES

STATION: 31 YINNAR SOUTH

SEASONS: SPRING & SUMMER

YEAR: 1989/90

CALMS %

OP. %

WIND SPEED CLASSES (M/S)

< 2 2-5 5-10 > 10

FREQUENCIES (%)

30 60 90

CALM: WIND SPEED LESS THAN OR EQUAL TO 0.3 M/S

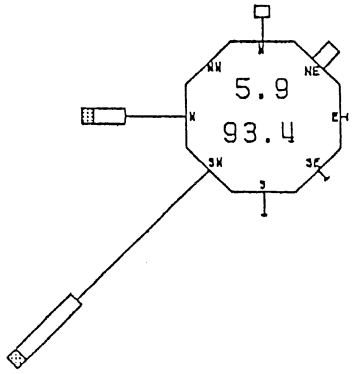
NOTE: DATA SOURCE RECORDS WIND SPEEDS TO THE NEAREST 0.1 M/S

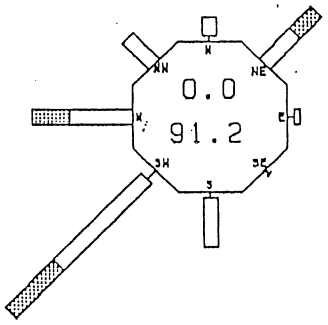
3 AM

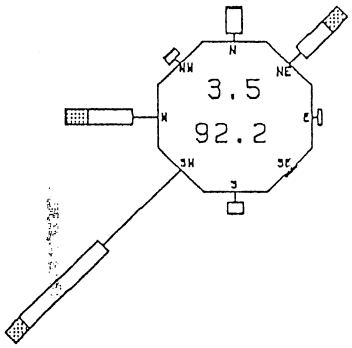
3 PM

ALL HOURS

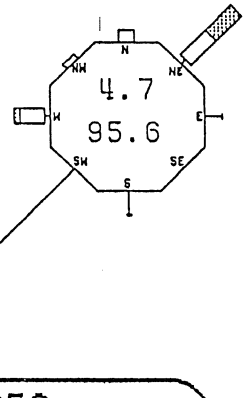
SPRING (SEP TO NOV)
1990

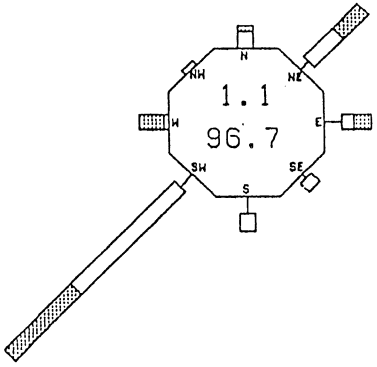


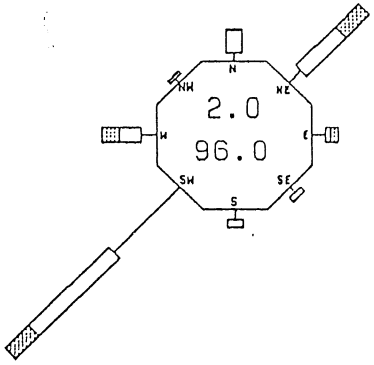




SUMMER (DEC TO FEB)
1990/91







SEASONAL WIND ROSES

STATION: 31 YINNAR SOUTH

SEASONS: SPRING & SUMMER

YEAR: 1990/91

CALMS %

OP. %

WIND SPEED CLASSES (M/S)

< 2 2-5 5-10 > 10

FREQUENCIES (%)

30 60 90

CALM: WIND SPEED LESS THAN OR EQUAL TO 0.3 M/S

NOTE: DATA SOURCE RECORDS WIND SPEEDS TO THE NEAREST 0.1 M/S

APPENDIX 3

1. HYDRAULIC APPRAISAL OF FIRE WATER DEMAND FOR WORKED-OUT AREAS

1.1 BACKGROUND

The Latrobe Valley Open Cuts Fire Policy details the method for determination of fire water demand in the worked-out areas. Water is required:

(i) for water spray on exposed coal, prior to the application of clay covering (Section 1.1.5 refers).

(ii) for fire protection (Section 2.1.2 refers).

The following brief analysis seeks to determine the best estimate of the maximum demand for fire water in worked-out areas, in accordance with the policy.

(i) Exposed Coal in Worked-Out Areas

From site visits and after review of an aerial photograph (scale 1:2500 approx.) there appear to be several sections of the worked-out area where clay covering has not been applied. These sections measure:

400m x 200	=	80,000
250m x 200	=	50,000
200m x 375	=	84,375
250m x 250	=	62,500
200m x 300	=	60,000
TOTAL		336,875m^2

The extent of water spray coverage is 50%, leaving alternating corridors of wet coal and dry coal of 50 metres width. The design precipitation is given as 6mm/hour.

Spray Rate = 336,875m^2 x 50% x 6mm/h
= 280 L/second

An allowance for hydraulic balancing of friction losses should provide for up to 15% flow in addition to the minimum. i.e. design for 325 L/second for coal spraying.

(ii) **Fire Protection**

Section 2.1.2 of the LVOCFP policy outlines the methodology for determination of flow rates as follows, using the greater of design method A or B.

OPTION A		Required Rate L/Second
(i)	all rotary sprays and all machine protection	Nil
(ii)	three hydrants on each header on working levels	Nil
(iii)	rotary and birdsmouth sprays, for quarter length of trunk conveyor	Nil
OPTION B		**Required Rate L/Second**
(i)	one half rotary sprays and all machine protection on working levels	Nil
(ii)	three hydrants per header for half headers on working face	Nil
(iii)	rotary and birdsmouth sprays for half length trunk conveyor	Nil
(iv)	three hydrants per header for half trunk conveyor	Nil

It is instructive to note that the policy presumes that the exposed coal surfaces will be clay covered - hence there is no perceived need for an allowance for hosestreams in such areas.

(iii) **Other Design Considerations**

The remaining sections of Clause 2 in the policy relate to requirements for the fire protection water supplies. These include:

- dual sources; minimum supply to provide 50% of calculated demand.
- adequate capacity for 24 hours plus make-up.
- maximum system pressure of 115m.
- remote system monitoring of critical functions.

1.2 HYDRAULIC CALCULATION METHODS

A precise analysis of the hydraulic performance of the various fire water systems is beyond the immediate scope of this study. There are severe limitations regarding the available data, including the currency of reticulation drawings (discrepancies exist), pipe leakage rates, and details on equivalent pipe-roughness co-efficients. The collection of this data has not yet been undertaken by SECV - the following methodology is therefore limited.

Important design constraints are:

(i) duplicated water supply; minimum to provide 50% of calculated demand (LVOCFPP)
(ii) duplicated Main Supply Lines (LVOCFPP)
(iii) calculation based on worst case flow path. (AS 2419)

Friction loss in pipes can be given by the Hazen Williams equation (refer AS 2118, ϕ 12-9)

$$P = \frac{6.05 \times Q^{1.85} \times 10^7}{C^{1.85} \times d^{4.87}}$$

Where
P = pressure loss (kPa/metre)
Q = Water flow rate (L/min)
d = mean internal pipe diameter (mm)
C = pipe roughness coeff. 120 (mild steel)

This can be simplified as $P = kQ^{1.85}$, for various pipe diameters.

d (mm)	k
1400	4.11×10^{-12}
1000	2.11×10^{-11}
760	8.05×10^{-11}
600	2.54×10^{-10}
450	1.03×10^{-9}
300	7.44×10^{-9}
200	5.36×10^{-8}

Pipe layout is given by SECV drawings LV61/1-3/26F and MS 12-2-1/5/3 and amendments given by Mr W. Brown. The water supply should be adequate for the worst case i.e. the hydraulically most remote location in the worked-out area. A variety of locations were considered as possible supply/demand locations. Valve 303 was selected as the notional 'most remote location' due to its hydraulic disadvantage (highest of the low pressure zone), and its being most distant from the water supplies. Valve 303 is located adjacent to a coal production area (refer to figure 3), but is otherwise considered to represent the 'most remote location' in the worked-out area.

The following trial calculations indicate that a satisfactory supply is available based on the calculation methods discussed above. With the reduced reticulation (as described by W. Brown) the available pressure is reduced by 22% to 580 kPa. This is still considered to be satisfactory.

A trial calculation on losses to valve OB01 has been made. This valve is located at level 0 adjacent to the conveyor transfer point - a vulnerable area. At the nominated flow demand of 325 L/sec, adequate pressure would be available.

75 m x 610 mm (407-404)
225 m x 450 mm (404-402)
250 m x 200 mm (402-303)

Total equivalent parallel feed losses = 230 kPa.

Total Friction Loss = 320 kPa
Available Static Head on Level 3 = 900 kPa
Computed Residual Pressure @ = 325 L/sec is 580 kPa; is satisfactory.

Refer also to attached calculation sheets/gradient sheets.

1.2.2 DW Pumps/Northern Batters/Valve 303

(complete reticulation - refer dwg No. MS 12-2-1/5/3)

Flow rate = 325 L/second

Pipe Run (m x mm)	Friction Loss (kPa)
325 m x 1000 mm	0.6
1000 m x 450 mm	89.0
750 m x 610 mm	16.5
550 m x 450 mm	49.0
Total Friction Loss	155.0 kPa

Available static head on level 3 = 900 kPa
Computised minimum residual pressure @ 325 L/sec is 745 kPa; is satisfactory. Note: this is considerably greater than scenario 1.2.1.

1.2.3 D Tank/Southern Batters/Valve 0B01

Flow rate = 325 L/second

Pipe Run (m x mm)	Friction Loss (kPa)
1250 m x 1050 mm	2.3
100 m x 760 mm	0.7
625 m x 450 mm	55.6
175 m x 300 mm	112.5
	169.5 kPa

Total Friction Loss = 170.0 say.

Available static head on level 1 = 800 kPa
Computed Residual Pressure @ 325 L/sec is 630 kPa; is satisfactory.

2. FIRE FUNDAMENTALS

2.1 Mechanism of Fire

The mechanism of fire development should be considered when any review of the LVOCFPP is undertaken. The following aspects of fire development are interdependent:

- effect of fire prevention.
- time for detection of fire.
- time for suppression of fire.

2.2 Morwell Open Cut Mine Brown Coal Characteristics

There is a higher incidence of fires in the Morwell open cut mine, in comparison to Yallourn. Possible reasons for this difference could lie in comparison of the spontaneous ignition properties, ability of the coal to oxidise and the effectiveness of fire suppressants.

A brief consideration of the ignition characteristics of the Morwell and Yallourn coal indicates that, although there is some difference in the ignition temperatures of the coal, these differences are believed to be insignificant with respect to the higher fire incidence rate at the Morwell open cut mine. The Morwell coal has a higher concentration of cations than the Yallourn coal, which leads to slightly lower ignition temperatures. The presence of cations in coal has been identified as a catalyst for the coal oxidation process.

There is some qualitative evidence to suggest that Yallourn coal has a greater tendency to oxidise and spontaneously combust. The Yallourn coal is a younger coal with greater porosity and so presents a greater effective surface area for oxidation.

It may be concluded that the higher incidence of fires at the Morwell open cut mine is possibly then due to factors other than the inherent properties of the coal itself. Geophysical site conditions, work practices, ignition sources, levels of activity and surface area of exposed coal may be more significant influences on the fire risk.

The state of the coal on site may also be an important factor. Brown coal in the weathered state undergoes oxidation with the atmosphere. Where the rate of heat dissipation is less than the heat generation from the oxidation process, combustion can occur. The locality of the exposed coal in the open cut can effect the rate of heat dissipation. Cracks and fissures in the coal, for example in weathered batters, allow oxidation to occur deep in the coal seam with no effective mechanism to dissipate the generated heat, resulting in potential fire sources. Also, loose coal that has been piled or deposited around roads or train lines are another significant ignition source as the coal is aerated and oxidises throughout the coal pile.

The use of water as an effective fire suppressant for brown coal is also limited. As water is used to extinguish a coal fire, the immediate effect is to quench the fire by cooling the coal site and restriction of available oxygen. Due to the fine porosity of the coal, there is little or no penetration of the water into the interior of the coal particles. Once the water has drained from the coal, the interior of the coal is then able to oxidise and dependant on the rate of heat dissipation, combustion can then recur. Wetting agents added to the water can improve the ability of the water to penetrate the coal pores, and so improve the effectiveness of the fire suppression. Localised fires that occur in the coal seam are more effectively dug out and removed.

3. RECOMMENDATIONS

3.1 Update reticulation drawing and hydraulic analysis using computer modelling.

3.2 Suggest revisions to LVOCFPP:

(i) 6 mm/hour precipitation rate seems to be based on 1964 report of 0.25 inch/hour. Check appropriateness.

(ii) Specify number, distance, capacity requirements for Tanker Filling Points.

(iii) Remote monitoring for fire pumps and other critical fire protection equipment.

4. EVALUATION OF APPLICABLE CODES AND STANDARDS.

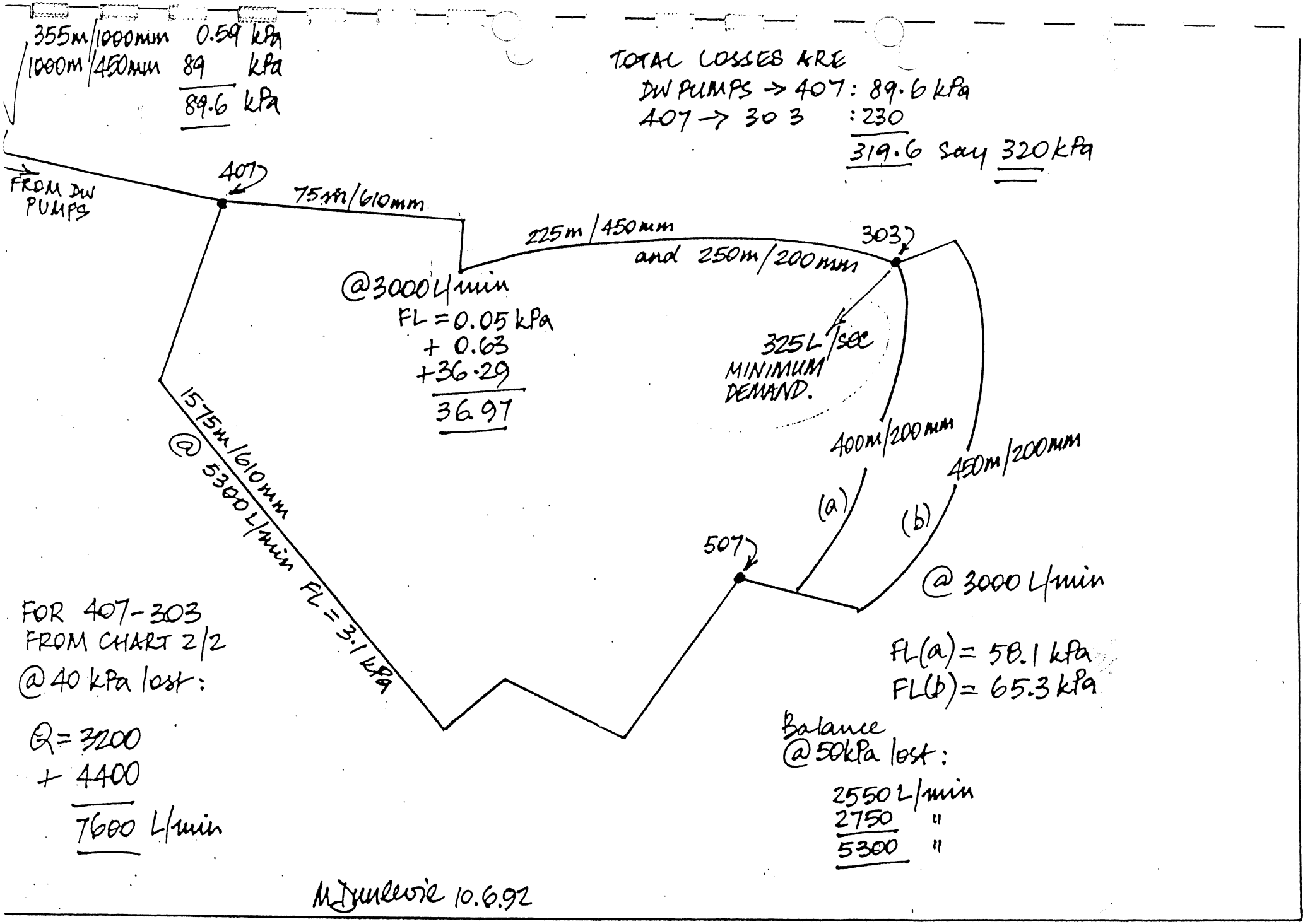
In addition to the in-house Latrobe Valley Open Cuts Fire Protection Policy (LVOCFPP), there are other codes and standards which may apply. A comparison of these has not been undertaken for this report. It is important to note that the winning of coal by open-cut methods is not the subject of statutory control by Mines Regulations. A large part of the control has been via internal documentation prepared specifically for the conditions in the Latrobe Valley. Comparison with codes prepared in other countries, or for other bodies of coal deposits, may not necessarily be compared with SECV policies.

Other Australian Standards which may apply are:

AS 1221	Fire Hose Reels
AS 1603	Automatic Fire Detection and Alarm Systems
AS 1674	SAA Cutting and Welding Safety Code
AS 1768	Lightning Protection
AS 2118	Automatic Fire Sprinkler Systems
AS 2419	Fire Hydrant Installations
AS 2441	Installation of Fire Hose Reels
AS 2444	Portable Fire Extinguishers - Selection and Location
AS 2941	Fixed Fire Protection Installations - Pumpset Installations

American NFPA Standards which may apply:

NFPA 121	Standard on Fire Protection for Self-Propelled and Mobile Surface Mining Equipment
NFPA 123	Standard for Fire Protection and Control in Underground Bituminous Coal Mines
NFPA 30	Centrifugal Fire Pumps

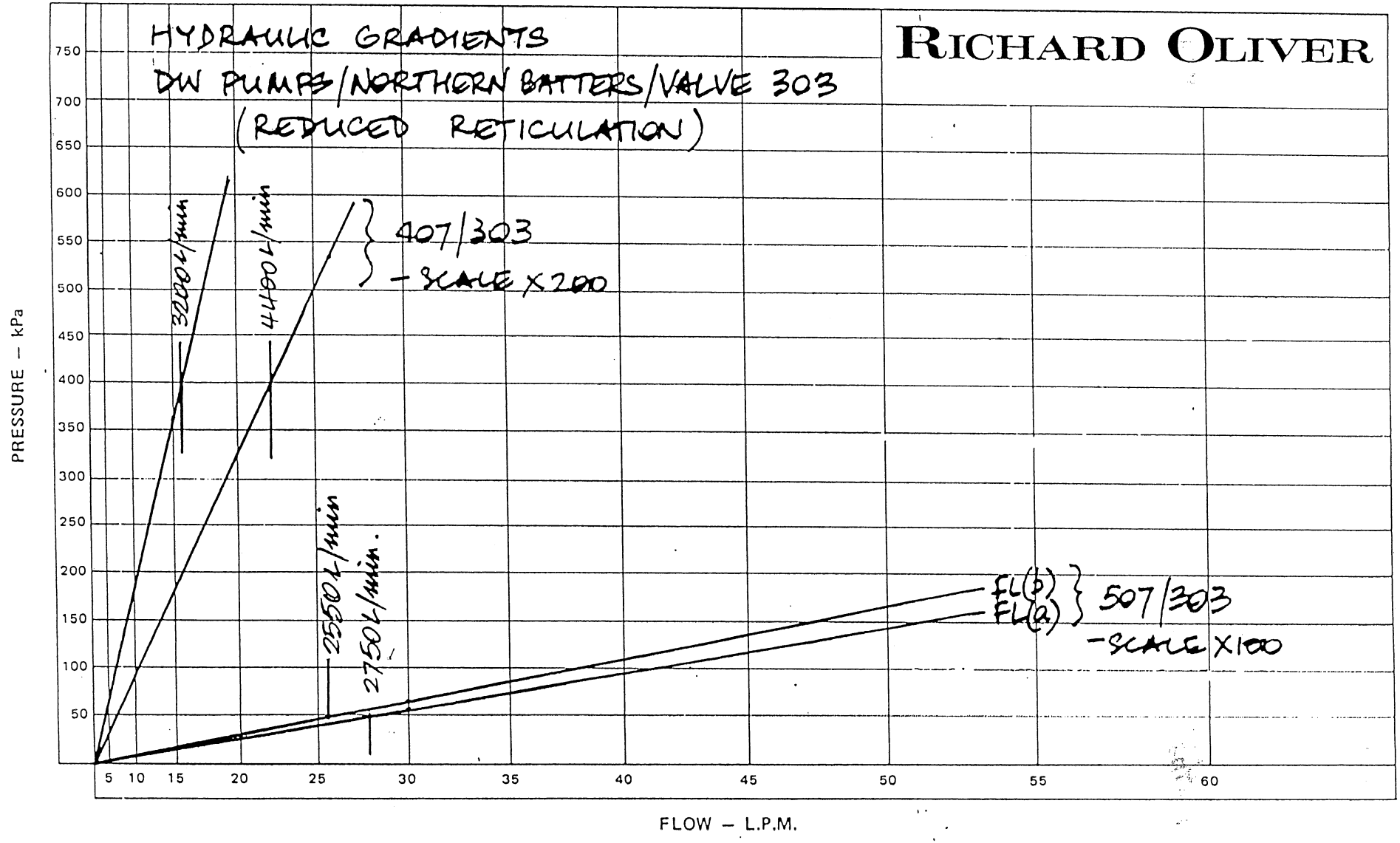


WATER SUPPLY ANALYSIS GRAPH

NAME OF INSURED	DATE	ENGINEER	INDEX No.
SECV / MOC	6/92	DUNLEVIE	1 OF 2

HYDRAULIC GRADIENTS
DW PUMPS/NORTHERN BATTERS/VALVE 303
(REDUCED RETICULATION)

RICHARD OLIVER



Estimated Total Water Demand _____ L.P.M. @ _____ kPa. Duration _____ Minutes

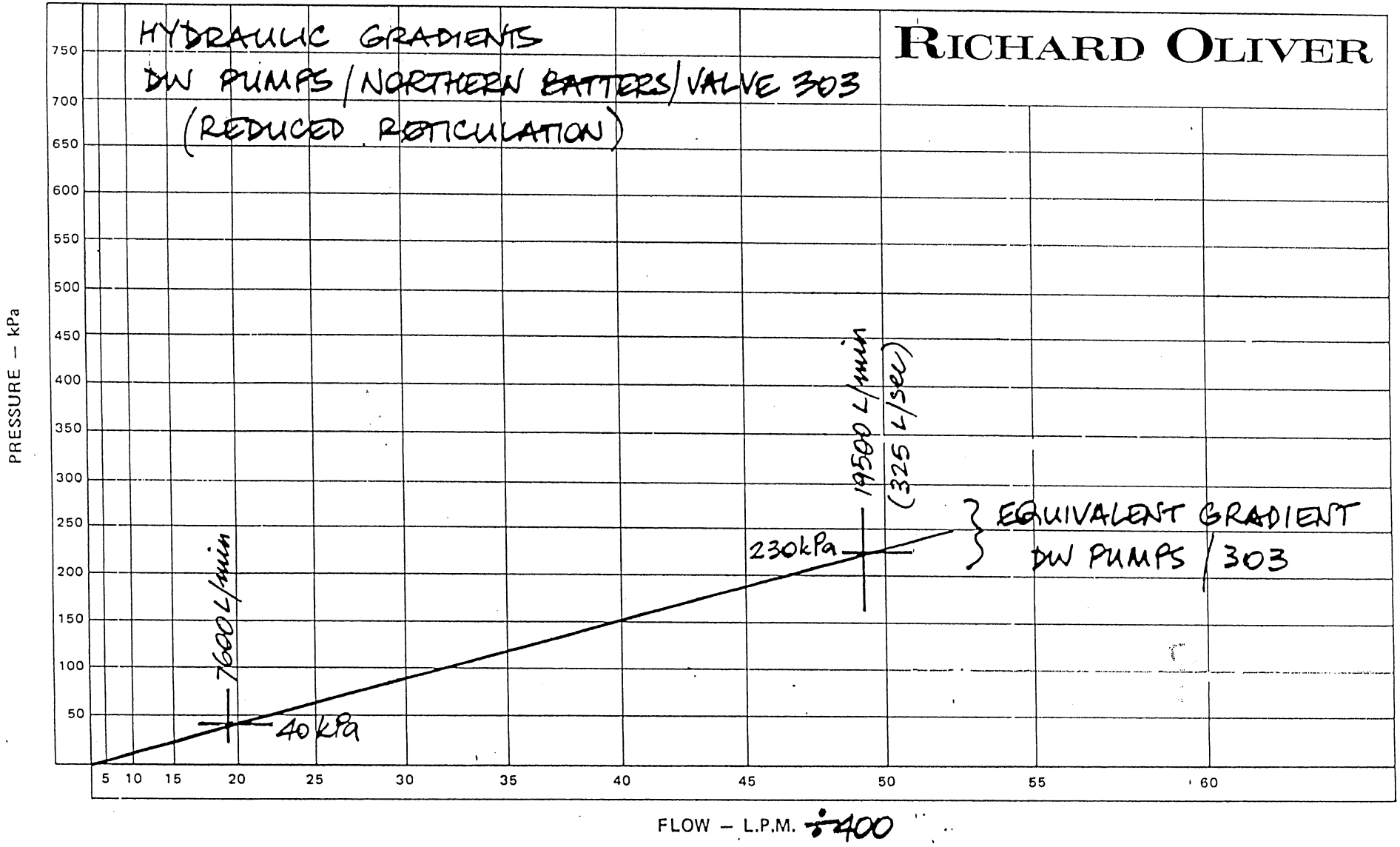
Estimated Water Demand for Sprinklers _____ L.P.M. @ _____ kPa. + _____ L.P.M. Hose Streams

WATER SUPPLY ANALYSIS GRAPH

NAME OF INSURED	DATE	ENGINEER	INDEX No.
SECV / MOC	6/92	DUNLEVIE	2 of 2

HYDRAULIC GRADIENTS
DW PUMPS / NORTHERN BATTERS / VALVE 303
(REDUCED RETICULATION)

RICHARD OLIVER



FLOW – L.P.M. ÷400

Estimated Total Water Demand _____ L.P.M. @ _____ kPa. Duration _____ Minutes

Estimated Water Demand for Sprinklers _____ L.P.M. @ _____ kPa. + _____ L.P.M. Hose Streams

APPENDIX 4

SUMMARY OF REPORTED FIRES IN WORKED-OUT AREAS OF M.O.C.

SECV MORWELL OPENCUT COALMINE
FIRE REPORT EXTRACT
(Nov.'89 to April '92.)

RELATING TO THE WORKED OUT AREA OF THE MINE

RICHARD OLIVER

11.06.92

Report No: A0083 Date: 15.12.89 Time Attend: 11.05 Time Extinguished: 11.25 Time Completed: 11.25 Alarm time: 11.05
Location Item No: 24 OTHER (SPECIFY) Plant Description: 7 LEVEL S/E CORNER AMONG OLD UNITS
Burning Item No: 25 COAL/PF Description Burning: OLD TRAILING FRAME
Prob Cause Item A: 37 Prob Cause Item B: HOT WORK(WELD,CUT Prob Cause Description: BURNING & WELDING
Damage Y/N: N Damage Description: Contrib Item No: 50 HUMAN INACTION
Contrib Factor Desc: BURNING & WELDING

How Extinguished: PIPED WATER Support ManHours: Equipment Hours: Actual Cost: Cosmos No:

Report No: A0918 Date: 18.01.90 Time Attend: 14.10 Time Extinguished: 14.20 Time Completed: 14.25 Alarm time: 14.10
Location Item No: 24 OTHER (SPECIFY) Plant Description: LARGE RUBBISH BIN
Burning Item No: 31 RUBBISH Description Burning:
Prob Cause Item A: 37 Prob Cause Item B: HOT WORK(WELD,CUT Prob Cause Description: SPARKS FROM BURNING & WELDING DROPPED IN BIN
Damage Y/N: N Damage Description: Contrib Item No: 49 HUMAN ACTION
Contrib Factor Desc:

How Extinguished: PIPED WATER Support ManHours: Equipment Hours: Actual Cost: Cosmos No:

Report No: A0938 Date: 14.02.90 Time Attend: 8.45 Time Extinguished: 9.20 Time Completed: 9.20 Alarm time: 8.45
Location Item No: 21 ON OR NEAR ROADWAY Plant Description: 4 LVL EAST CUTTING CRAP UNITS
Burning Item No: 25 COAL/PF Description Burning: COAL
Prob Cause Item A: 37 Prob Cause Item B: HOT WORK(WELD,CUT Prob Cause Description: BURNING & WELDING
Damage Y/N: N Damage Description: Contrib Item No: 49 HUMAN ACTION
Contrib Factor Desc: BURNING & WELDING

How Extinguished: WATER TANKER Support ManHours: Equipment Hours: Actual Cost: Cosmos No:

Report No: A1152 Date: 24.02.90 Time Attend: 14.40 Time Extinguished: 14.45 Time Completed: Alarm time: 14.40
Location Item No: 22 VEHICLE OR MOBILE PLANT Plant Description: 11D64 DOZER
Burning Item No: 25 COAL/PF Description Burning: LOOSE COAL
Prob Cause Item A: 39 Prob Cause Item B: HOT ENGINE OR EXH Prob Cause Description: ENGINE OVERHEATING COAL DUST
Damage Y/N: N Damage Description: Contrib Item No: 52 DESIGN
Contrib Factor Desc: FIRE FOUND @ EXHAUST & MOTOR

How Extinguished: WATER Support ManHours: Equipment Hours: Actual Cost: Cosmos No:

Report No: A1155 Date: 25.02.90 Time Attend: 14.30 Time Extinguished: 14.45 Time Completed: 14.45 Alarm time: 14.30
Location Item No: 21 ON OR NEAR ROADWAY Plant Description: ON SIDE OF ROAD NEAR PJM WASH N/S 1 LVL
Burning Item No: 35 GRASS/SCRUB Description Burning: DRY GRASS
Prob Cause Item A: 47 Prob Cause Item B: UNKNOWN Prob Cause Description: UNKNOWN
Damage Y/N: N Damage Description: Contrib Item No:
Contrib Factor Desc: CAUSE UNKNOWN

How Extinguished: WATER Support ManHours: 1.00 Equipment Hours: 1.00 Actual Cost: Cosmos No:

SECV MORWELL OPENCUT COALMINE
FIRE REPORT EXTRACT
(Nov.'89 to April '92.)

RELATING TO THE WORKED OUT AREA OF THE MINE

Report No: A1327 Date: 9.07.90 Time Attend: 9.25 Time Extinguished: 9.25 Time Completed: 9.35 Alarm time: 9.25
Location Item No: 21 ON OR NEAR ROADWAY
Burning Item No: 25 COAL/PF
Prob Cause Item A: 37 Prob Cause Item B: HOT WORK(WELD,CUT
Damage Y/N: N Damage Description:
Contrib Factor Desc: BURNING & WELDING
Plant Description: 5 LEVEL S/EAST CORNER
Description Burning: LOOSE COAL
Prob Cause Description: BURNING & WELDING
Contrib Item No: 49 HUMAN ACTION

How Extinguished: PIPED WATER Support ManHours: .25 Equipment Hours: Actual Cost: Cosmos No:

Report No: A1530 Date: 29.10.90 Time Attend: 8.30 Time Extinguished: 9.00 Time Completed: 9.00 Alarm time: 8.30
Location Item No: 21 ON OR NEAR ROADWAY
Burning Item No: 25 COAL/PF
Prob Cause Item A: 48 Prob Cause Item B: OTHER (SPECIFY)
Damage Y/N: N Damage Description:
Contrib Factor Desc:
Plant Description: 7 LEVEL NTH EAST CORNER
Description Burning: COAL ON SIDE OF ROAD
Prob Cause Description: HOT COAL OFF DUMP TRUCK
Contrib Item No:

How Extinguished: Support ManHours: .50 Equipment Hours: Actual Cost: Cosmos No:

Report No: A1534 Date: 31.10.90 Time Attend: 11.35 Time Extinguished: 11.40 Time Completed: 11.40 Alarm time: 11.35
Location Item No: 21 ON OR NEAR ROADWAY
Burning Item No: 25 COAL/PF
Prob Cause Item A: 39 Prob Cause Item B: HOT ENGINE OR EXH
Damage Y/N: N Damage Description:
Contrib Factor Desc: ENGINE EXHAUST
Plant Description: 8 LEVEL DUMP DOZER 11G135
Description Burning: LOOSE COAL
Prob Cause Description: LOOSE COAL AROUND EXHAUST
Contrib Item No: 52 DESIGN

How Extinguished: PIPED WATER Support ManHours: .25 Equipment Hours: Actual Cost: Cosmos No:

Report No: A1539 Date: 6.11.90 Time Attend: 10.50 Time Extinguished: 10.59 Time Completed: 10.59 Alarm time: 10.50
Location Item No: 22 VEHICLE OR MOBILE PLANT
Burning Item No: 25 COAL/PF
Prob Cause Item A: 39 Prob Cause Item B: HOT ENGINE OR EXH
Damage Y/N: N Damage Description:
Contrib Factor Desc: LOOSE COAL AROUND EXHAUST
Plant Description: EXCAVATOR 6F23 3 LEVEL N/SIDE
Description Burning: LOOSE FINE COAL
Prob Cause Description: COAL AROUND EXHAUST AREA
Contrib Item No: 52 DESIGN

How Extinguished: MAN TANKER, 1 DRY POWD.EXTING. Support ManHours: .30 Equipment Hours: Actual Cost: Cosmos No:

Report No: A1571 Date: 2.12.90 Time Attend: 14.00 Time Extinguished: 14.25 Time Completed: 14.25 Alarm time: 14.00
Location Item No: 3 RAW COAL BUNKER
Burning Item No: 25 COAL/PF
Prob Cause Item A: 47 Prob Cause Item B: UNKNOWN
Damage Y/N: Y Damage Description: 1 X 64 FIRE HOSE
Contrib Factor Desc: NO OBVIOUS REASON FOR FIRE
Plant Description: DBL BUNKER HALF WAY ALONG M52 CONVEYOR
Description Burning: LOOSE COAL AND GRASS
Prob Cause Description: UNKNOWN
Contrib Item No: 53 ENVIRONMENTAL(WIND,RAIN,S/C)

How Extinguished: PIPED WATER Support ManHours: .75 Equipment Hours: .20 Actual Cost: Cosmos No:

Report No: A1590 Date: 13.12.90 Time Attend: 14.45 Time Extinguished: 14.50 Time Completed: 14.50 Alarm time: 14.45
Location Item No: 21 ON OR NEAR ROADWAY
Burning Item No: 25 COAL/PF
Plant Description: 1 LEVEL A/SIDE
Description Burning: FINE COAL
Prob Cause Item A: 39 Prob Cause Item B: HOT ENGINE OR EXH
Prob Cause Description: BUILDUP OF COAL AROUND EXHAUST AREA
Damage Y/N: N Damage Description:
Contrib Item No: 52 DESIGN
Contrib Factor Desc: ENGINE EXHAUST

How Extinguished: PIPED WATER Support ManHours: .16 Equipment Hours: Actual Cost: Cosmos No:

Report No: A1603 Date: 31.12.90 Time Attend: 12.00 Time Extinguished: 12.25 Time Completed: 12.30 Alarm time: 12.00
Location Item No: 21 ON OR NEAR ROADWAY
Burning Item No: 25 COAL/PF
Plant Description: ON SIDE OF ROADWAY BELOW DBL
Description Burning: COAL AND GRASS
Prob Cause Item A: 47 Prob Cause Item B: UNKNOWN
Prob Cause Description: UNKNOWN
Damage Y/N: N Damage Description:
Contrib Item No:
Contrib Factor Desc: UNKNOWN

How Extinguished: PIPED WATER Support ManHours: 1.50 Equipment Hours: Actual Cost: Cosmos No:

Report No: A1604 Date: 31.12.90 Time Attend: 14.15 Time Extinguished: 14.30 Time Completed: 14.35 Alarm time: 14.15
Location Item No: 21 ON OR NEAR ROADWAY
Burning Item No: 25 COAL/PF
Plant Description: ON SIDE OF ROAD AT DBL
Description Burning: COAL
Prob Cause Item A: 47 Prob Cause Item B: UNKNOWN
Prob Cause Description: UNKNOWN
Damage Y/N: N Damage Description:
Contrib Item No:
Contrib Factor Desc: UNKNOWN

How Extinguished: Support ManHours: 1.00 Equipment Hours: .33 Actual Cost: Cosmos No:

Report No: A1612 Date: 4.01.91 Time Attend: 8.20 Time Extinguished: Time Completed: Alarm time: 8.20
Location Item No: 11 POWER POLE NO./LINE NO.
Burning Item No: 33 ELECT EQUIP
Plant Description:
Description Burning:
Prob Cause Item A: 43 Prob Cause Item B: ELECT FAULT-SHORT
Prob Cause Description:
Damage Y/N: N Damage Description:
Contrib Item No: 51 EQUIPMENT MALFUNCTION
Contrib Factor Desc: POWER POLE

How Extinguished: PIPED WATER Support ManHours: 3.00 Equipment Hours: Actual Cost: Cosmos No:

Report No: A1702 Date: 19.02.91 Time Attend: 14.40 Time Extinguished: 14.55 Time Completed: 14.55 Alarm time: 14.40
Location Item No: 22 VEHICLE OR MOBILE PLANT
Burning Item No: 25 COAL/PF
Plant Description: DOZER 11G135 1 LEVEL NORTH SIDE
Description Burning: COAL BUILD UP AROUND BOTTOM OF RADIATOR & FAN B
Prob Cause Item A: 41 Prob Cause Item B: FRICTION(BELT/MAC
Prob Cause Description: COAL AROUND BOTTOM OF FAN BELT
Damage Y/N: N Damage Description:
Contrib Item No: 52 DESIGN
Contrib Factor Desc: COAL DUST AROUND FAN BELT

How Extinguished: PIPED WATER Support ManHours: Equipment Hours: Actual Cost: Cosmos No:

SECV MORWELL OPENCUT COALMINE
FIRE REPORT EXTRACT
(Nov.'89 to April '92.)

RELATING TO THE WORKED OUT AREA OF THE MINE

Report No: A1708 Date: 25.02.91 Time Attend: 23.45 Time Extinguished: .05 Time Completed: .05 Alarm time: 23.45
Location Item No: 24 OTHER (SPECIFY)
Burning Item No: 25 COAL/PF
Plant Description: M24 CONVEYOR H/E 6.6KV ELECTRICAL CUBICLE
Prob Cause Item A: 47 Prob Cause Item B: UNKNOWN
Description Burning: CABLES IN CUBICLES COALDUST IN CUBICLE &ON WALK
Damage Y/N: Y Damage Description: CABLES DAMAGED IN ELE
Prob Cause Description: UNKNOWN
Contrib Factor Desc: UNKNOWN
Contrib Item No:

How Extinguished: PIPED WATER Support ManHours: 1.33 Equipment Hours: Actual Cost: Cosmos No:

Report No: A1724 Date: 13.03.91 Time Attend: 17.50 Time Extinguished: 17.80 Time Completed: 18.00 Alarm time: 17.50
Location Item No: 21 ON OR NEAR ROADWAY
Burning Item No: 25 COAL/PF
Plant Description: LOOSE COAL ON ROAD, LVL 2 METAL BINS
Prob Cause Item A: 47 Prob Cause Item B: UNKNOWN
Description Burning: LOOSE COAL IGNITED ON ROADWAY
Damage Y/N: NA Damage Description:
Prob Cause Description: UNKNOWN
Contrib Factor Desc: UNKNOWN
Contrib Item No: 53 ENVIRONMENTAL(WIND,RAIN,S/C)

How Extinguished: PIPED WATER Support ManHours: Equipment Hours: Actual Cost: Cosmos No:

Report No: A1901 Date: 5.08.91 Time Attend: 12.30 Time Extinguished: 12.45 Time Completed: 12.45 Alarm time: 12.30
Location Item No: 22 VEHICLE OR MOBILE PLANT
Burning Item No: 25 COAL/PF
Plant Description: DOZER 11 G134 COAL CARTING AREA NO 2 LVL EAS
Prob Cause Item A: 43 Prob Cause Item B: ELECT FAULT-SHORT
Description Burning: LOOSE COAL IN BELLY PLATE & WIR'G FRM START MTR
Damage Y/N: N Damage Description:
Prob Cause Description: WIRES FROM STARTER MOTOR
Contrib Factor Desc: WIRING FROM STARTER MOTOR
Contrib Item No: 51 EQUIPMENT MALFUNCTION

How Extinguished: 2 DRY POWDER EXTINGUISHERS Support ManHours: 1.00 Equipment Hours: Actual Cost: Cosmos No:

Report No: A1927 Date: 10.09.91 Time Attend: 8.30 Time Extinguished: 8.10 Time Completed: 8.45 Alarm time: 8.30
Location Item No: 22 VEHICLE OR MOBILE PLANT
Burning Item No: 25 COAL/PF
Plant Description: DOZER 11G135
Prob Cause Item A: 39 Prob Cause Item B: HOT ENGINE OR EXH
Description Burning: COAL IN AROUND EXHAUST
Damage Y/N: N Damage Description:
Prob Cause Description: COAL ON EXHAUST
Contrib Factor Desc: LOOSE COAL AROUND EXHAUST
Contrib Item No: 52 DESIGN

How Extinguished: PIPED WATER Support ManHours: 1.00 Equipment Hours: Actual Cost: Cosmos No:

Report No: A1987 Date: 9.12.91 Time Attend: 9.25 Time Extinguished: 9.55 Time Completed: 9.55 Alarm time: 9.25
Location Item No: 21 ON OR NEAR ROADWAY
Burning Item No: 25 COAL/PF
Plant Description: 5 LEVEL SOUTH EAST CORNER
Prob Cause Item A: 37 Prob Cause Item B: HOT WORK(WELD,CUT
Description Burning: LOOSE COAL
Damage Y/N: N Damage Description:
Prob Cause Description: BURNING &,WELDING
Contrib Factor Desc: BURNING AND WELDING
Contrib Item No: 49 HUMAN ACTION

How Extinguished: MAN TANKER Support ManHours: 1.00 Equipment Hours: .50 Actual Cost: Cosmos No:

Report No: A2065 Date: 7.01.91 Time Attend: 14.35 Time Extinguished: 15.10 Time Completed: 15.10 Alarm time: 14.35
Location Item No: 21 ON OR NEAR ROADWAY
Burning Item No: 25 COAL/PF
Prob Cause Item A: 39 Prob Cause Item B: HOT ENGINE OR EXH
Damage Y/N: N Damage Description:
Contrib Factor Desc: UNIDENTIFIED VEHICLE EXHAUST
Plant Description: 8 LEVEL DUMP
Description Burning: LOOSE COAL
Prob Cause Description: ENGINE EXHAUST ON UNIDENT
Contrib Item No: 52 DESIGN

How Extinguished: MAN TANKER Support ManHours: 2.00 Equipment Hours: Actual Cost: Cosmos No:

Report No: A2066 Date: 10.01.92 Time Attend: 8.10 Time Extinguished: 8.40 Time Completed: 8.40 Alarm time: 8.10
Location Item No: 21 ON OR NEAR ROADWAY
Burning Item No: 25 COAL/PF
Prob Cause Item A: 44 Prob Cause Item B: SPONTANEOUS COMBU
Damage Y/N: N Damage Description:
Contrib Factor Desc: HOT SPOT IN COAL
Plant Description: 8 LEVEL DUMP
Description Burning: LOOSE COAL
Prob Cause Description: HOT SPOT IN COAL
Contrib Item No: 53 ENVIRONMENTAL(WIND,RAIN,S/C)

How Extinguished: MAN TANKER Support ManHours: 2.00 Equipment Hours: Actual Cost: Cosmos No:

Report No: A2078 Date: 17.01.92 Time Attend: 12.00 Time Extinguished: 12.20 Time Completed: 12.20 Alarm time: 12.00
Location Item No: 21 ON OR NEAR ROADWAY
Burning Item No: 25 COAL/PF
Prob Cause Item A: 39 Prob Cause Item B: HOT ENGINE OR EXH
Damage Y/N: N Damage Description:
Contrib Factor Desc: SUSPECTED VOLVO DUMP TRUCK
Plant Description: 8 LEVEL DUMP
Description Burning: LOOSE COAL ON DUMP
Prob Cause Description: SUSPECTED VOLVO DUMP TRUC
Contrib Item No: 52 DESIGN

How Extinguished: MAN TANKER Support ManHours: 1.00 Equipment Hours: Actual Cost: Cosmos No:

Report No: A2088 Date: 21.01.92 Time Attend: 11.45 Time Extinguished: 12.10 Time Completed: 12.10 Alarm time: 11.45
Location Item No: 24 OTHER (SPECIFY)
Burning Item No: 25 COAL/PF
Prob Cause Item A: 43 Prob Cause Item B: ELECT FAULT-SHORT
Damage Y/N: N Damage Description:
Contrib Factor Desc: FUSE BLOWN IN BOX
Plant Description: M24 CONVEYOR FUSE BOX
Description Burning: LOOSE COAL ON LEVEL
Prob Cause Description: FUSE BLEW
Contrib Item No: 51 EQUIPMENT MALFUNCTION

How Extinguished: PIPED WATER Support ManHours: 1.66 Equipment Hours: Actual Cost: Cosmos No:

Report No: A2254 Date: 1.02.92 Time Attend: 7.50 Time Extinguished: 8.50 Time Completed: 8.50 Alarm time: 7.50
Location Item No: 21 ON OR NEAR ROADWAY
Burning Item No: 25 COAL/PF
Prob Cause Item A: 37 Prob Cause Item B: HOT WORK(WELD,CUT
Damage Y/N: N Damage Description:
Contrib Factor Desc: BURNING AND WELDING
Plant Description: BELOW M22 CONV. ON 4 LEVEL EAST SIDE
Description Burning: LOOSE COAL AT BOTTOM OF COAL BATTER
Prob Cause Description: BURNING AND WELDING
Contrib Item No: 49 HUMAN ACTION

How Extinguished: MAN TANKER Support ManHours: 4.00 Equipment Hours: 1.00 Actual Cost: Cosmos No:

Report No: A2256 Date: 31.01.92 Time Attend: 17.10 Time Extinguished: 17.40 Time Completed: 17.40 Alarm time: 17.10
Location Item No: 21 ON OR NEAR ROADWAY
Burning Item No: 25 COAL/PF
Plant Description: BELOW M22 CONV. 4 LEVEL EAST SIDE
Prob Cause Item A: 37 Prob Cause Item B: HOT WORK(WELD,CUT
Description Burning: LOOSE COAL AT BOTTOM OF COAL BATTER.
Damage Y/N: N Damage Description:
Prob Cause Description: BURNING & WELDING
Contrib Factor Desc: SPARKS FROM BURNING & WELDING
Contrib Item No: 49 HUMAN ACTION

How Extinguished: TANKER Support ManHours: 1.00 Equipment Hours: .50 Actual Cost: Cosmos No:

Report No: A2257 Date: 5.02.92 Time Attend: 14.00 Time Extinguished: 18.00 Time Completed: 18.00 Alarm time: 14.00
Location Item No: 21 ON OR NEAR ROADWAY
Burning Item No: 25 COAL/PF
Plant Description: 5 level South East corner
Prob Cause Item A: 37 Prob Cause Item B: HOT WORK(WELD,CUT
Description Burning: loose coal & grass
Damage Y/N: N Damage Description:
Prob Cause Description: Burning & Welding
Contrib Factor Desc: BURNING & WELDING SPARKS
Contrib Item No: 49 HUMAN ACTION

How Extinguished: MAN TANKERS Support ManHours: 18.00 Equipment Hours: 5.00 Actual Cost: Cosmos No:

Report No: A2260 Date: 7.02.92 Time Attend: 19.20 Time Extinguished: 19.50 Time Completed: 19.50 Alarm time: 19.20
Location Item No: 21 ON OR NEAR ROADWAY
Burning Item No: 25 COAL/PF
Plant Description: 7 LEVEL EAST SIDE
Prob Cause Item A: 37 Prob Cause Item B: HOT WORK(WELD,CUT
Description Burning: LOOSE COAL UNDER PIPE
Damage Y/N: N Damage Description:
Prob Cause Description: CUTTING 450 DEG. PIPE
Contrib Factor Desc: CUTTING 450 DEG. PIPE
Contrib Item No: 49 HUMAN ACTION

How Extinguished: MAN TANKER Support ManHours: 1.50 Equipment Hours: .50 Actual Cost: Cosmos No:

SUMMARY

Manhours required to extinguish a fire;

Average	=	2.01 HOURS
Maximum	=	18.00 HOURS
Minimum	=	.16 HOURS
Count	=	22

Equipment hours required to extinguish a fire;

Average	=	1.13 HOURS
Maximum	=	5.00 HOURS
Minimum	=	.20 HOURS
Count	=	8

Total No. of Fire reports
for the Worked Out Area = 28

SECV MORWELL OPENCUT COALMINE
FIRE REPORT SUMMARY
(Nov.'89 to April '92)

RELATING TO THE WORKING AREA OF THE MINE

Manhours required to extinguish a fire;

Average = 1.77 Hours Count = 419
Maximum = 154.50 Hours
Minimum = .05 Hours

Equipment hours required to extinguish a fire;

Average = .97 Hours Count = 101
Maximum = 23.00 Hours
Minimum = .08 Hours

Total No. of Fire reports
for the Working Area = 534

APPENDIX 5

INITIAL APPRAISAL OF LEGAL RISKS OF CHANGES TO LVOCFPP

PHILLIPS FOX
SOLICITORS

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OUR REF: GRM:OLIV
WRITER'S DIRECT LINE: 604 5693
ENQUIRIES: Geoff Masel
YOUR REF:

4 June, 1992

Mr C Teniswood
Richard Oliver
International Pty Ltd
Box 956G GPO
MELBOURNE 3001

Dear Chris,

**Initial Appraisal of Liability -
Risk of Changes to SECV Morwell Fire Policy**

I have considered your letter of 2 June, 1992 together with enclosures.

The State Electricity Commission of Victoria is a public authority as defined by Section 3 of the Country Fire Authority Act and it is accordingly bound by Section 43(1)(a) of that Act which provides that "it shall be the duty of.... every public authority to take all practicable steps (including burning) to prevent the occurrence of fires on and to minimise the danger of the spread of fires on or from any land vested in it or under its control or management..."

A duty cast by statute to take all practicable steps has been held to impose a stricter standard than a duty to take all reasonably practicable steps. However, the steps must be possible in the light of current knowledge and invention - Adsett v. K & L Steel Founders & Engineers Ltd (1953) 1 All ER 97; affirmed (1953) 2 All ER 320; Gregson v. Hick Hargreaves & Co Ltd (1955) 3 All ER 507. Steps are practicable if they are precautions which can be taken without

practical difficulty - Brooks v. JMP Coats (1984) 1 All ER 702. Because of the high duty cast by a statutory obligation to take all practicable steps it is probable that questions of cost are not relevant to practicability but the test of practicability might otherwise be concerned with available resources - Adsett v. K & L Steel Founders & Engineers Ltd (supra).

It is further provided by Section 47 of the Country Fire Authority Act 1958 that the provisions of sections, including Section 43, "shall be read and construed as in aid of and not in derogation from the provisions of any other Act or law relating to fires or to the careless negligent or criminal use of fire."

There are no relevant specific provisions in the State Electricity Commission Act 1958. Section 43 must not be read in derogation from the common law of negligence casting a duty of care on public authorities to prevent the occurrence of fires and to minimise the danger of the spread of fires on or from any land vested in it or under its control or management. However, the common law duty of care is only to take all reasonably practicable steps and accordingly Section 43 of the Country Fire Authority Act imposes a more stringent obligation. It is the more stringent obligation which must be complied with in respect of any changes to the SECV Morwell fire policy.

In this context it is necessary to consider whether it is practicable to retain Sections 1.04 and 1.05 of the SECV Latrobe Valley Fire Protection Policy for worked out areas and batters. To determine the issue of practicality your analysis will have to determine whether it has been practical in the above sense to apply the policy to worked out areas and batters in the past and, if not, what are the minimum amendments necessary to enable the formulation of a policy which is practicable in the sense that it can be carried out without practical difficulty. If your analysis shows that Sections 1.04 and 1.05 of the policy have been successfully applied in the past to worked out areas and batters this probably proves that the application of the policy to these areas is practicable, even if it may not be reasonably practicable.

In the result, any amendment of the Policy to reduce the stringency of precautions has a potential for an increase in liability for the SECV. This is not to say that such increase in liability may in fact eventuate as legal liability ultimately will depend, not only on the existence of a duty and breach of the duty, but proof of causation of loss by breach of the duty. Your appraisal may well show that the risk of loss caused by amendment of Sections 1.04 and 1.05 in respect to worked out areas and batters is minimal. Nevertheless, even if a fire was not caused by a breach of the duty, evidence of breach of the duty will undoubtedly be undesirable because of its effect on the public and political profile of the SECV.

It does not seem to me that the principles to be applied in determining practicability will vary between an option of exempting worked out areas and batters from Section 1.04 and 1.05 as distinct from an option of modification of the sections.

It may be that a risk analysis would show that it has not been practicable to apply Sections 1.04 and 1.05 to worked out areas and batters in the past but if it is practicable to modify the policy that will carry less risk of breach of the legal obligation than an outright exemption from the policy.

I hope this initial appraisal assists you in the drafting of your report. I would be glad to discuss any aspect of it with you at your convenience.

Yours faithfully,

GEOFF MASEL

lcb/wpdly9/9104.4

RICHARD OLIVER

2nd June, 1992

COPY

Mr Geoff Masel
Phillips Fox, Solicitors
461 Bourke Street
MELBOURNE VIC 3001

Dear Geoff,

RE: INITIAL APPRAISAL OF LIABILITY/RISK OF CHANGES TO SECV MORWELL FIRE POLICY

Thank you for your time spent in discussion of this matter. I am very pleased that you can examine the issues and provide an initial appraisal to me by June 11. I am required to submit a draft report on June 12.

The circumstances are this. Morwell Open Cut wants an exemption from the SECV Latrobe Valley Fire Protection Policy, sections 1.1.4 and 1.1.5, for its "worked out" areas and "batters". We are carrying out a risk analysis to see if such exemption is justifiable.

However, the CFA Act (section 43) requires SECV to take steps to prevent and suppress fires. I also understand that the SECV's own Act makes reference(s) to fire mitigation.

Moreover, SECV has a high public and political profile where fire, especially bushfire, is concerned. A fire at Yallourn Open Cut led to a Royal Commission in 1944. A fire at Morwell Open Cut in 1977 was the foundation for the Latrobe Valley Fire Protection Policy (revised in 1984).

Against this background and under these circumstances, I am therefore interested in your views on the increased liability and/or risk of exemption from part of SECV policy, from a legal perspective. Secondly, if a modification (rather than exemption) to the policy with regard to worked-out areas and batters was to be made, what would the key issues be in developing any modification?

I attach a copy of the SECV policy, and also the Royal Commission and Morwell fire reports as general information should you require.

.../2

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I appreciate your assistance, Geoff and look forward to your report.

Yours sincerely,

CHRIS TENISWOOD

encl/-

CT\SECV\PHILFOX.LTR:mg