

WARDEN'S COURT

MR F W WINDRIDGE, Warden and Coroner
MR R J PARKIN, General Manager, Capricorn Coal Pty Ltd
MR P J NEILSON, District Secretary, United Mine Workers' Union
MR C ELLICOTT, Training and Development Officer, Department of
Mineral Resources, New South Wales
PROF F F ROXBOROUGH, Professor of Mining Engineering, School
of Mines, University of New South Wales

IN THE MATTER OF A CORONIAL INQUIRY IN CONJUNCTION WITH
AN INQUIRY (PURSUANT TO SECTION 74 OF THE COAL MINING
ACT 1925) INTO THE NATURE AND CAUSE OF AN ACCIDENT AT
MOURA UNDERGROUND MINE NO 2 ON SUNDAY-MONDAY, 7-8 AUGUST
1994

GLADSTONE

..DATE 10/03/95

..DAY 41

THE COURT RESUMED AT 9 A.M.

ALBERT HUBERT SCHAUS, CONTINUING:

WARDEN: Thank you, witness. You are on the former oath you took yesterday. Do you understand that?-- Yes.

MR CLAIR: Mr Schaus, just before we finished yesterday afternoon you were explaining that you were on leave from 11 July through to 2 August. When you returned on 2 August did you look at the mine record book to see what entries had been made during your absence?-- I had discussions with Joe Barraclough on that day as to the state of the mine, but I - the first time I looked back at the record book with regards to the entries made by Joe Barraclough was on Sunday afternoon when I made my own entries in that record book, after making my own entry.

So when you say Sunday afternoon, that was Sunday, 7 August?-- That is correct. The report that is in the record book for that date as a result of my inspection being carried out on Friday were actually recorded in that record book on Sunday during my visit to the mine. After completing my report I perused through the report written by Joe Barraclough.

We will come to that record book in a moment, but can you recall now what conversations you had with Joe Barraclough on your return on 2 August about what had been happening at the mine during your absence. One of the first points we discussed was the fact that I noticed that the three weeks that I had been away were lost time injury free. I noticed that because we keep a safety board at the entrance to the mine and there is an accumulation of the number of days of lost time injury, and after going through the gate I noticed that the three weeks had not resulted in any lost time injury at the mine. I was very pleased with that result and so was Joe Barraclough and I remember that being one of the first topics of conversation.

What else did you discuss with him?-- As far as I recollect we discussed the general status of the mine, where the different machinery was working, and I believe Joe Barraclough - it's during that conversation that Joe Barraclough mentioned to me that Mike Walker had come to the mine. I understood it was a week before and his only - one of the concerns was that there was an odd shaped pillar between 1 and 2 cross-cut in 512, 4 and 5 heading, driven at an angle. There was an intersection that was wider than usual and Mike Walker had made comment about extra care needed while extracting - while coming back towards that corner, and Joe Barraclough told me that that was pointed out to the relevant people and instructions were given of the extra amount of coal that had to be left in order to avoid that intersection coming down. I believe he also mentioned that Mike Walker talked about cable flashes and the controls we had in place to deal with it.

XN: MR CLAIR

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Anything else that Mr Barraclough discussed with you on your return?-- That is the gist of the conversation I remember.

Was there anything mentioned about the events on 22 July? You've heard evidence in the Inquiry about those events?-- There was no mention of the events of 22 July. The first time I became aware of a reading higher - of the 8 ppm reading basically is when I read Joe Barraclough's report on that Sunday the 7th after filling out my statutory report.

Did Mr Barraclough mention anything about establishing a system for the shift by shift measurements in 512 Panel to enable the CO make to be calculated on a shift by shift basis?-- I do not recall him mentioning that system. Again I remember reading Joe Barraclough's entry for that - 22nd, I believe, isn't it - for 22 July where he mentioned that Drager readings will be taken daily as in his report. So that was as far as I was aware at the time.

I'm really looking at what occurred on your return. You say there was no discussion about that. Was there any discussion between yourself and Mr Barraclough on your return about the CO make in 512 Panel?-- I have no recollection of any discussion about the CO make or the level of CO when I returned to the mine.

Could the witness see Exhibits 93 and 94, please, Your Worship? Either on the day of your return or at any time before the first explosion on 7 August did you see those documents?-- I have never seen those documents until they were asked about at the Inquiry. I didn't know that they existed, didn't know of their existence.

Did you have occasion to read any deputies' reports after you had returned to the mine on 2 August?-- During shift changes deputies' reports end up on the undermanager's desk and I - I made a habit of reading the undermanager's report as a matter of course. Sometimes I perused through some deputy's report. I can't recall if I read any deputy's report specifically that week, but if I did I certainly did not notice any readings being mentioned on those reports.

You didn't notice any extra readings including wind velocity and wet and dry?-- I did not notice any reading, but I'm not sure that I even looked at any deputy's report. That's what I'm saying. If I looked at some I didn't notice it, didn't notice the readings.

So during that week did you become aware that those extra readings were being taken, that is Drager readings and wind velocity readings?-- I never became aware that those extra readings had been taken until I read Joe Barraclough's report asking for daily readings in his statutory report and that is on Sunday, afternoon.

When you arrived back did you take any steps yourself, either on the second or after that, to ascertain what was happening with the CO make in 512 Panel?-- Every morning that

I go to the mine I made a habit of entering the instrument room and looking at the monitor. So when I returned from my holidays I believe I recall a CO reading of 7 ppm on the Unor.

Did you attach any particular significance to the 7 ppm?-- From what I recalled at the time before I left, the readings were around five to 6 ppm, I believe. That's as best as I recall. So the readings had gone up 1 ppm in three weeks and that did not cause me any concern.

Your recollection is that you saw readings of 7 ppm on the Unor for 512 Panel. Did you see any readings higher than that during that week on the Unor?-- I believe that I saw a reading of 8 ppm on Friday afternoon.

Friday afternoon?-- Or day shift, I don't know. Sometime on Friday I had a reading of 8 ppm to which I refer in my statutory report. I'm not sure if it's the morning or afternoon.

Was that taken from the Unor?-- That was taken from the Unor, yeah.

What time used you arrive at the mine in the morning?-- Between 6.30 and 6.45.

That was the practice during that week after you arrived back at the mine on the second?-- That has always been my practice since I joined Moura. That was in order for me to see the night shift undermanager, and I had an opportunity to talk to the deputies on night shift coming off their shift. I was there for day shift coming out and the start of afternoon shift, so I could speak to the three undermanagers, and all the deputies had an opportunity to speak to me either at the end or the start of the shift. That is when I was available. If I was in conference, of course, I was not there at the change of shift, but I usually tried to be there at the change of shift.

When you talk about going to look at the Unor after you arrived, would you do that virtually as soon as you arrived or would that be some point of time after that?-- It is usually as soon as I arrive. As I come to the start-up point I look at the screen from the window and I usually made a habit, unless I was held up through some conversation, to go to the Unor room and have a look from inside within five, 10 minutes of my arrival.

On the day after you arrived back, that would be Wednesday, 3 August, you did go underground and visit, amongst other things, 512 Panel; is that so?-- That is correct.

That was with Mr Regan and a group of people who had been at the Board of Directors of BHP Mitsui Coal Limited meeting; is that right?-- That is correct. I don't believe Mr Regan was actually in the group I took underground. It was a fairly large party. George Mason took one party and I took the other. I remember Tim Headly being in the party I took underground.

Did you notice anything in particular when you visited 512 Panel on that day?-- They were mining 3 cross-cut from the travelling road at the time and because of the lack of space and the machinery moving, I remembered taking my group in - on two separate occasions towards the face and we stayed at the goaf edge. Because of the numbers I never noticed anything and nothing was pointed out to me.

That was in No 2 heading did you say?-- That's correct. We stayed at the intersection of No 2 heading and 3 cross-cut.

You didn't go -----?-- Sorry - no, that's correct, 3 cross-cut, because they mine the rest after.

You didn't go into the return, into the top return at all?-- No, I didn't go into the top return, not with visitors. They were cutting coal. It's too dusty.

I want to ask you some questions about the Unor system. First of all, prior to you coming to Moura had you been involved yourself with such a system?-- While I was working at Appin Colliery, as a miner that is, they used a Unor monitoring system there, but being a miner I never had any direct involvement with that system, but I knew of its existence and I knew how it worked, the basics of it.

When you arrived at Moura did you take steps to familiarise yourself with the Unor system there and its operation?-- I might take you back a bit; at Charbon where I spent seven years there is no mine monitoring system at all, so I became aware of the Unor being used again when I joined BHP Australia Coal, Moura. I remember during the two days that I spent with Phil Reed, Phil Reed giving me a quick run down on the Unor, but I was bombarded with information, as you can imagine, and it's a fairly user friendly system, so I remembered some of the instructions, but not all.

Did you take some steps after that to, in effect, train yourself in its use?-- Having a look at George Mason or undermanagers operating it I picked up a few extras, but there was never any formal training on the Unor.

Did you ever take any steps to set up a system of formal training for any other people on the Unor system?-- Before August 1994 the system that was in place appeared to me to be working and I did not perceive the need to do any training on the Unor.

Were you aware yourself of just how many people were able to operate the system and who they were?-- Yes, I was one of them, of course, and George Mason, undermanager-in-charge, the three or four shift undermanagers, and I knew some deputies were familiar with the system because during weekends when there was no labour bar the regular inspection of the mine, because we - the mine was inspected 365 days a year right around the clock - some deputies had become familiar with the system as well, as far as acknowledging alarms only for the deputies, for some deputies.

Was there any protocol in place for the accepting of alarms at the Unor?-- There was no formal protocol set up, but the system was controlled by a limited number of people which I've just mentioned, and at the time I did not perceive the need to set up a protocol.

Did you know whether the limited number of people knew what

steps to take in order to accept an alarm and to reactivate the system?-- I cannot comment on that. I'm not sure. When I joined Moura No 2 Underground in December '92 I don't know if the siren in the Con Log was hooked up to the Unor. I don't think it was, but I'm not sure. I certainly was never shown that particular part. I cannot recall how that alarm was hooked up on the Unor. That was not done on my request. I don't know who requested it, or is it the electrical department that thought it was a good idea; I'm not sure.

Did you become aware at some stage that the siren was hooked up to the Unor?-- It would be fair to say yes.

Do you remember when that was?-- No.

Are you able to say whether the siren in fact was activated each time that the Unor alarm was activated?-- Before August '94 my understanding of the system was that the alarm always went off, the sound went off.

The siren?-- The siren, sorry, went off when there was an alarm. I had no reason to suspect all the problems that have been exposed here.

Well, those problems include, it seems, alarms on the Unor not being accepted at the Unor for long periods of time on occasions. That's one item that's been revealed; is that so?-- What I'm trying to say is I'm not sure how many people at the underground were aware that that could happen. I was not before coming here to this Inquiry. I don't know if the electrical department that hooked up the system were aware of that either.

That alarms could remain unacknowledged for a long period of time do you mean?-- No. Well, that's a result of the fact if it wasn't reset, as I understand, after being acknowledged on the computer, but we are talking here very much from a hindsight perspective. What I'm trying to say is the people that were using the siren, I can't comment if they were aware of that particular possibility, but I certainly was not made aware of it, and I'm not sure the electrical department knew that either.

Well, would you agree that one of the features that would come out of what we have heard about or can see about the system when we look at the alarm log is that the alarm system may well have operated more effectively if there had been a formal protocol established for its use and people trained according to that protocol; would you agree with that?-- If we had perceived the need at the time, that's what we would have done.

Did you at any stage yourself have an understanding that when accepting an alarm at the Unor that you should use particular digits, put in particular digits peculiar to you in order to accept the alarm?-- While working at Moura No 2 Underground I can only recall one occasion when I accepted an alarm; that is, without anyone else being present. That was before 512

extraction. I cannot recall the circumstances, but I recall accepting an alarm. As I said, Phil Reed had shown me how to operate the system, and after looking at George Mason and undermanagers operating the system - the system is fairly user friendly, it gives you the steps on the screen - I picked up how to accept an alarm. As I recall, I entered two digits. I have a vague recollection that it was asking for your cap lamp number, but I'm not sure if I've noticed that after the Inquiry or before, but I didn't use any specific number. I remember being told that any two numbers would do, and at the time I didn't perceive the need to change that system. The alarms at No 2 Underground were not raised that often apart from when we had a sealing - when we had sealed a section, and if we wanted to track someone that had acknowledged an alarm on a particular shift - and that wouldn't happen often - I'm pretty sure that the existing system would have allowed that to do - would have allowed us to do that, sorry.

Could the witness see Exhibit 127, please, Your Worship?
While that's being obtained, Mr Schaus, one of the items that was shown on the Unor system was the Graham's Ratio?--
That's correct.

Were you familiar with the Graham's Ratio and how it might be used?-- During my engineering degree and during the tutorials at the technical college I learned about Graham's Ratio which is carbon monoxide ratio over oxygen deficiency. When I joined Moura No 2 Underground I noticed that ratio on the screen. I understood its values but I could not recall any particular value. I knew that you watched the trend in a Graham's Ratio and any variation in trend had to be watched for, but I - when I joined Moura No 2 I had learned about the figure of .4, .5 that I have heard mentioned here but I certainly had not those figures in my mind at the time. It appeared to me that Graham's Ratio, although appearing on the screen, was not used by anyone at the underground. By that I mean undermanager-in-charge or shift undermanagers. During my discussion with Phil Reed I cannot recall any specific mention of Graham's Ratio, so until he came to this Inquiry I did not know his views on the Graham's Ratio either. During my time at Moura No 2 Underground I myself didn't keep a close watch on the Graham's Ratio.

You say you didn't?-- I did not.

When did you become aware of that value that you mentioned, .4, .5?-- I'm sure I would have been made aware of the values of the Graham's Ratio during my studies as mining engineer and as - during my tutorials for my certificates, but it's like everything. I hadn't used Graham's Ratio for seven, eight years because I didn't work at a mine that was liable to spontaneous combustion, so I understood the Graham's Ratio, but something you do not use every day you don't remember.

Did I understand you to say that after you arrived at Moura No 2 that your awareness of relevant figures became more acute, or did you just remain in the same state of relative ignorance?-- It would be fair to say that although I knew that for the Graham's Ratio you were watching trend, I never

kept a close eye on the trend of the Graham's Ratio during my time.

At Moura No 2 did you have any particular figure in mind as to what was an appropriate level for the Graham's Ratio?-- No, that's just what I've been trying to explain to you. I'm sure I've known of the figure but - before August 1994. I can't recall that figure.

So, your position was really that if you were to attach any significance to it, the significance would be upon the Graham's Ratio changing?-- Yes.

Now, the Unor system was set in respect of each monitor point with different alarm levels for each of the gases, or appropriate levels for each of the gases?-- Correct.

Did you know yourself what levels had been set in the system at any given time?-- In the submission of my Part 60 I mention two levels for carbon monoxide, so they were the levels that were set on the Unor. The other levels throughout the mine were just in accordance with statutory requirement.

Was there any system in place whereby only persons with certain authority could alter the set point values for the alarms?-- While I worked at Moura No 2 Underground that was the clear understanding that I had. Through previous sealings - when gases were rising during previous sealings I observed on more than one occasion the level being reset and that was always done by either George Mason, some - well, the - Mr Max Robertson under the instructions of George Mason or an undermanager. I'm not sure if undermanagers would raise that alarm level. I don't know if they could.

Well, you were the Underground Superintendent. Who was it on your understanding, or on the system you had in place who was it that was authorised actually to either adjust the set point value or to permit someone else to adjust the set point value?-- My clear understanding while working at Moura No 2 Underground was that it would be either myself, George Mason or a shift undermanager only that would authorise the raise in the alarm level. I would not expect anyone else to authorise that.

Now, you mentioned that you did yourself on one occasion previously accept an alarm. Have there been other occasions when you have looked at the Unor system and it's been in alarm mode?-- Not that I can recall. The time - and I know it was not in 512, it must have happened at another time, and I don't know the level of alarm, but no-one was present in the instrument room at the time the alarm was raised and I just followed, you know, what the screen said, and I knew where it was and it did not give me any concern. Usually - that's the only time - I think I've only done it once.

Has that been the only time you have seen the system in alarm mode or any point on the system in alarm mode?-- While I was working at Moura No 2 Underground I never noticed a point in alarm mode for an extended period of time because had I seen

it, I would have done something myself, or I would expect that it would be attended to.

I suppose if it was just after a sealing, you might expect to see points in alarm mode?-- That is what I'm saying. It is only during sealing or straight after sealing that the Unor alarms on a more regular basis, if I might say, otherwise under normal circumstances Unor alarms are very rare.

And if a point went into alarm mode sometime other than just after sealing, then you would expect that you would notice it when you looked at the screen?-- I would have noticed it and I would have done something about it.

Just have a look at that Exhibit 127. In particular have a look at the sixth entry there which is for Tuesday, 2 August, which in fact is the day you returned to work, and you will see that that entry relates to an alarm in respect of point 16 which was the 512 top return and it was a breach of the CO level with the set point value of 7, and according to the log that alarm registered at a minute past 6 that morning; do you see that?-- What line?

This is the sixth line on the document there, you see?-- From the top of the document, is it?

Yes, that's right?-- Correct, yes.

Point 16, 512 top return, a breach of 7 ppm on the CO; do you see that?-- Yeah, that's correct.

And it alarmed at a minute past 6?-- That's correct.

I think you have told us that it was your custom when you arrived, which was sometime around, I think you said, 6.30, was it?-- Yes, 6.30, 6.45.

That it was your practice to look at the screen and you recall you did so during this week?-- Yes.

But you will see that that alarm in fact wasn't acknowledged at the Unor until 6 minutes to 10 that morning. Can I ask you, first of all, do you recall whether there was any siren sounding when you arrived that morning?-- There was no siren sounding when I arrived that morning.

When you looked at the Unor screen did you see this point 16 in alarm mode on the screen?-- When I looked at the screen it was green.

You don't recall seeing that point in alarm mode?-- I'm positive when I saw it it was green.

Certainly you don't recall taking any steps to have anything done about an alarm that day?-- No.

Can you offer any explanation yourself as to why we have a log showing an alarm at a minute past 6, not acknowledged until 6 minutes to 10 on that alarm log there?-- I find it very hard to understand because I'm confident that I would have looked at that Unor on the 2nd of the 8th before 9.54 - yeah - because of my habits. I'm not saying the sheet is wrong, but unless I looked at the screen not before 10 o'clock, which I doubt, I have a clear recollection of the line being green at that time. I cannot explain that.

Have a look at the next entry, which was for 3 August, and that's the day that you took the - or one group anyway of people who had been at the directors' meeting underground - you will see that there is an alarm on that day registered at the Unor at 9 minutes past 11?-- Correct.

Now, do you recall when the meeting took place? What time it was you went underground?-- It was right at the change of shift, so it would have been around 2.15 - plus or minus 15 minutes.

Had you been at the mine throughout the morning?-- I was at the mine on Wednesday morning, yes.

Do you recall whether the siren went off at about 10 past 11, or 9 past 11?-- I couldn't say "yes" or "no" to that answer because the Unor alarm was not a specific sound in itself, so the alarm might have gone off and was silenced by an undermanager, or it didn't sound. I don't know. I cannot recall.

Was it a frequent event that the siren sounded at the mine - at times other than just when there had been a panel sealed or when span gas tests were being done?-- As far as I remember there was low air pressure on that Con Log - it was maybe the fan, I'm not sure - and there was another set of alarms with a different siren for the C bells going off, so you can imagine now, or I hope you can understand that seven or eight months after the event I cannot really tell you if that particular alarm sounded because it is not a specific alarm for a specific job.

You will see that that alarm, in fact, remained unacknowledged until 5 minutes past 7 that night?-- I am very much surprised of that fact.

Is there any explanation that you can advance in relation to it?-- The only explanation I can advance is if it did sound, which I'm not saying if - I can't remember if it did or it did not - someone silenced it, either an undermanager or a miner. If it was a miner he would have instructed someone that that alarm had sounded and the person receiving that information or having silenced the siren might have got busy with something

else and forgot about acknowledging the computer. That is the only explanation I can give.

Now, you will see that that alarm was the breach of CO level in 512 top return and that the set point value on that occasion that was breached was a set point value of 8?-- That is correct.

If you go over to the second last column?-- That is correct.

If appears the set point value had been changed from 7 to 8?-- Correct.

Some time after the alarm on the previous day?-- That's so, yeah.

Now, did anybody discuss that with you - changing that set point value for the alarm from 7 to 8?-- I cannot recall. That doesn't mean that they did.

Now, you did say that when you returned that you - when you looked at the Unor from time to time during that week, that apart from the Friday afternoon, as you recalled, the reading on the Unor was 7 ppm, or thereabouts?-- Yes, I believe that the first time I saw 8 ppm was - on the screen was some time on Friday, and that is why it is in my statutory report. That is to the best of my recollection.

I think you were saying that before you went away the level in terms of parts per million was around - did you say 5 to 6?-- 5 or 6. I can't really be 100 per cent sure.

You also said that from your point of view one of the things that you did look at, quite apart from looking at the CO make that was being calculated, as far as you were aware from week to week, one of the things you looked at in monitoring what was happening in 512 panel yourself was the CO in parts per million?-- Correct.

And whether there had been some increase in that. You will see that, in fact, when that alarm was registered on the Wednesday, 3 August there, it was with a reading of 8.8 ppm; do you see that?-- That's correct.

Now, we are getting there close to 9 - close to 9 ppm at 8.8, aren't we?-- I'm not sure. The screen shows the decimal point - I don't think it does, from recollection.

You think it does?-- I don't think it does.

You don't think it shows the decimal point?-- That's my recollection. I'm not sure. I cannot recall seeing a decimal point on the Unor - on the screen. I know that the values you can get out of the computer go to the decimal point, but I think on the screen it is just a round figure, from what I can recall.

In any event, let me take, first of all, the alarm set point value of 8. That value would be considerably above the value

of the 5 or 6 that it had been at when you left?-- Yes, but three and a half weeks had gone by as well.

Yes. How did you feel at that time about the CO level in the 512 panel? Did you yourself have a view about whether it should be at 8 ppm, given the history that you were aware of up to that time?-- As I said before, I don't consider I've got the knowledge, experience and expertise to say what I can expect in a panel. What I was doing is watching what was happening and not expecting something and - because I just haven't got the knowledge to do that.

Of course, if you don't have the knowledge on something, you make inquiries or carry out research and take steps to find out what an appropriate level is?-- As I said before, I'm not sure that people can do that. In my opinion, I'm only going to look for something or someone if I believe that they can help me. I don't believe it can be done.

One of the purposes of having the Unor system with set point alarm values and having an alarm is to warn you that a particular gas has breached a particular level at some particular monitor point; is that right?-- That's correct.

In this case, on the Tuesday at least, what we had was the CO in the 512 top return breaching this set point value which had been selected of 8 ppm. It breached it with a reading that was approaching 9 ppm. Wasn't it the purpose of this system then to bring to somebody's attention that fact - that is, that there was a breach of a predetermined level at this monitor point - a breach of the CO level?-- That is correct. That is a purpose of the alarm.

Was this factor ever brought to your attention - that there had been a breach of that CO level with a reading of almost 9 ppm on that Wednesday?-- Not that I can recall.

So, really, the Unor system, although it appears it did the right thing and registered the alarm, in terms of any response by anybody to that system, it failed at that point; is that right?-- Well, it depends on the understanding that the person accepting or acknowledging eventually the alarm has - it depends on his own understanding of the circumstances.

Now, it also appears that we can't, at this stage, ascertain who it was that accepted that alarm on the Wednesday; would you agree with that?-- That is correct.

All we know is that whoever accepted it put two ones in when they accepted the alarm?-- That's correct.

There was no system whereby we can identify who that was?-- That is probably because we are sitting here, seven or eight months later, looking at it through a fine comb. I think if we wanted at the time, I could have found out - that's what I'm trying to say.

But, of course, given that there was no protocol for the acceptance of alarms and no identifying number used by whoever

it was that accepted them, we are in the position now that we can't identify who it was that accepted that alarm; isn't that so?-- In the case of an event like August '94, if you want to critically analyse what happened, that is a weakness of the system.

But one of the purposes of having the alarm system there to warn people when gas levels have exceeded a predetermined alarm set point value is so that it is brought to someone's attention - the attention of someone in authority - that that's occurred, and, secondly, so that there is some record of just what happened over a period of time leading up to the event?-- You only need that in case of an event like August 1994; that's what I'm trying to point out. I don't disagree with you in principle.

Of course, Mr Schaus, if there had been some cognisance taken of the breach of the alarm level by someone in authority, then perhaps it could lead to action that might avoid the kind of event that we are speaking of?-----

MR MORRISON: I object to that. I object to that. That is really asking the witness to do some extraordinary hindsight speculation and to usurp your function and it shouldn't be permitted.

MR CLAIR: Your Worship, I would submit that it is a perfectly logical question to follow the questions that have led up to it. It is a matter that is highly relevant to the events that led to the explosion on 7 August - that is, the change in alarm levels at the mine. The witness in the witness-box is the underground superintendent who, in effect, had responsibility for the administration of these systems. He is in a position where he can say what matters - what action, I should say, and what lack of action may well have brought about the event on 7 August. At the moment, the questions that he is being asked - or the question that he has been asked really relates to what lack of action. Now, it is well within the ambit of this Inquiry to investigate what action or what lack of action may have brought about the events that resulted in the explosion. It is as simple as that, Your Worship, and I submit the question is a perfectly proper one.

MR MORRISON: May I reply?

WARDEN: Yes.

MR MORRISON: If the question was truly framed as Mr Clair suggested it was - but I submit it clearly wasn't - then I would have no objection because I have said before on a number of occasions the purpose of this Inquiry is to do exactly that; to look at who did what, who did not do what, what do they know, what did they not know, what did they see, what did they not see, not to ask them in hindsight what would have, what might have, or everything else. Now, the question that was asked, as best my note recalls it, was if there had been some cognisance by someone, I think in managerial positions, of the breach, then that might have led to some action that might have avoided the events of August 1994. Now, you

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couldn't ask for a more rolled-up, triple-barrelled, hindsight conclusionary exercise which usurps your function. That's the truth of it. The man is being asked if it had come to someone's attention; not did it, or didn't it, but if it had, then might something else have happened; not did it, or didn't it, might it, then leading on to, and might that have, in circumstances that we don't know about, led to something else that might have avoided August 1994. It is an extraordinary proposition to suggest that is a proper question and it should not be permitted.

WARDEN: I think it is a proposition that shouldn't really be put to the witness. It is more an inference that could be drawn in any submissions for the panel to consider.

MR CLAIR: Thank you, Your Worship.

Mr Schaus, the fact is, of course, that it was never brought to your attention that there was a breach of that alarm level of 8 with a reading of 8.8 of CO in the 512 top return on 3 August; isn't that right?-- I cannot recall it being brought to my attention.

Now, given what you have told us about your approach to the CO make in 512, how would you perceive a rise from - up to that level - that's almost 9 ppm on that day?-- In line with what I have said before-----

MR MORRISON: Excuse me, I object to that question. It has been put forward as effectively asking this witness now to comment in an ex post facto fashion - with hindsight. That's, in my respectful submission, as I have made a number of times before, really not what this exercise is about. He may be asked how did he view it at the time, or how did he not view it at the time, but he is now being asked to conduct an ex post facto exercise. Now, if that ex post facto exercise is to be conducted, as we well know, it will be conducted by experts, and we well know that those experts are coming and we will be hearing from them in a week or two, perhaps. They are the people who will conduct that exercise, and as I think we all know, they have already indulged themselves in that exercise in their reports. It is not appropriate to do this through a witness of fact.

MR CLAIR: Your Worship, this is a different proposition to the one that my learned friend just previously objected to, and it is quite wrong to say that this is simply asking for some sort of speculation about what would or might have happened. Again, might I say that Mr Schaus is here in the witness-box as the underground superintendent/registered mine manager who was there at that time when this alarm level was breached. It is well within the ambit of this Inquiry to look at what action he would have taken in that position if this had come to his attention, because the Inquiry has to deal with the question as to what was done or what was not done that may have brought about or contributed to the event on the 7th of August.

It would be different if there was some other witness in the witness-box who was not here as an expert and who was not in a position at that time to do anything about it. It may well be inappropriate in those circumstances to say, "Well, what would you have done if you had been confronted with this?" We are not dealing with that sort of situation here. What we are dealing with here is the man who was on the spot who did have the authority and to whose attention this ordinarily, in the course of events, a breach of an alarm level like this would properly have been brought. It seems on this occasion it wasn't, it wasn't brought to his attention

MR MORRISON: I wish to be heard in reply. That's precisely the point I'm making and have made before. We can examine what the man did or didn't do, what he knew or didn't know, what he saw or didn't see. Now, we will have experts coming along who will say to us, as is the appropriate course and has always been the appropriate course in any proceedings, you get an expert in who says, "This is the way to approach this situation. This is an appropriate course of conduct for someone.", and then against that you look at what people have said they did or didn't do and you judge against that expert advice whether that person's conduct matches up or doesn't, and that's the point of saying to the person who was involved, "What did you do? What didn't you do? Thank you." Then later hearing an expert say, "Now, an appropriate course of conduct is that.", and it's for the panel, with respect, to make that assessment right at the end. That's exactly the point I'm making.

WARDEN: You've got no response to that? Did you have any response?

MR CLAIR: Having listened to Mr Morrison say, in effect, what he had said before my first submission, I'm concerned if I make a response we could go on all day, Your Worship.

WARDEN: That's correct.

MR CLAIR: I'm quite happy to abide by Your Worship's ruling. I can only reiterate my first submission, and basically that's what Mr Morrison has already done with his, but what we have here is the witness, not a witness who might have been working off at another mine and who might be asked, "Well, what would you have done in that situation?", what we have here is the man who was on the spot who had the authority. This should have been reported to him and it wasn't. It's highly relevant to know what he would have done if it had been reported to him. It is well within the ambit of the Inquiry.

WARDEN: Yes, thank you. I will allow the question on that basis.

MR CLAIR: Thank you, Your Worship. Do you remember the question, Mr Schaus?-- Could you repeat it, please?

What would you have done if that breach of the alarm set point value of eight on 3 August with a CO reading of 8.8 in the 512 top return had been brought to your attention on that day?--

XN: MR CLAIR

WIT: SCHAUS A H

I would have to qualify my answer by saying there is an element of speculation because I was not aware of that. However, in line with what I said before, a rise of that extent might draw my attention to some sort of investigation. However, if that rise was not continued and sustained and increasing in an avalanche effect or in the exponential way, that particular alarm would have not raised any concern.

But certainly your first step would be to carry out some further investigation in relation to it; is that so?-- By investigation I mean that someone or myself might have gone down that bottom return to do an inspection to see what the reason might be. A similar inspection to that one I now understand was carried out on 22 July.

Okay. Now, if you look at the next alarm, that's an alarm on Friday, 5 August, it seems that the set point value on Friday, 5 August there - again it was an alarm for the 512 top return breach of the CO level - the set point value was still at eight, so whoever it was that accepted that alarm or acknowledged that alarm at the Unor certainly didn't go ahead and raise the set point value again. It seems the set point value stayed the same. Would you agree with that?-- That's correct.

Did anybody consult you about whether or not that set point value should stay the same?-- No, they didn't.

Well, there was a further breach of it, and you will see that that was with a reading of 8.03 at 10 to one on the Friday. Were you there at the mine at 10 to one on the Friday?-- At 10 to one on that Friday I was underground with George Mason on my statutory inspection.

When you came back up top again did anybody tell you that there had been an alarm on the CO in the 512 top return?-- Not that I can recall.

Then it seems there was an alarm at 10 to eight the next morning, again the set point value had stayed at eight and this time it was breached with a CO reading in the 512 top return of 8.33. That was the Saturday morning -----?-- That's correct.

----- 6 August. Did anybody contact you that morning to say there had been another breach, yet another breach of the CO level in the top return, 512?-- No-one did contact me.

Did anybody talk to you on the Friday about whether that set point value should be raised from eight or whether it should stay the same?-- I cannot recall anyone contacting me about raising set point on the alarm.

Is it a matter that either does concern you now or would have concerned you then that there had been these four alarms by way of breaches of the CO level in the 512 top return during that week through to the Saturday morning, and that none of those had come to your attention as the underground superintendent?-- That is a very difficult question to

answer, Mr Clair, because knowing what I know now, but -----

Let me cast it back to the Saturday. If you had known that on the Saturday that there had been four alarms of the breach of the CO level in the 512 top return and they hadn't come to your attention up to that time, would that have been a matter of concern for you then?-- What I consider a matter of concern would be the fact (1) that these alarm appeared to be unacknowledged for an extended period of time; (2) that I was not informed of some of them. However, I would like to qualify it by saying with what my understanding was of a heating developing in the panel, that might not have changed my opinion as to the safety of the mine, might not.

Okay?-- Might have.

I want to move away from that exhibit. You can put it to one side, if you would, Mr Schaus. On the morning of Friday, 5 August you conducted your weekly statutory inspection of the mine with George Mason; is that right?-- That is correct.

You inspected 5 South, you mentioned in your statement what you found there, and then you inspected 512; is that so?-- Yes.

Can you tell the Inquiry what happened at that time?-- I recall going underground with George Mason at around 10 a.m.. He drove the PJB underground. We went to 512 first. We left the PJB at the crib room which was, I believe, 0 cross-cut in 2 headings to the best of my recollection. George Mason rang 5 South to check on the situation down there. They had problems with the continuous miner, as I can recall. I stayed in the PJB during that time. After that phone call we went to 5 South and did our inspection. We came back to 512 after 5 South and I conducted a 520 inspection as well, of the drivehead. We met with Phil Shorten, miner driver, in that panel and Rod Stafford, mine deputy on that day in that panel. We were not always together as a party during the course of the inspection. During some time the four of us were talking together, as I recall, and at other times I have a vague recollection that Rod Stafford and George stayed a bit behind and I was having some discussions with Phil Shorten about new mining machinery that we considered to buy for the underground. I recall that we went down the travelling road, No 2 heading, to No 2 - to No 1 cross-cut at the goaf edge. I recall doing a reading of methane there and inspecting the goaf. To the best of my recollection methane was .5 per cent. Then we proceeded in the cross-cut towards the belt road, 3 heading. I did a gas reading there that was similar to the previous one, .5 per cent methane to the best of my recollection, that is at roof level. I believe Phil Shorten, on my arrival the second time in the panel, advised me that there was a substantial roof fall somewhere in the goaf while we were doing our inspection in 5 South. I recall going down - walking down the ramp, I think Phil Shorten was following me, down to No 2 cross-cut to try to identify that fall. I could see a bit of stone, but the precise location was not determined. I did not notice anything untoward at the waste going to 2 cross-cut either. I believe during that time

XN: MR CLAIR

WIT: SCHAUS A H

George and Rod Stafford stayed at the cross-cut. They didn't go down the ramp with us. Then I looked at the goaf edge of 3 cross-cut looking towards No 4 heading. I remember having some discussions with Phil Shorten, and I think Rod Stafford was there as well, and George, about the fact that the ramps in that area were really well cleaned up. There wasn't much coal left behind. Some time during that time I also recall Rod Stafford asking George Mason if he had to do a CO reading on that shift, and George told him that he had to do so. At that time my understanding of that CO reading was the usual Friday CO reading for the CO make, and in evidence I heard that that was actually the one that was used in the graph.

That in fact was a reading that was taken with a view to calculating the CO make?-- On that Friday, yeah.

So it wasn't just the CO reading, it was actually a wind velocity reading that was taken as well; is that so?-- Yeah, I remember the words, "Have I got to do a CO reading?" I didn't hear any "velocity", but I was expecting a velocity reading because I thought in my mind that it was the one to be used to do the CO graph for that week, which I understand now it turned out to be the case.

Well, did you at that stage have any concerns about anything in 512 Panel at the end of that inspection?-- I didn't see anything untoward during that inspection and no-one raised any concerns with me at that time.

Well, what happened after that? Did you continue with your inspection of the mine?-- I carried on with the inspection of the mine, yeah.

And you ultimately went back up top again; is that right?-- That is correct. I remember going up in the transport from North West with the day shift mine workers finishing their shift.

Now, did anything else happen during that day which affected your view of what was going on in 512 panel?-- No, it did not.

You subsequently made an entry in your mine record book of that inspection; is that so?-- That's correct. The entry in the mine record book relating to my inspection on the Friday was not done on that Friday. I made that entry on the Sunday when I visited the mine. The reason being, we came out of the mine a bit before three o'clock, I remember having lunch that we hadn't had yet. I remember conducting some other business that I have no clear recollection of and just before we left the mine we were having some discussions with George Mason, Steve Bryon and Jacques Abrahamse in his office. I believe I left the mine at around five o'clock, 5 p.m..

Those discussions you mention, did they touch on 512 Panel, what was to happen with it, as you recall?-- To the best of my recollection it didn't touch with 512 specifically. They were more discussions towards the future layout of the mine.

Can you have a look at that Exhibit 160 again? That's your mine record book. Go to the last page. The entry there appears to have "5/4/94" underneath but it follows the other entries and it seems it should be "5/8/94"; is that right?-- I entered the date of my inspection, although I did that on the 7th but the inspection was conducted on the 5th, that's why I entered the date of that inspection, and obviously I got the month wrong. I was still on annual leave.

Now, in respect of 512 Panel, the entry you have made is this: "Panel completed on night shift. Machines being removed. CO readings climbing steadily (8 ppm = 19 lpm)"?-- That equals sign is one sign I use to mean approximate.

Approximately 8 ppm?-- It's a wavy line on top of two straight lines.

I see. Approximately 19 lpm. "Section will be sealed as soon as possible (this weekend)." Then you mention the methane reading and you say the goaf appears stable. Now, the entry, first of all, "CO readings climbing steadily" with the reference to 8 ppm approximately 19 lpm, can I ask you, first of all, where did you get the figure from, the 8 ppm?-- As I said, when I filled out that report on Sunday I filled it out as my state of mind was on the Friday because I should have filled it out on the same day, so that was the report as to my state of mind after that inspection and my knowledge after that inspection.

The 8 ppm?-- So, the 8 ppm, to the best of my recollection, is the value I noticed on Friday on the Unor. I cannot tell you when for sure, but sometime on Friday I noticed an 8 ppm.

Now, you have down then approximately 19 lpm. Is that a calculation you made or was that a calculation that was passed on to you by somebody?-- I have pondered on that question over a long period of time. I'm not able to come up with a definite answer of where that 19 lpm came from as I was writing that down on Sunday afternoon as a result of my inspection conducted on Friday.

Had you on the Friday when you were aware of the 8 ppm - had you made that calculation in your mind or at least in some way did you have in your mind that there was a make of 19 lpm on the Friday?-- I was going to come to that. You didn't let me finish my answer.

I'm sorry. I sometimes -----?-- You anticipated what I was going to say.

I sometimes recognise a pause but sometimes I miss them. Go on?-- I was going to carry on. I know what it is not. I know that I did not calculate it because I wouldn't have put approximate, and I remember clearly not calculating it. It is

not a figure that I heard from someone either. I never heard that figure on the Friday or the Saturday or even the Sunday. Now, the best I can do is refer to a calculation that I had done once on a previous occasion in 402/401, I recall, where I wanted to determine the impact of a rise of 1 ppm on the CO make. Now, I'm only speculating at this point in time. I think I had in mind at that time that 8 ppm were more or less equivalent in my mind to 19 lpm based on that calculation.

Can I just pose the question again as to whether that's something you had in your mind on the Friday or was it something that wasn't in your mind till the Sunday when you wrote it down?-- No, that was something I had in my mind on the Sunday when I wrote it down. Well, I made that jump from 8 ppm to 19 lpm on the Sunday as I was writing my report for the sake of being complete.

Now, irrespective of how you came to the 19 lpm, at some point that's the view you had, at some point prior to the explosion on 7 August?-- That's correct.

How did you see that 19 lpm of CO make in the context of the 512 Panel and the stage that things had reached with 512 at that time?-- Again, before I went on annual leave, to the best of my recollection the parts per million were around 5 and, to me, around 5 is a 12 - assuming that the quantity of air in the panel was what I expect - and I qualify always that which is the 45 cubic metres per second - 5 ppm was equivalent, in my mind, to the 12 lpm that I referred to earlier. When I came back I equated all I'd seen on a graph on my desk on Friday - somewhere in my mind I equated 7 ppm to around 15 or 16 lpm, so that was what I had in mind the figure of CO make on the Friday before this coming Friday or Sunday. I've always - I've explained before that I considered peaks and troughs in the graphs due partly to the accuracy of the measuring instruments that we were using and the positioning of the miner, although in this case there was no mining taking place on the Friday in the panel. So that 19 lpm, to me, was still following the general trend which I described earlier in what I mean "CO climbing steadily". That is in my mind. I never graphed it or had a look at the graph.

In terms of absolute value of the CO make in litres per minute, you have said earlier that it was your understanding from the conversation that you had with Phil Reed that anything above 12 lpm required vigilant monitoring. Now, that would tend to suggest that a litre per minute make of 19 would be, in terms of absolute value, a very high make; is that so?-- I agreed 7 lpm above the 12, but then again I said that I was looking for a rise expressed in CO make or in parts per million of the exponential nature.

Yes, okay. Now, in the entry in your mine record book you go on to say, "Section will be sealed as soon as possible (this weekend)." Now, that was obviously a thought that you had on the Friday, albeit that it was recorded on the Sunday?-- That is correct. I tried to express the view I had on Friday, although I knew it had been sealed on the Sunday. I was not present at the overtime meeting held by George Mason on

Thursday. I was discussing the results of the monitoring in 512 with Jacques Abrahamse and David Hill from ACIRL. I knew that George Mason had organised the Tecrete contractors to work on weekends. I assumed that as 512 was completed on that Friday at 6 a.m. after the machinery had been removed, we would seal the 512 section. However, I never gave such instructions or understanding to George and George never communicated his intentions of doing the 4 South prep seal at that time either. That is a reflection of what were my thoughts at the time, just following good mining practice.

On the Friday you made that - or at least you had that view in mind that the section would be sealed as soon as possible. The fact that you had that in your mind tends to suggest that that was something different to what the normal practice would be?-- No, the normal practice was that we seal the section as soon as possible after it had been mined. I've been involved in 511, 403, 402/401 and the sections were usually sealed straight after, as far as I recall, the machinery was pulled out. This is the first time that we had to seal a section and had to do the prep seal for another. That's how confusion between George and I come about, I believe.

You had that in mind on the Friday?-- I had that in mind on the Friday, yeah, and that tends to reflect what I had in mind on the Friday.

Did you give any direction to anybody?-- No, I did not. As I said to you, I never expressed those directions to George because I knew that Tecrete contractors were rostered on the weekend and I assumed George would have put that labour on the 512 seals and he did not convey to me that he wanted to put them on the 4 South prep seals.

Okay. You can put that exhibit - I should ask you this: you said that on that Sunday you did read back through Mr Barraclough's -----?-- That is correct.

----- entries in the mine record book?-- Yes.

And it was at that stage that you saw a reference to - and that was for the entry 22 July - a reference to Drager readings being taken and recorded daily?-- Yes.

What significance did you attach to that when you saw it?-- I remember when reading that report from Joe Barraclough I thought at the time - that was on that Sunday - that considering that he had had 8 ppm at that time, not on the Friday that I was, but at that time because of background reading it was - I don't know what it was at that time - it was an appropriate course of action.

In fact, that entry on 22 July has, "Maihak CO readings remain stable at 6 ppm", and then, "With Drager reading rising to 8 ppm."; you see that there?-- Yeah. My understanding at that time was that by doing the daily Drager reading - although I hadn't spoken to anyone about it and I did not know anything about the scheme in place - my understanding was that Joe Barraclough tried, by doing the daily Drager reading, to

check on a regular basis the Unor - the veracity of the Unor with the Drager.

The entry for 29 July has the notation, "CO on the Maihak remains at 6 ppm."; do you see that?-- Yes.

So that, in effect, the Maihak had been 6 ppm the week of the 22nd, 6 ppm - remained at 6 ppm up to the report of the 29th and, of course, at the time of your inspection it was - that was on the Friday the 5th - it was at 8 ppm?-- Yeah, but I had been at the mine on the Tuesday and I've said it was 7, so -----

But did that rise of 2 ppm over a week cause you concern?-- At that time I did not notice that there was a rise of 2 ppm for that week, but in line with what I said before, unless the rise was sustained and of an exponential nature, that was not going to concern me.

Put that exhibit to one side if you would. I want to go to the events of Saturday, 6 August. I am in Your Worship's hands as to when we take a break. That's the only reason I am looking at Your Worship. I am obviously moving to a new point. I am quite happy to continue, Your Worship.

WARDEN: I would prefer to take one now and have a larger session before lunch, so we will take 10 minutes now, thank you, gentlemen.

THE COURT ADJOURNED AT 10.40 A.M.

THE COURT RESUMED AT 11.02 A.M.

ALBERT HUBERT SCHAUS, CONTINUING:

WARDEN: Before we start, just a couple of other matters: today is a short day. Can we take the lunch adjournment from 12.30 to 1.30 and finish no later than 3.15 to cover arrangements? I will also indicate to you that I desire to do an inspection on another matter in Central Queensland on Friday, 24 March. That will indicate then that I'm not available on that day, and it is related to another matter - not anything to do with this matter - so you could plan your arrangements a bit around that day not being a sitting day. The third matter: a word which you would like to hear - "submissions" - because it indicates some progress towards finality. In preparing submissions, if possible could you provide a disk copy of your submissions if they are prepared on a computer? I anticipate some requests from groups or bodies or students in relation to what may be put forward in submissions - just as an aid to the Court to meet those requirements. Thank you.

MR CLAIR: Mr Schaus, I want to move to Saturday, 6 August. You mention in your statement that at approximately 9 p.m. you received a phone call from George Mason?-- That's correct.

Can you tell the Inquiry what discussions took place?-- When I took the telephone call I remember vividly the first sentence that George Mason said to me: "I thought I'd just ring you to tell you what's happening to your mine." That first sort of phrase really sticks in my mind. Then he went along telling me about events that were reported to him from Michael Squires throughout the day, earlier that afternoon. He told me that on Friday afternoon Mick Caddell had detected a smell at around 7 or 8 cross-cut - was my best recollection - and he had measured 8 ppm in the return. He also told me that Cole Klease and Michael Squires on Saturday morning had detected a haze at the belt road goaf edge, but the source of the haze was not clear. There had been machinery working around on the prep seals and it was thought that that was a source of the haze. He also told me that Michael Squires had started preparation for the sealing on Saturday day shift. I understood that he had gone to the mine-----

That's George Mason?-- George Mason, sorry - that George Mason had gone to the mine on afternoon shift and that he had done an inspection of 512 in the company of George McCrohon. To the best of my recollection, I understood that he went down the belt road and walked down the ramp to 3 cross-cut.

XN: MR CLAIR

WIT: SCHAUS A H

He could not see a haze or detect any smell. I then remember him saying that he attempted to inspect the return where Mick Caddell had detected the smell on Friday, but due to the baskets being erected for the prep seals he could not go into that return.

The prep seals?-- Sorry, for the seal. I remember him mentioning a reading of 7 ppm of carbon monoxide in that top return. He was of the opinion, and in agreement with George McCrohon, that there was no cause for concern, and he went along with the sealing that Michael Squires had started although he thought it was not necessary, it was an overkill. That is the clear impression he gave me. Throughout that conversation he was mentioning all those points to me and I just nodded or - and listened basically. He then mentioned that Neil Tuffs had approached him earlier that afternoon and Neil had inquired about our intentions to send the drill crew in 510 on Monday day shift. So I understood him to be saying, "What are you going to do" - or my perception of Neil Tuffs' question was, "What are you going to do on Monday morning with the drill crew?". My interpretation of that was that as the panel was being sealed I expected the 512 Panel to go through the explosive range around that time, and I understood Neil to be asking us what we were going to do with the 512 crew while 512 was going into the explosive range because 510 crew was inbye of the 512 Panel. That is what I understood. I then replied to George that I did not understand what Neil was talking about. I could not follow the logic of him having some problem in going underground on the coming Monday day shift because 512 was going through the explosive range and because 512 was inbye - 510 drill crew was inbye of the 512. I considered the argument illogical and said so to George. I think that was the gist of the conversation I had with George.

Was there any mention during the conversation of the CO make in 512 Panel?-- There was no mention of CO make - of the CO make of 512 during the conversation.

Did you ask him whether he or anybody else had taken steps to calculate the CO make?-- He did not mention the CO make and I did not ask him the CO make.

Given what you've said about your understanding of the significance of CO make, when he mentioned to you that there had been a smell and a haze detected, was there any reason why you didn't ask him whether a CO make had been calculated?-- Well, I can only reflect to my thinking or my perception at the time. I perceived that George had been rung up by Michael about a possible problem, that George went to the mine and with George McCrohon - that's George Mason, sorry, went to the mine, and in company with George McCrohon inspected the area, and I was made aware that both of them agreed as to the state of the area at the time. The readings that he gave me in the top return of 7 ppm CO were even one part below the reading I had on Friday on the Unor, and to me - I agreed with the assessment that those two experienced persons had made underground, that there was no cause for concern.

You were the registered manager of the mine; was that right?--

That is correct.

What you had was a report to you of a smell - was it described in some way?-- In my statement I put benzene smell, but as I said before, I use benzene, tar, bitumen - to me they are all the same, so he might have said another word than "benzene". He described a smell somehow, yeah.

As a smell that you would, if there were not some other explanation, you would be ready to associate with a suspected heating?-- Correct.

Whatever word he used that's the way you perceived it?-- That is what I'm saying, yes.

There was reference to a haze?-- Yes.

And that was against the background that you at least had in your mind, if not down on paper, that there was a CO make in the panel on the Friday of 19 lpm?-- You didn't really understand what I said before then. I might have had in my mind, but I equated 8 ppm to 19 lpm on that Sunday. I'm not saying I didn't have that equation before, but I cannot recollect me equating the 8 ppm to the 19 lpm before my actual report on the Sunday. That's what I'm saying. Consciously

You had the raw material, you had the 8 ppm?-- Yes.

8 ppm, and whether you converted that on the Sunday or whether it might have been even subconsciously in your mind before that as 19 lpm, you had a reading which at least indicated to you a high CO make and you had a smell and you had a report of a haze. Now, did that give you some concern on that Saturday night that there was in fact a heating of some kind in the 512 Panel?-- All those signs that you just reported, all the signs that were reported were subsequently checked by experienced personnel and they made an opinion about the state of the mine and I concurred with that opinion.

You were content to rest on that without carrying out any further investigations yourself?-- At that time I understood that the investigation that was taken - that had been taken by George Mason was sufficient.

It seems from what you say you were prepared to rest on that without even asking George Mason whether anybody had calculated a CO make on the Saturday?-- There was no question for my part asking George Mason about CO make.

Did you discuss with George Mason, either expressly or in terms that impliedly accepted the possibility of a heating, that there may have been a heating in 512?-- Are you asking me if we specifically discussed the possibility of a heating in 512 during that conversation?

Either expressly or in terms that impliedly accepted the possibility of a heating?-- As I said before, during that conversation George Mason gave me a series of factors that may

indicate a heating, then the results of his inspections and the fact that he was not the only one of that opinion. In that sense I suppose that indirectly we took into account the fact that there may be a heating, but there was never a question either from me, "what do you think?", or from him, "What do you think?", if you know what I mean. He just gave me a list of events and a report of what the action had been taken, and his opinion at the time at the mine, and I agreed with that opinion.

Okay. You say in your statement - and I'm looking at page 6, half-way down the page when you are dealing with this telephone call. "George told me that he had been approached by Neil Tuffs, deputy, on Saturday afternoon about whether the 510 drill crew would be sent underground on Monday day shift while 512 was expected to be in the explosive range because it was on the inbye side of that panel." Now, is that what he told you?-- No, in that sentence - that's why here under oath I've tried to reflect the conversation as I best recalled it. To the best of my recollection my interpretation was that 512 was expected to be in the explosive range, or that's what I understood Neil was saying. Although the question was not specifically put by Neil that was my understanding anyway, and the fact that the 510 was inbye of the 512 was what I understood Neil was querying about or - that was the reason for his question. George Mason never gave me the exact words, I suppose, of what Neil asked. I cannot recall this right now. I'm trying to give you the spirit of what I understood at the time.

When you made your statement you - it appears from the reading of the statement you were taking some care to express yourself accurately in the statement?-- Yes.

You did have Mr Bannerman, the legal officer for BHP, with you?-- Yes.

Did you consult with him from time to time during the making of your statement?-- Just once during the statement, I believe.

In any event -----?-- Not at that time.

In any event, you were taking some care to put things accurately in the statement?-- That's correct.

Now, are you saying that that part of your statement that I've just read to you is in fact incorrect? I mean, did George Mason tell you that or not? That's really my question?-- It is very hard to put in words of the statement exactly the conversation and your interpretation of that conversation, and to me that was, when Mike Walker was taking the statement, the best way to put it across, but you understand if I had to explain every word on that - it's possible, I suppose - but that at the time was the spirit of what I understood, and I'm just taking the opportunity to be here at the Inquiry to explain what I understood and what my perception of the question was and the interpretation that I put and that I thought that Neil Tuffs put in - to the best of my recollection.

Were you in Court here when Mr Mason gave evidence?-- Yes, I was.

Has your thinking on this matter been affected in any way by what you heard during his evidence?-- No. I can't even recall really what Mr Mason said in regards to that.

Have a look at your statement again. You go on in the next line to say, "I told George that if Neil had any such concern about the safety of the 510 location I considered that logically all other locations in the mine would be at risk and if we were not going to send the 510 drill crew underground, that no-one else ought to go underground either because of the risks involved to them." Now, is that what you told him?-- Again, that is the spirit of what I was telling him. I'm not saying that is exactly the words I used.

You go on to say, or you give in fact an explanation in brackets there about why you considered the argument illogical and all the rest?-- Yeah.

Then you go on to say - I am looking at the bottom line at the close of the bracket - you say, "George agreed with that course of action.", that is, that if 510 were not going to be sent underground, then no-one else ought to go underground because of the risks involved to them?-- That's correct. What I forgot to say, I remember George telling me that - I've got that in the statement - that he had not given Neil an

answer because he hadn't had time to consider it, so I remember him telling me that.

Well, given what you have set out there in the statement and what you have said, what was the net result of your conversation with George Mason about this point?-- As I understood it, I could not follow what Neil was saying and unless George or I heard more from Neil we were going to deal with that matter on the Monday morning. I did not say to George he couldn't give an answer to Neil that night either. I don't know. My perception - the clear message I gave to George: if Neil has got a problem with going underground on Monday, whatever the problem is we ought to send no-one underground.

So, if Neil Tuffs had said that he didn't want to go underground because 512 Panel was going through the explosive range, would you have forced him to go underground?-- No, certainly not.

And then, of course, following the logic that you have just expressed now and that you expressed to George Mason at the time, if you weren't going to send Neil Tuffs underground, or at least if you weren't going to force him to go underground, then you wouldn't - the logic suggested that you wouldn't send anybody down?-- Yes, because I was going to inquire with Neil Tuffs as to his reason of not wanting to go underground on Monday morning, and if he had a concern even after discussions that he did not want to go underground, I was not ready to let anyone go underground.

So, to some extent whether or not you sent the men underground during the time the panel was going through the explosive range was left to be dependent on your discussions with Neil Tuffs?-- Either my discussions or George's discussions, yeah, as I understood it.

And, of course, there was the further factor that 512 Panel may well go through its explosive range before Neil Tuffs even presented for his shift on Monday morning, wasn't that so?-- That is a possibility.

And, in fact, that became a reality?-- That is correct. That is another reason why I couldn't understand the logic of Mr Tuffs. If you have problems about a panel when it's going through the explosive range, in my opinion you do not wait until the panel is nearly into the explosive range to come out of the mine. You seal the section and you get out of there.

Now, given that possibility, that is, that the 512 Panel might go through its explosive range before you spoke with Neil Tuffs on Monday, did you consider that it would be wise to speak with him on the weekend and see what his concerns were?-- I didn't consider that possibility.

Now, was there anything else in that conversation with George Mason that you can recall?-- As I say in my statement, I was left with a clear impression that the sealing of 512 was a normal sealing and that there was no cause for concern. The

sealing was not under duress at the end of that conversation.

Did you inquire of George Mason whether he had any knowledge of the reason for Neil Tuffs' concern?-- Can you repeat the question? If he inquired, are you asking?

Did you inquire of George Mason whether he had any knowledge of the reason or reasons for Neil Tuffs' concern?-- No, I did not.

You didn't ask him whether Neil Tuffs had taken any readings or smelt any smells?-- No, no, I didn't.

Now, what was the next thing that happened from your point of view? Did you have any communication with anybody prior to the Sunday afternoon about 512 Panel or what was happening at the mine?-- No, not at all.

Well, you went to the mine, you mention in your statement, at about 3 p.m. on Sunday afternoon?-- That's correct.

Was that unusual?-- It is not unusual. Unless I am away on the weekend I got into the habit of calling at the mine usually on Sundays, not every Sunday, and usually at around that time just to see what was happening and to catch up with some mail in my office.

What did you do when you got there?-- I went to the Unor room and looked at the Unor screen.

What were you looking for?-- I looked at the reading for 512, and to the best of my recollection 512 was showing around 110 ppm CO and 3.5 per cent methane at that time.

Did you know where the monitor point had been put in 512?-- I did not.

Ordinarily would you have been advised as to where the monitor point would be located in a sealed panel or upon sealing of a panel?-- It had been my experience while I was at Moura that two monitor points were always installed just inbye the seals of each return of every section as in accordance with a submission of the Part 60. Until - in every case before 512, that is, 511, 403 I think we only used one return, there was no flanking return in 403, I'm not sure, but 402/401 - those monitor points were left as the seals were erected and we were monitoring two points, one on either side of the panel.

Were you surprised when there was only one monitor point behind the seals in 512?-- At the time I didn't notice that there was only one monitor point. It didn't strike me as being different from other times.

Did you have any view as to whether what you were seeing on the Unor screen was in fact representative of the whole of the panel or whether because of the location of the monitor point or the fact that there was only one monitor point there that it was a restricted sampling process?-- I had no reason to suspect that the monitor point that I was looking at would be

at a different place than the ones on previous sealings, which is I expect that monitor point to be inbye the seals in the top return.

Now, you mentioned the readings that you saw there -----?--
Yes.

----- when you first looked at it. Did those readings have any significance for you?-- In what sense? As far as raising concerns?

Yes?-- They didn't raise any concern, no, at the time.

Well, what expectation did you have in relation to the readings that you would see?-- After experiencing previous sealings, I knew that methane and CO were going up in a linear fashion, approximately linear fashion, after the completion of the seals, so I was expecting values higher than before sealing.

Did you have any idea of the rate at which you might expect the CO in particular to increase after sealing?-- At that time I never put my mind to doing any comparisons between panels as to the rate of increase after the seals were erected.

Well, what did you have in your mind to measure these readings against when you looked at the Unor screen this afternoon, this Sunday afternoon?-- That afternoon when I was looking at the Unor screen I was looking at the absolute value and at the rate of increase as far as being linear or not linear in the sense that if there had been a problem there would be an increase, an exponential increase, in that rate behind the seals.

Why do you say that? Where had you acquired that knowledge?-- It goes in line with my understanding that I got before - that I expressed before of the heating developing before - after you seal a section. If there is an exponential increase when the heating is developing while you are ventilating the panel, that increase should reflect itself while you are sealing it too. It is that avalanche effect.

What about after sealing? Had you anywhere ascertained any knowledge that after sealing what you looked for in order to determine whether there was a heating was some exponential rise?-- As at 7 August 1994 that was my understanding.

But where had you acquired that understanding?-- Through the education I'd been given. I don't know if it was ever specifically discussed in any formal matter what you would expect the CO make to do in a sealed section if you had a heating. That is the understanding that I had at the time.

Did you inquire as to the time at which the panel had been sealed?-- Yes. I talked to Michael Squires and I asked him when the sealing had been completed. In my conversation with George Mason, I recall asking him when the sealing was going to be completed - that is on the Saturday - and he told me he expected it to be completed at 6 a.m. the next morning. Michael Squires told me that the seals were actually completed at 1.15 a.m. on that Sunday, and I was quite pleased with that. The reason I asked the time of completion of the seals were to evaluate the benefits of using the new Tecrete seals in comparison with the brick seals because I saw potential for improving the speed of erection, and for a first attempt under supervision I was quite pleased that the outcome was better than what was expected.

You say in your statement that's the only reason that you asked Michael Squires the question about the time the seals were completed, but, in fact, didn't you need to know when the seals were completed so that you could assess the number of hours since the seals had been completed and then look at what kind of readings you were getting on the Unor from the monitor point behind the seals?-- That is correct. You need that if you want to determine the rate per hour, I agree.

Did you do any exercise on it - that is, how many - what sort of rate of production of CO there had been since-----?-- I did not do that exercise, but I remember Michael Squires telling me of the rate of increase per hour of carbon monoxide and methane. I do not remember the exact figure, but he was giving me a clear impression that they were constant - that was my understanding.

At the time did you take any particular note of the figures - I don't necessarily mean a written note - but did you take note of the figures and address the question as to whether that seemed like an appropriate rate of increase, or did you simply rely on what Michael Squires was telling you?-- As I said before, I didn't calculate myself the rate of increase per hour. Michael had been at the mine throughout that weekend, and I trust his ability to determine that. Michael

was telling me that the rate of increase was constant every hour, and I mentioned before that at the time I didn't have - I never had made a comparison, either in my head or on paper of the rate of increase of CO behind the seals.

That is a comparison between-----?-- Between panels.

What was happening in this panel and what might have happened in other panels?-- Yeah.

Did it occur to you that afternoon that you should make such a comparison?-- No, it did not because what I saw on the screen was not concerning me. I remembered seeing figures of 170 ppm in previous sections.

But did you know how long it took for the CO to reach that 170 ppm in other sections?-- At that time I didn't have any clear recollection of - or consciousness of the time it took for the CO to reach that level.

I mean, it is true to say, is it not, that the fact that CO would reach 170 ppm in another section after sealing would not be at all surprising because you would expect the CO to increase overtime? Isn't the question that would be of concern in determining what was happening in the section - isn't the question the rate at which it reaches that kind of level?-- As my state of knowledge was on 7 August '94 I looked at the absolute figure as one guide and at the change in the rate of increase as another guide to determine if there was anything untowards in that panel after sealing. I can only tell you that.

In terms of the rate of increase in production of CO, you really had no measure against which to gauge this; is that so?-- At the time I did not have a measure to gauge that constant rate of increase, correct.

Was there some conversation between Michael Squires and yourself about what was to happen when the men came on night shift?-- That happened after I went to my office, which I share with George, and I filled out my statutory report for my inspection on the Friday and I sorted through some mail that was left over my desk from Friday. As I was leaving the mine, probably 3.30, 3.45, around that time, I met Michael Squires in the shift undermanager's cabin and Michael inquired about what to do if men on night shift were uncomfortable or did not want to go underground.

Go on. What conversation took place?-- Well, I understood his question was being a hypothetical question - a "what if" type question - and the answer I gave him was that if that was the case, he was to ring George Mason and/or myself, not let anyone go underground, we'd come to the mine and deal with the situation.

What did you have in mind yourself to do if you found yourself in that position?-- If men on night shift didn't want to go underground I understood that Michael would have rang me up, and George as well, or I would have rang up George. I

understood that both George and I would have proceeded to the mine and we would have had some discussions about the reason for the men not wanting to go underground.

Was there ever any other occasion at the time of a sealing when you were asked that kind of question, either by Michael Squires or by any other undermanager?-- Can you repeat the question? Are you referring to 512 only or to another panel?

No, any other panel?-- Any other panel?

Yes. Was there any other occasion when either Michael Squires or any other undermanager had asked you that same question?-- Not that I can recall in the two years that I was there.

When you were at the mine on that Sunday and you looked at the Unor screen, did you look at all at the Graham's Ratio?-- No, I did not cast my eye on Graham's Ratio.

Was there any reason for that?-- Again, my understanding as before 7 August 1994 was - but I'm not saying that's the reason I didn't look at it - but my understanding was that Graham's Ratio was a useful tool when the section was ventilated. I had no idea that one could use Graham's Ratio to determine if there was a heating in a sealed section.

Did you bring up the Ellicott diagram?-- I did not bring up any graph. I just looked at the screen.

Was there a discussion between yourself and Michael Squires about when the atmosphere in 512 might enter the explosive range?-- I think that Michael, after mentioning the rate of increase per hour to me, said something about, "It's going to go through the explosive range some time on night shift.", and I concurred with his evaluation. It might have - I think I recall him mentioning that to me after giving me the rate of increase for CO and methane.

Did you have any view at that time as to whether the men who were to go down on night shift should be informed of all of these circumstances that had arisen over the weekend?-- At that time, that is on the Sunday, I was made aware of certain facts that may have indicated the presence of a heating. Those facts had been checked by experienced personnel at the mine that had been working at the mine for a considerable amount of time and that had some experience through the 5 North incident, I thought, and I agreed with the decision those people made as to the state of the safety of the mine on the Saturday. Therefore, on the Sunday, after my inspection - not my inspection, but after my reading of the Unor on Sunday, I had no cause to change the assessment that was made and I agreed with that assessment in regards to the state of the safety of the mine. At that time I did not perceive the need to inform the people about the circumstances. I would like to add that I know that Moura is a close mining community and I'm convinced that the information that the panel had been sealed would be communicated throughout the town and the mine. I'm not saying that the relevant factors were known - I couldn't comment on that - but I would be convinced in my mind that

people knew that the section had been sealed.

You wouldn't have expected that, for instance, Michael Caddell's report of a smell on the Friday afternoon would have become - would necessarily have become known to all of the men that went down on night shift; is that right?-- That is correct, but what I'm trying to say-----

I understand - sorry?-- If Michael Caddell had a view and a concern about that, some of that news would have travelled to the people. Now, that is what I'm saying; but I did not expect those people to know all the circumstances over which experienced personnel and myself had made the decision at the time and I had no reason to change that decision at the time.

The detection of a smell and the existence of a haze on the Saturday, again you wouldn't have expected that that information would necessarily have come to the notice of the men that were going down on the night shift - to all of them?-- Not necessarily, I agree, but again, if it was perceived to be relevant at the time by the workforce, and I'm not going to comment on - if that was perceived as being relevant by the workforce or not - but had it been relevant to the workforce at the time, those signs would have been communicated. It's like the sealing. I am convinced that all the people that went underground that night knew that the panel had been sealed and I'm even convinced that all the people or a great majority of the people that went underground that night knew that the section was going through the explosive range because what I experienced before was that there was a general discussion about the matter. That's what I'm saying.

Of course, while you were at the mine on the Sunday afternoon, you actually filled out the report in a mine record book in which you indicated the 19 lpm make on the Friday?-- That is correct.

And again you would not have had any basis to expect that the men that were going underground that night would have been aware of that 19 lpm make you recorded in your mine record book?-- That is correct.

Of course, at this stage, too, you hadn't spoken to Neil Tuffs about concerns that he had obviously had?-- I hadn't.

So that you couldn't have any expectation at that time that the people who were going underground on the Sunday night night shift would be aware of any matters that caused Neil Tuffs concern about going underground?-- You are correct in saying that, but can I repeat that if Neil Tuffs had any concerns, that's a logic I could not follow - that you leave the men down there and you withdraw them just before the panel goes through the explosive range. It just doesn't make any sense to me. It is either dangerous when you seal, and you stay out of the mine, and it becomes a sealing under duress, or it is a standard sealing and then you stay down the mine as it goes through the explosive range.

Just let me ask you this: does the danger increase when the panel moves into the explosive range?-- In what sense do you mean "the danger"?

Well, let's assume that the danger that we are speaking of is the existence of a heating in 512 which has the capacity to ignite an explosive mixture of gases?-- If you perceived that danger as being a heating, then you do not let the men underground straight after the sealing, and the sealing would be done under duress.

I just want you to answer that question I asked you, though. Given that the danger that I'm postulating is the existence of a heating in the panel, which has the capacity to ignite an explosive mixture of gases, would the danger in those circumstances increase when the panel moves into the explosive range?-- Yes.

Thank you. About 11.45 p.m. that Sunday night, you received a phone call from George Mason; is that right?-- That is correct.

And what did he tell you?-- He told me that Michael Squires had just rung him up and he thought that we had had a suspected explosion at the underground.

What did you do?-- Well, it was obvious to us that we both had to proceed to the mine. I discussed with him the fact that he would come and pick me up at my place and we agreed upon that course of action. However within five, six minutes George turned up on my front door step with a car and I told him to go to the mine and I would follow in with my car thinking that it could be handy to have - useful to have two cars to deal with the emergency.

Yes. You went to the mine; what did you see?-- I arrived at the mine at about 12.05, to the best of my recollection, and I noticed what I referred to as a bitumen smell in the air and a haze caused by the dust particles around the portals. I noticed that some men were in the lamp room at the start point. I asked Michael Squires how many men were not accounted for and at that time the reply was nine. I learned that the 1 North West crew came out of the mine and I suspected they were the people that I had seen at the start point. I asked Michael Squires to compare the names of the people that had come out of the mine to the people that had not come out of the mine in order to ascertain their number and their possible location. I think, but I'm not sure, I checked that someone was in charge of registering those coming out of the mine. It might be George Mason that assured that, I'm not sure. I checked that Mines Rescue, ambulance and a doctor had been advised, but all that had been done, and I took the emergency response manual that was sitting on top of the fridge in the undermanager's office or cabin and ensured that the emergency procedure was being followed and the relevant duty cards were allocated. After being satisfied that the initial response to the emergency was proper I rang Mike Walker, explained the circumstances to him. At that time I think I told him that we still had nine people missing because I hadn't been advised of the proper number, and soon after completing that phone conversation I rang Rob Regan, mine manager, informing him of the incident.

I have no further questions, Your Worship.

WARDEN: Thank you.

CROSS-EXAMINATION:

MR MORRISON: Mr Schaus, can I just ask you a couple of things about your training in the past, if I may. You mentioned that you had done various certificates of competency in New South Wales?-- That is correct.

Are they Third, Second and First class certificates?-- Yeah, they are referred to - manager, undermanager and deputy under the New South Wales Coal Mines Regulations Act.

When you did the deputy's certificate, was that in about 1985?-- To the best of my recollection I received - I sat for the three tickets in a period of about a year, year and a

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half. It would be in '85, yeah, that's correct.

What training did you undertake to get that certificate?-- There were tutorials run by technical college in Wollongong, and I attended those tutorials, and there was a deputies' course as well that was organised at Wollongong college and I attended that course. Although the course was basically a review of what I heard - or what I learned in my engineering - mining engineering training in Belgium, it made me familiar with the English terms and conditions of Australian coal mining.

With that course do you have to do some sort of assessment like an exam?-- There is an assessment for the course, yes, but the main assessment is the ticket, of course. The main assessment is the ticket, written and oral.

A written and oral examination?-- That's correct.

When you did the undermanager's certificate of competency was the assessment much the same as for the deputies or was it different?-- You are talking about the assessment?

Yes, I said assessment, I didn't really mean that. Was the training much the same or the tutorials much the same or different?-- The tutorials for the undermanager's and manager's course at that time at Wollongong college were running at the same time, so I went to the deputy's course and to the tutorials for managers and undermanagers. The subjects are the same, they just covered different subjects, have got a wider - the subject matter is deeper.

More intense?-- More intense, yeah.

Was there an assessment again for the undermanager's certificate both oral and written?-- There is a written and an oral, yes.

When you went for a mine manager's certificate of competency, what about the training for that? Was it much the same as before or more intensive again?-- Well, it took place at the same time as the undermanager's tutorial, but again the questions that the managers are asked are more in-depth.

Was that again at Wollongong?-- Wollongong.

The form of assessment there, oral and written again?-- Oral and written both by the Department of Mineral Resources.

When you had to convert your New South Wales mine manager's certificate to a Queensland one, how did you go about doing that? Was there any further training or testing done?-- At the time there was no mutual recognition act like there is now, I believe - or understand. The procedure was that having - being in possession of a New South Wales mine manager's certificate you had to sit for an oral examination in Brisbane in order to receive your Queensland mine manager's certificate.

You underwent that oral examination?-- That's correct. That oral was mainly about the legislation.

Can I just ask you to have a look at this document, please? Does this document set out your formal qualifications and the various courses you've attended?-- Yes, it does.

Is it up-to-date in terms of courses or is there anything after the ones mentioned there?-- It is up-to-date in terms of courses.

You mention there the degree of mining engineering from the University of Liege in Belgium with the greatest distinctions, does that have an equivalent in Australia to your knowledge?-- A or A plus, I don't know what - it's the highest level.

Highest level?-- Yes.

Do you have to do extra study from a normal course in order to get that?-- No, it was just my academic success, I suppose.

And the courses that you have mentioned in that document, are they all courses that have been organised by BHP or are there outside courses mentioned there as well?-- There are a few courses from when I was working at Charbon. They are the ones referring to Blue Circle Southern and Boral. The courses I went to during my employment with BHP at Moura No 2 Underground is course number 5, Introduction to Industrial Relations, I think that's an in-house run course. They might use some outside consultants, but it's an in-house course. Safety A BHP, that is an in-house course. Management Development Program, that was an in-house course as well, five days.

On the second page you mention other proficiencies. The thesis referred to there, was that something that you did as part of your degree in mining engineering?-- That's right. That's part of getting my results for my engineering degree, so that doesn't really - that belongs with my degree. The degree comes with the thesis. You can't get your degree without a thesis.

I tender that document, Your Worship.

WARDEN: Exhibit 204.

ADMITTED AND MARKED "EXHIBIT 204"

MR MORRISON: Now, can I just ask you about the period before you came to Moura? You mentioned your experience at Appin as a miner, and did you go up the ranks at Appin from miner to deputy?-- No, I stayed as a miner while working at Appin.

And at Charbon as well, you then moved up the ranks during your time at Charbon?-- That was an opportunity for promotion at Charbon. Having been in possession of a First, Second and Third Class Certificate, I was still a miner at Appin, so I took the opportunity to become a deputy shortly after at Charbon Colliery in the western district of New South Wales.

Now, in relation to Appin and Charbon, can you say anything about those mines as to whether they are recognised spon com mines?-- Appin is a gassy mine but considered to be low propensity for spontaneous combustion. Charbon is a non-gassy, no propensity for spontaneous combustion.

Now, those two mines - your experience at those two mines consists of your entire Australian experience before you came to Moura; is that right?-- That is correct.

Whilst at those two mines did you have much, if any, practical experience with spontaneous combustion and how to deal with it and so forth?-- Apart from what I learned in the tutorials and the visits I made to underground coal mines for gaining my certificates, there was no actual practical on-hand experience

with spontaneous combustion.

In so far as your Mines Rescue experience is concerned in those districts, did that have an emphasis towards spon com or was its emphasis directed elsewhere?-- As I said before in these proceedings, the emphasis in the western coalfields as far as that is concerned was at the time on rescue procedures and rescue - and breathing - use of breathing apparatus and not in the detection on how to deal with spontaneous combustion. That was at the time.

Was that, as you said, largely a product of the fact that those areas weren't, as it were, spon com susceptible areas?-- Yes, that was my understanding.

You mentioned to Mr Clair, I think, yesterday when he asked you about what you knew of the various signs of - early signs of detecting spontaneous combustion - you mentioned a smell which you have since described by a variety of names which you say you use interchangeably?-- That's because in the English literature I heard referring all smells with those different names, so to me they were all the smells.

Now, have you ever had any personal experience with such a smell?-- Not until I went - arrived at the mine and I recognised - what I do call it - bitumen smell.

That's on 8 August?-- On 8 August, yeah. That's what I would refer to as a benzene smell or tar smell, but I'm not sure if - what other people do.

You mentioned also sweating of surfaces in the mine. As at 7 August - now we are talking about your knowledge back then - did you have any understanding of how that would appear or whether it would persist?-- It's condensations on the coal surfaces of the mine, usually steel bolts and plates.

But in terms - is it a sign that you understood would come and persist or come and go?-- The haze would stay, as I understood it.

And the sweating?-- As I understood it, the sweating would stay as well.

Because you mentioned to Mr Clair yesterday that your understanding was that the smell that would be associated with a spon com is a smell that arrives and then persists?-- Yes.

I am just asking about these other signs, whether they fall into the same category because you didn't mention them specifically?-- Yes, in my opinion, before '94 they fell into the same category.

Was there any other feature of the haze, as you understood that indicator back in August last year, about its behaviour?-- Not really. I only knew there was a haze, I never experienced one, so ----

Did you have any understanding about whether it would be in

the general body, floor to ceiling, or layer or move or anything like that?-- I didn't know.

Now, of those signs we have talked about, you mentioned smell before as you hadn't had an experience with that until after this event. What about the sweating and the haze, any personal experience with those?-- No.

Now, when you were having discussions about taking up the position at Moura, did you have some discussions with a couple of representatives of BHP, Mr Sleeman and Mr O'Reagan?-- Yes, that's correct.

Did one of those gentlemen tell you something about control mechanisms employed at Moura for spon com?-- I remember having a discussion with John Sleeman before I took my position underground. It was in relation to the work model for Moura No 2 Underground and over dinner, so very informally. We were discussing the features, if I may say, of Moura No 2 Underground after being - after accepting the position basically. I hadn't started at Moura yet but I had accepted the position, and it was a briefing about the work model before I actually went to the mine. Over that meal I inquired of how the spontaneous combustion issue was controlled at Moura No 2 Underground. I realised, although I had suspected it but I wasn't sure, that the seam was liable to spontaneous combustion. I learned that at the interview. Mr Sleeman told me that the main method of control was that by design the panels were laid out in such a manner that the time it took for them to go to their limit and come out was within the incubation period.

Did you understand something from what you had said about what that incubation period was?-- At that time I don't think any period of incubation as such was mentioned. I understood that by design Moura No 2 Underground - the panels were such that they were progressing to a limit and coming out well within the incubation period.

And was the concept of an incubation period something that you knew about before that time?-- The concept of incubation period has been known to me since my studies as a mining engineer.

You mentioned a habit of yours when you were at the Moura No 2 Mine of checking the Unor in the morning when you arrived?-- That is correct.

And routinely was that the only time you checked the Unor during the day, or would you check it more often than that?-- Generally I would check it more often than that. Depending on my movement - sometimes around midday, but not all the time, and maybe before leaving, so generally speaking I looked at the Unor as a matter of course first up in the morning and at least - even if I had gone - if I had spent all day at the open-cut conference room, while I was coming back from underground I looked at it again. So, twice a day would probably be the minimum, generally speaking.

And might there be occasions that have occurred where, depending on what work you have to do first up or who wants to see you, and things like that, you wouldn't follow that routine of looking up first, but you might look at it later?-- That is correct. I'm saying that would be my routine for 90, 95 per cent of the time. I'm not saying I followed that every time.

When you got to Moura No 2, you mentioned - or it had been mentioned that it was a gassy seam with methane?-- Yes, it is.

Were you aware of that before you arrived at Moura, or did you find out while you were there?-- I suspected that Moura was gassy because while I was at Charbon, I heard about the No 4 incident, so I knew the area had gas.

Can you just tell me this - I might divert for a moment since you mentioned Charbon. When you arrived at Moura No 2 - can you make some comparison between the sort of equipment and the systems that were employed at No 2 and those that were employed at Charbon?-- They were very similar, actually. I fitted into my position as manager of No 2 quite comfortably, very quickly, because the systems of work and the equipment were very similar.

What about the systems of - I'm sorry, I will have to withdraw that. I was going to ask you about gas monitoring, but I think you said there was none at Charbon?-- There is no gas monitoring at Charbon. It is a B-class mine in accordance with the New South Wales Coal Mines Regulation Act. That means that gas has never been detected.

What about Charbon's size in terms of number employees and production compared to Moura No 2?-- Very similar. Moura had a bit more people. At the time, Charbon had 110 people, Moura at the time of the incident had 150, 160, 155, and in terms of production, Charbon was 600,000 tonnes per year and Moura was budgeted at 700,000 tonnes per year; so very comparable mines.

By industry standards, quite small mines?-- There are smaller operations. I would - I would say medium to small. There are smaller operations, but it's not a big operation.

Can you make a comment about the standard of reports - that's if you want to deal with undermanagers' reports first - those - in terms of format and their content at Moura, by comparison with those you have experienced in New South Wales?-- They would be very similar in my opinion. Had they not been similar, I would have taken steps-----

Likewise deputies' reports?-- As far as I can recollect, they were.

The standard of those reports at Moura, so far as you can see, weren't dramatically below or even substantially below standards elsewhere?-- I never perceived that, no.

Now, at either Appin or Charbon, so far as you can recall, were deputies' reports pinned up on the notice board at the start point for the men?-- At Charbon they weren't and at Appin I'm not sure, but I would say they weren't either. I don't think it is part of the legal requirements under the New South Wales Coal Mines Regulation Act. Those - the copies of the report are left in the panel - that is similar for both legislations - but as far as copies left on the surface for everyone to peruse, I would say Moura was the first mine that I worked at where that practice was adopted.

And the pinning up of those reports at the start point is expressly for the purpose of letting everyone read them?-- It is to serve that purpose, and it fulfils a requirement.

Now, can I just come back to the question of the gas at Moura? There was a methane drainage program in place when you arrived at Moura, wasn't there?-- That is correct.

And can you make some comment as to your experience - as to whether the methane drainage program was dealing with the gas problem adequately or otherwise?-- I perceived that the work that had been done before I arrived at Moura was substantial and the mine was really getting on top of its gas problem, yes. Methane drainage was well practised, and very efficiently and successfully-----

We have heard about the lengths of some of the holes dictating the panel design for 512 - 400 metre length predrainage holes?-- That's correct.

Were there plans, in fact, to take holes to a much greater length than that?-- Yeah, by the drilling of the down-hole motor - no, continuous survey tool - no - what's the name?

You are looking for the name of the-----?-- Yeah, DDM it's called.

Directional Drilling Monitor?-- That's right, sorry. It is called a Directional Drilling Monitor which means - which is a system that uses a down-hole motor in conjunction with survey equipment that gives you the positioning of that motor at any time, instead of the - instead of having to stop to do the readings and sending the survey tube down the hole.

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Were there plans to take them up to about 1,500 metres?-- I don't think we were ambitious that far initially, but before the event we had successfully drilled a hole to, I think, 560 metres, and we were planning to try them to 700 metres.

Okay. Your Worship, I am moving on to another point.

WARDEN: That's a convenient time, Mr Morrison. Adjourn till 1.30, thanks.

THE COURT ADJOURNED AT 12.28 P.M. TILL 1.30 P.M.

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THE COURT RESUMED AT 1.31 P.M.

ALBERT HUBERT SCHAUS, CONTINUING:

MR MORRISON: Mr Schaus, I was talking about methane drainage before we broke for lunch. In terms of the problems that one had to deal with at the mine, was the gas drainage a significant area to be dealt with?-- Yes, it was a very important area as the mine - the seam we were mining had a methane drainage content between 12 and 15 cubic metres per tonne and that content was remaining the same or even increasing at greater depth.

The monitoring of that gas after drainage was carried out largely by the Unor; is that correct?-- Through the ventilating current of the mine, yes.

Backed up with spot readings on Draggers?-- Methane is not measured on Draggers, on minders, yeah, by statutory officials.

And the CO itself was monitored on the Unor?-- That is correct.

And backed up by Draggers and used in the CO make calculation weekly?-- That is correct.

In relation to that system of doing a CO make weekly and graphing it, was that a system in place when you arrived at the mine?-- As far as I understood, yes. When there was no extraction taking place, when Phil handed all of the underground to me, 511 started extraction within one or two weeks after I started and a CO make graph was produced at the time as a matter of course.

During your time they were largely, if not completely, done by Allan Morieson?-- That is correct.

And with some assistance if at all from Jacques Abrahamse?-- Only if someone else couldn't enter the data in the computer like Allan Morieson did or could.

Did you see any particular need to change that system or did you see it operating fairly well?-- I perceived no need to change that system.

I just want to turn to one other matter. You mentioned some time before lunch the comment that had been made to you about the life of the extraction panels as being used as a way of coping with spontaneous combustion?-- Yes, by Mr Sleeman.

Did you ever have a figure in mind as to what the incubation period was or was there some received view at the mine as to what that might be?-- Before working at Moura I had no indication of what that incubation period was. However, after studying the mine plan it appeared to me that that period of

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time was fairly long for 402/401. The period of its extraction lasted 11 months, I believe, and there had been no concern about CO make or a heating, so I - I can't remember specifically hearing discussions about a particular incubation time, but I inferred that it would have been at least as long as the 11 months that we stayed in 401/402.

Some short time up to that time?-- Yes.

Now, in terms of the period of time in 512, we have heard that as designed it was going to be about a three month extraction period?-- That is correct.

How did that compare with other sections that were extracted? Was that fast, slow, about the normal?-- That was a lot faster than any other section. In comparison with other sections that worked - that were worked before my time I think it was fairly quick as well. The only section that was slightly shorter than 512 was the 403 section due to the small amount of coal that was extracted. All the other sections were significantly higher than the three months.

In relation to 512 and in terms of its productivity of coal extracted, how did it compare with other panels?-- We achieved the best productivity on extraction that the mine has ever achieved.

Was that achieved on development as well as extraction or only on extraction?-- It was a combination of both. The introduction of the cut and flit method improved productivity on development, and during extraction the small pillars and the short ramping system were fairly successful from a safety and productivity point of view.

In relation to the short ramping system, was that an idea of yours?-- It came about after investigating an incident involving Dave Camplin in the 4 South A area which was just the last part of 402/401 extraction. It appeared at that time that the miner driver on night shift had started grading the floor just inbye the intersection and within a distance of 30 to 35 metres had reached bottoms and then turned the miner to the right into the punch. That exposed the miner driver to a significant rib height, more or less full seam height, although he wasn't - although he was in the cabin. The cable attendant was instructed, that's Dave Camplin, to stay at the start of the ramp just at the intersection and the miner cable, as I can recall, was laid out either on the canch that was left or on the floor. The circumstances, as I recall, was that Mr Camplin wanted to warn the shuttle car driver of a possible rib failure because it was the first time the shuttle car driver had gone on that particular car after crib time, and as he was - just after telling him and as he was coming out of the cut-through that had been mined to a height of four metres, a piece of rib fell on the canch, broke down in multiple pieces and a piece of coal caught Mr Camplin's leg between the shuttle car and the - his leg got caught between the shuttle car and the piece of coal. After reviewing that incident it was decided that a few methods would be implemented. The first one was that area had been previously

mined in accordance with a rib support standard that was different to the one that we practised at the time, so Mr Walker insisted, and I agreed, that any future extraction section extracting coal in areas where rib support was not to the standard as currently practised would be resupported to that standard before the rib stripping operation was started. The main cause of the incident was perceived as being the rib height at which that cable men had been exposed. Therefore it was decided to ramp in the punch only, meaning that the miner was only allow to brush the floor up to a height of three metres in the cut-through. As he was turning the machine into the punch he would start going down into the punch reaching the full seam height at the back of the punch, the 4.7 metres. The system was carried out for the rest of that extraction and as 512 was being prepared for extraction, in the submission of 512, that's part of the Part 60 submission, I have outlined with sketches how precisely I wanted those bottoms to be taken out.

Can I just pause you there? Did you say that the ramp system was continued in 4 South A where the accident to Camplin happened?-- Yeah, we extracted coal in that area to a greater depth than the three metres coal quality allowed it, using the short ramping system then.

Was Mr Walker aware of that change in method?-- Yes, he came to the mine to investigate the accident and we had discussions about the measures that were taken. Those discussions were put down on paper by me and a letter was referred to the mines inspector. I discussed those recommendations and the changes implemented at safety meetings and there are records of that. When 512 Panel was due for extraction I basically kept the same system and updated it.

Now, after the short ramps were introduced in 4 South and utilised for the balance of extraction there, were they ever inspected by members of the Inspectorate, the balance of that panel?-- I think they were, but I'm not 100 per cent sure because I don't know if it's before or after - we had another incident that called for Mr Walker's visit, but I can't be sure if Mr Camplin was before or after. I think it was after, so I am not sure if Mr Walker came down to see the result of that system in that particular panel.

Now, at that stage when the short ramps were being used in 4 South A, did anyone suggest to you then that there might be a spontaneous combustion problem generated by the method of mining?-- No, no-one ever did.

When it was adopted in 512 did anyone suggest to you that their view was that short ramps might be conducive to or assist the problem of spon com?-- Not at all. I recall the problem that people had with the short ramping was they considered it a crime to leave that much coal behind.

When the system was used in 512, that was obviously approved by the Inspectorate?-- Yes, it was.

And that would be Mr Walker?-- Yes, he sent me a letter of

acknowledgment of having received that submission.

And the ramping system was the same as had been designed and approved by him for 4 South A?-- A modification of it. We never ramped that much in 4 South A by that method.

But essentially the same general procedure, short ramps?-- That was perceived to be the only way bottoms could be taken safely at Moura No 2 underground. Rib failures have been a source of fatality at Moura and we had a significant incident where Mr Camplin had broken tibia and fibula, and we perceived at that time that if bottoms were to be taken at Moura No 2 underground that was the only method by which those bottoms could be taken safely.

We heard, I think when Mr Clair was asking you questions, about how you had had some words with the crews when they took bottoms where they shouldn't at the start of this panel?-- That's correct.

Can you just indicate where that was, the position where they took the bottoms where they shouldn't? If you want to turn the two maps over there you will find a large plan of 512?-- When I became aware of it I think the position of the miner was at 13 cross-cut, around 4 heading.

Did you put a stop to it immediately?-- That's when I had a talk with the crew warning them that it won't be tolerated to take an extra amount of coal in addition to the maximum laid out in the extraction plan. They were to adhere to that procedure. If I realised that they were not adhering to that procedure I would take severe actions, and if I realised that I could not control them in them mining the bottom safely I would stop mining bottoms altogether.

Thereafter did they adhere to the plans?-- Yes, they did, as I recorded in my weekly inspection in the mine record book.

Can I just turn to a slightly different topic? In relation to the design of 512 we have heard that that was a consultative process effectively between yourself, Mr Mason, Mr Abrahamse and Mr Madden from ACIRL?-- That's correct.

That consultative approach, is that something that is carried over or was carried over into other areas of decision making at No 2?-- Yes, it was. The company a year earlier introduced what they called a production and engineering agreement - sorry, I'm lost for words again.

Do you want to give it in French?-- No. I think it was called a production and engineering agreement.

Whatever its name was, let's call it that for the moment?-- It was an agreement whereby a series of committees were - it's P & E Agreement, it's not production and engineering, it's - anyway. It was a system whereby a series of committees were formed dealing with safety, production, productivity, labour cost, demarcation problem, work model issues, and all those subcommittees, they had representatives from the workforce

that were elected and from management and they were to meet on a regular basis to discuss how we could improve the situation. They had to formulate action plans, outcomes were checked, and if the action - if the outcomes were actually achieved out of the action plans there was a monetary reward for the miners. It's basically enterprise bargaining. That's the principles of enterprise bargaining.

An incentive to guarantee the outcomes?-- That is correct,

and, as I said, that was not only in the air. The outcomes had to be achieved not only in the reduction of cost and increased production and productivity but in safety as well.

Now, in your experience, did those committees work well?-- They did.

And were miners represented on them - I am sorry, were those miners who were represented on them enthusiastic about their involvement?-- There were some committees that worked very well. The safety committee, for example, was achieving significant results, I believe.

Now, in terms of your own approach to decision making, how would you characterise your approach at No 2? Did you go it alone on decision making or did you involve others in the process?-- My style of management couldn't be described as being dictatorial.

Could or couldn't?-- Could not. I tend to consult. That doesn't mean that the final decision is not mine. I tried to listen to different inputs from different people. I don't see that as an abdication of my decision making, but I accept different point of views, and if they are conflicting I make up my mind and take that decision and live by it.

In terms of decisions that depend upon assessment of conditions in the mine, I take it most managers would have to rely on others to gather data for them?-- That is correct. You cannot be at the mine 24 hours a day, seven days a week, 365 days a year, so as far as evaluating the conditions of the mine, I had no trouble in relying to the miners - they brought dangers or improvement to my attention - mine deputies, shift undermanagers, undermanager-in-charge, engineers, and I was always ready to listen to them, and if they could not fix the problem at their level and they needed resources and I could help, I certainly was ready and happy to do so.

Did you perceive that anyone was in any way inhibited in approaching you in relation to decision making?-- Since I have been at Moura No 2 Underground I had an approach which you could call an open door policy. The office that I shared with George Mason was open for most of the time and on regular occurrences miners, deputies and undermanagers could come and discuss different matters. They would always be listened to. I'm not saying that we agreed with everything that came forward or we acted upon everything that came forward, but if the consensus was that it was important and there was serious concern, we would act upon it straight away.

In terms of assessing conditions under the mine, did you consider - I am talking about prior to the explosion now - did you consider that your workforce was an experienced one in terms of this mine?-- I considered that my workforce was very experienced. Contrary to a lot of other mines in central Queensland where labour goes from the newest mine to the next newest one, the workforce at Moura was very stable. I was quite surprised at that because conditions at other mines

sometimes are better pay and even environment sometimes. I felt very comfortable with that. People had been at the mine for many, many years, some people even as far back as Kianga. At safety meetings they kept handing out badges for 10, 15, 25, and I even remember 30 years of service, which showed a commitment to Moura No 2 Underground and the company that I appreciated, and I certainly took a real opportunity to talk to the people and listen to what they had to say due to their experience.

Well, in terms of getting reports from or assessing conditions under the ground - down the mine, I should say - did that experience that they had with the Moura No 2 Mine and the Moura seam play a part in the weight that you would give to their reports?-- That played a great deal to the weight I put on their report because those people had been at the mine for a lot longer than I had. At the time of the incident I was only there for 20 months, and although I knew the mine - the layout - the actual layout well, they had an in-depth knowledge of the mine that I was ready to listen to and listen to any suggestion.

Now, can I just turn to a couple of other points unrelated to that? You were asked about and shown Mr Reece Robertson's report where he reports the benzene smell?-- That's correct.

And I think you said that you didn't see that until after the incident?-- That is correct.

Can you recall the circumstances in which you did first see it?-- I can only be sure it's after the incident. The direct circumstances when it was first presented to me are not clear in my mind, but to the best of my recollection I believe it was sometime after the second explosion. I believe that it is George Mason that put that document on my table and used words like, "Look at this." He was very upset about what was in that report, and I was, of course, as well, not understanding why either of us had been aware of that report.

Had been unaware of it - not understanding why you had been unaware of it?-- Not aware I said, unaware.

Can I ask about one other thing? You mentioned to Mr Clair that at no time did Mr McCamley mention any smell to you?-- No, he did not.

When was the first time you heard a suggestion that he had encountered a smell?-- Here at this Inquiry.

Prior to the Inquiry had you had some contact with Mr McCamley?-- Yes, I had.

How did that come about?-- Mr McCamley was transferred to Crinum. He came to the mine two or three weeks before the start of the proceedings in October, to the best of my recollection, to look at some equipment we had left on the surface of Moura No 2 Underground and that was considered useful to the mine at Crinum. During that time I had opportunity to walk with Mr McCamley through the surface yard

where the pumps were, where the workshop was, and we had discussions with some members of the Rescue personnel. I remember Steve Bryon was there, Peter Rose, I don't know if Reece Robertson was there, but I spent, in all, probably an hour and a half to two hours with Mr McCamley and at no time did he make mention of him detecting a smell on the 17th, or any other date for that matter.

On that occasion was the subject of the Inquiry soon to commence, was that being talked about?-- Yes, it was only, as far as I recall, two or three weeks before. The mine inspectors were still around at that time, I think, and they were around until three weeks before the Inquiry, I think.

Even though the impending Inquiry was being discussed, McCamley didn't say anything about the smell on that occasion?-- Well, he did not mention anything to me about it. I don't know if he did to someone else.

Did he say anything to you to the effect that he had once before told you about a smell?-- He didn't mention anything about a smell at all.

Can I just ask you this general question: at any stage - if we take, say, the 2nd, Tuesday - 2 August when you were back, the 2nd - it was a Tuesday, I think?-- Yes.

Through to when the explosion happened. Did anyone suggest to you that there might be a heating in 512?-- No, no-one did.

Was it your view at any stage that there might be?-- That was never my view.

We were talking before about 512 and you were mentioning that it was, in terms of productivity, the most successful panel in the mine's history?-- That's correct.

Now, did that have some impact in your assessment of the CO in the panel, the level of the CO?-- Well, in conjunction with discussions I remember with Allan Morieson and Jacques Abrahamse, that was another factor that I considered could be related to the rate of increase of CO being higher than previous panels.

Were there a couple of particular aspects about 512 that caused you to think that in terms of the amount of coal and the rate of extraction?-- Well, at any given time we exposed more surface than previously, so I interpreted the increased level of CO as being a result of - partly a result of what happened or of what was conducted down there.

Is there anything in your training that you experienced - going back to the days of your university degree - which gave you an understanding of how coal oxidises in terms of its rate of oxidisation when first exposed to air compared with later on?-- Not really. I understand the basic phenomenon of oxidisation with the exothermic reaction and that the oxidisation reaction is increased by the increase in temperature and, therefore, goes into an avalanche effect and

that would eventually result in that exponential rise that I have been mentioning earlier.

Now, can I turn back to 512 - not so much 512 but the time around 512's development and the design for its extraction? Were you taking a particular course of action in relation to obtaining greater productivity in development as opposed to extraction?-- Yes, that's correct. I believe that with the roof conditions at Moura we could increase production and productivity significantly on development, and I approached it from a different point of view. First of all by design, I looked for the introduction of smaller pillars because the shuttle cars that we were using took a long time to wheel around the big pillars. Because of grades we couldn't use DC shuttle cars, we had to use AC shuttle cars. I was seeking new machinery as well which got approved in last year's budget. That was a continuous miner, a Fletcher bolter. The Fletcher bolter was to be used in conjunction with a cut and flit method. That is widely practised in South Africa and America, as I understand. I visited a colliery in New South Wales - Munmorah is the name - where they have been implementing a cut and flit method in conditions not so dissimilar to Moura, although they had a coal roof over there, and they achieved significant production and productivity results. So, all those features convinced me that we could increase productivity on development and rely less on extraction to make up the shortfall on development, if you wish. My long-term view for the mine - and that would be over a period of four, five years - to make it a development only mine because I perceived that whenever extraction is taking place you are widening the excavation. There are areas underground that are unsupported in first workings, it is a cyclic method, but with the cut and flit you take the cycle out and all the areas underground are bolted, so I could see safety - potential safety benefits in making it a first working mine, and I know that in New South Wales Munmorah has got first workings only, and there are lots of mines in South Africa and in the United States that are very successful, much more successful than Moura without any extraction.

Did you involve, or tell your plans, or discuss your plans about that with the Inspectorate?-- Some of those plans were discussed with Mike Walker. I believe Mike Walker knew that we were trialling the cut and flit using handheld machines, and I wanted to get rid of those handheld machines because there is a potential for injury, and he knew of the general discussions we had.

I will just ask you to have a look at a document here. I have just handed you the mine record book and a copy of one of the pages pasted into that mine record book?-- Yes.

Is that a letter from the Inspector to yourself in 1993? Sorry, a record book entry?-- It's a record book entry for 21 October '93, yes.

And in that does the Inspector refer to the fact that modifications to the development system are being investigated?-- That's correct.

And is that a report that's been put in the record book? Just look to your left and I think you will confirm that it's a copy of what's in the record book?-- It is a copy of what's in the record book, yes.

Can you just read that last paragraph that deals with that?-- "Modifications to mining systems to maximise recovery and productivity are being assessed carefully and responsibly."

Does that refer to the sort of things we have been discussing?-- Partly. That refers as well to modifications of the mining method going from two side rib stripping to the system of taking a row and leaving a row where Bernard Madden was involved with ACIRL.

And I think in fact the report mentions some involvement of Mr Madden?-- That's correct. Mike Walker came to the mine on more than one occasion when I just happened to have discussions with Bernard Madden and himself had discussions, and sometimes I think we even went underground together with Bernard -----

Now -----?-- ----- to discuss those features.

I tender a copy of that report. I think I have only had the one made, but the record book is there anyway. I will tender the copy, if I may.

WARDEN: Thank you. Exhibit 205.

ADMITTED AND MARKED "EXHIBIT 205"

MR MORRISON: You don't need that document any more. You can have that back. Were you also experimenting in relation to roadway widths as part of this modification?-- That was a project that was very much at the experimental stages. David Hill from ACIRL had been working a significant amount of his career in South Africa in a bord and pillar mine with seam height similar to Moura, although at lower depth. He brought to my attention the benefits of mining wider roadways and taking bottoms at a later stage on extraction or even on development if the rib stability allowed it. We had roadway width up to 7.5 metres at Moura which are probably one of the widest roadways in the country, as far as I'm aware. Roof conditions allow that, and we perceived that after monitoring the results of extraction in 402/402, even on development roadway width could be extended. There was a - I remember vividly a monitor that was put in the roof of 402/401 in the initial stages of taking a row and leaving a row. The dominating factor there, or the important factor was ensuring that by taking a row and leaving a row you were creating wider space and ensuring we were not caving to the C seam where we could have had gas emissions from the C seam coming into the workings.

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So, we installed a 30 metre extensometer in that goaf area. We extracted to a width of about 20 metres, and the extensometer recorded a displacement of two millimetres at two metre height and that was the only displacement it recorded. Only half the area was bolted, and we had experienced in extraction a diagonal width of up to 30 metres that were only half bolted and that stayed up. Actually, I can even refer to a section which is called the 3 South which is that section in grey over there-----

That's the one - the panel immediately outbye the main entries into 4 South?-- That's correct. I was not there at the time, but that panel had done the practice of total extraction, so there were only basic stooks that were left. That panel was driven to a major fault that had a displacement of 30 metres and I am told that the width of that panel was about 200 metres and it took 150 metres before the whole lot came down. So that gives you an idea of the competency of the roof at Moura No 2 Underground.

It is that competency that allows you to have the wide roadways?-- We had control - if we had the immediate layer, we could experience with a wider roadway. The roof was not a problem. The ribs could have been the problem, and we discussed with David Hill the monitoring system took systematically one step at a time from the 7.5 metre roadway to the 10 metre roadway and doing it in a scientific way, so we were not exposing anyone to any dangers.

Now, staying with the design aspect for a moment, if I may; when it came to 512 design, we have heard of the rows that have been called compartment pillars, with which, no doubt, you are familiar?-- That's correct.

Did you consider the impact or the effect of those compartment pillars on ventilation questions at the time of design?-- Due to the fact that our roadways are 7.5 metre wide by 2.6, 2.7 metres high, I know there is a dog leg, but I considered at the time that the shock loss due to that dog leg was not significant due to the cross-sectional area in - of the roadway. I also remind you of that prep seal I installed before extraction started and that restriction is a lot more than what these wide pillars would have created.

The impact of a prep seal, you mean?-- Yes.

So, did you consider whatever impact they would have would be minimal?-- I realised that they would have an effect on the ventilation, but not significant enough to create any problem, because we were ventilating with a lot of air in those sections.

Now, can I just touch on 17 June, for a moment, and then move away from it? We have heard that was the occasion when Mr McCamley gave you a report about his findings down below and what he had done?-- That's correct.

I don't want to go over what he said, but can you tell me when you spoke to him that day, and when he spoke to you, what was

his manner of delivery about his report?-- Nothing unusual. He just was reporting to me in a professional manner what he had observed - what he had done about it.

Didn't seem to be excited about any particular aspect, or upset or concerned or jumping up and down?-- He was not jumping up and down at that stage. He didn't look upset or excited about anything. He was behaving in a very professional manner.

Can I turn to another aspect, please, to do with safety? We have heard mentioned by a number of people about the occasions of cable damage in No 2?-- That's correct.

Did you institute a program or, at least, a procedure for dealing with cable flash incidents?-- The inspectorate and I were unhappy about the situation and we agreed that some urgent action had to be taken, so in conjunction with the inspectorate we agreed on a procedure that was to be laid down so capable flashes wouldn't just happen; we investigated after, and so on. So, we decided in December 1993, I believe - I issued a notice to all undermanagers and officials at the mine that cable flashes had to be thoroughly investigated; that mining would stop in that area; if we had nowhere else to mine, it would not make any difference; that myself, the undermanager in charge, a representative from the mechanical department, a representative from the electrical department, and usually the mine inspector himself, being Mr McMaster, or Mr Walker, would go down underground and investigate the circumstances, make up - draw up recommendations and the section would only be allowed to carry on mining until after all that was done.

Some of these cable flashes would be instances where you could just bring down another cable, take the damaged one out?-- That was what was happening before I instigated that procedure, and the section was - kept on mining while the cable flash was just removed, and we advised the inspectorate that was the procedure in place when I joined No 2 underground, but due to the numbers involved, we thought at the time that that was not appropriate anymore and some further actions had to be taken. If the cable is removed and the car goes back into action again, it is very hard to determine the cause of the cable flash.

So, production was stopped while the safety aspects were carried through to their conclusion?-- That's right. I recall instances where production was stopped over two or three shifts. That doesn't mean that it was all the time. Sometimes production was stopped only for a shift, depending on the time the cable flash occurred.

Now, was there some program that was undertaken to heighten the awareness of operators about this issue?-- Yes, at safety meetings I went through the recommendations that were drawn after each result.

Did you do these meetings yourself?-- I attend every safety meeting personally. I wanted to hear from the workforce what

they had to do and not hear it from a third party. That doesn't mean I was waiting for a safety meeting to listen to safety matters. Anyone could come at any time, but I wanted to hear personally what their concerns were, and sometimes if it was within my power to give an answer to them straightaway, I would, instead of going through the channels, and if that was not possible, then we had a system that we instigated where Joe Barraclough - where each point was never coming off the list until it was adequately dealt with. So, if a point was not completed by the next safety meeting, or not investigated, it just kept coming up, coming up until eventually it was dealt with in a satisfactory manner.

And this was tracked in document form?-- That is tracked in document form, yes.

Now, did you also take some steps to get an extra budget allocation for new trailing cables?-- That is correct. One of the reasons why we had cable failures and some cable flashes was the age of the cable. The machinery was bought in 1986, I believe, so some of those cables were eight years old, and ageing, in my opinion, had a significant - was a significant reason for the extra number of cable damage that we had; therefore, I approached Mr Brecknell, at the time mine manager, in the budget for \$100,000 to buy nine new shuttle car cables. That was allocated, and at the time of the incident I was ready to sign the order form.

Now, were there also procedures implemented in relation to the anchor points of trailing cables?-- Yes, I perceived that the problem - or one of the problems were due to back-spooling. Back-spooling in bord and pillar mining is a common occurrence, although recognised very good mining practice. I tried to formalise that system of anchoring in the cut-throughs, so at least we would only back-spool around the pillar a short distance and the cable would stay out of the wheel traction of the shuttle car. I had a further plan to modify a ratio feeder - two wheel, three cars, three ways - and that was going to be trialled in the next fortnight following the event.

You mean the August?-- It was actually outside in the workshop being modified, so we could discharge three shuttle cars on that ratio feeder. That way, in conjunction with a use of small extension cables, 50 metres maximum, we could anchor those cars at the ratio feeder and eliminate back-spooling altogether. I was intending to trial that program to see if it had an impact on cable damage and, if it had, all the sections would have been eventually set up that way.

And were there other steps being taken in relation to protection when the continuous miner was cutting across methane drainage holes?-- Yes, it was brought to my attention by a deputy that the butt of the hole - the butt of the methane drainage hole - that's where the gas was coming from - they preferred to cut it on the Trolex side, which is the miner driver side - Trolex being a device to cut electricity to the head of the machine at 1 and a half per cent and

current to the machine at 2 per cent. Due to the grade that we experienced at Moura, it is not recommended to cut uphill. Sometimes it was hard to cut uphill, so the cut-throughs had to be driven downhill. Now, depending on the angle of the panel with a full dip, because we had 4 to 5 degree angle on either side, you could not always drive the cut-through down deep and have the Trolex on the miner driver side. There was a dip miner that was out for maintenance on the surface in the workshop and I approached Dennis Evans, mine electrician, to install a Trolex head on the other side of the miner so that could be fulfilled.

Was the idea that they would have two heads?-- That's correct, they had two heads. That way it wouldn't matter which way the panel was in relation to the dip. We could cut down and have the Trolex near the butt of the hole where the gas was coming from.

Had that been done to the miner that was in 5 South on-----?-- That is correct, that miner was still and probably still is on the surface now.

Sorry, the one that was down 5 South at the time of this incident, did it have the dual monitor point?-- No, that particular miner did not have a dual monitor point at the time.

Now, we were talking about cable flashes a minute ago. Now, when you came back from your holidays, you said that you got filled in on the status of the mine by Mr Barraclough?-- That is correct.

Did you also learn, apart from the things you have mentioned before, about a reportable incident that had happened while you were away?-- Yes. I don't know if it's Joe Barraclough or George Mason that made me aware that while I was away a high tension cable plug had experienced some problem. I certainly was never aware of such an instance, and after talking with the electrical department, Dennis Evans, in his 30 years of mining experience at Moura, had never such seen such an event either, but that was reported to me and that was addressed by the time I got there.

And as you understood it, had the members of the inspectorate been out to the mine in the week before you got back?-- Yes.

Including Mr Walker?-- I believe that Mr McMaster and Mr Walker came together. I'm not sure.

And did you discover that Mr Walker had been to the mine, I think, on the 27th of July?-- That is correct, and when I was made aware that he came to the mine, although Joe Barraclough relayed to me the information that they discussed, I had a look at the entry in the record book in relation to that - to his inspection.

Now, in that week that you were back, you didn't get back on the Monday, which I think was the scheduled day to be back; is that right?-- That is correct.

Was there some problem with Airlines getting back from holidays that resulted in that?-- Well, to cut a long story short, I ended up not going overseas at the place where I was supposed to go due to airline strikes, so - I had an intention to come back on the Monday, but I landed on - at Brisbane airport on Sunday, 9 o'clock, I think, p.m.. I had the car down there in Brisbane, so it took me all of Monday to drive up to Moura.

You got back to the mine on the Tuesday?-- Yes, that's correct.

Now, you caught up with things on the Tuesday-----?-- Yes.

-----with Mr Barraclough. Did anyone raise with you at that stage - that's Barraclough, Mason, or anyone you came across - raise with you at that stage any concern at all with 512?-- No, there was no concern raised with me about 512.

The following day, the Wednesday, was the day the BHP Mitsui Board was going down the mine?-- That's correct.

In conjunction with that visit did anybody at all at the mine raise any problems at all with 512?-- No concerns about 512 were raised on that day.

When you went down there yourself to conduct members of the Board down, did you experience or see or get told of by anyone any unusual event or abnormal event, or anything untoward at all to do with 512?-- No, I was not.

Mr Clair asked you about an alarm that occurred that day at point 16 at a level just above 8 ppm?-- That's correct.

He asked you some questions about whether the fact that the CO reading was closer to nine - 8.8, I think it was in fact, whether that would have caused you any concern and I think you answered him no and you gave him some reasons why. Do you recall those questions?-- Yes.

I just want you to have a look at this document, please. It shows you the recorded values of that point. It's Volume 1 of SIMTARS. Now, you mentioned in answer to Mr Clair that when you went away on holidays, your memory of the readings roughly, that they were something like five to six parts, you said?-- That's correct.

I've opened it at page 14 of appendix 2.1.7J, but can you just turn back, please, to page 1 of that appendix just for the moment? When you went away I think was 11 July?-- That was a Monday. My last day at the mine was the Friday before that, I think.

On that first page of that schedule we see readings of five to six down that period and that's 27 July, do you see that? The first column is the date column, the fourth column is the CO column. Are you still in appendix 2.1.7J?-- No, H, sorry.

You've gone too far back. Go back to page 1 of 26, appendix 2.1.7J?-- 27 July, yes.

Do you see the CO column, readings of five to six even at that time?-- That's correct.

Now, go back to page 14 where I had you originally. I think there is a marker there?-- Yes.

If you look down that column about, point 3 on the page, you will see that alarm level that Mr Clair was talking about, 3 August 110919, 8.8 CO?-- Yes.

Mr Clair was asking you what impact that would have had on you if you had been aware of it and so forth?-- That's correct.

As you read down that column what do you notice, the next three entries?-- The next entry, so that is -----

In terms of CO?-- CO is 8.8.

Then?-- The next one is eight.

Then?-- It goes back to 7.6, 7.4, 7.5, 7.4, 7.3.

As you look down the rest of that page, is it all back in the low sevens?-- That's right, there is only three readings that are above eight, eight and above.

Turn over the next page, page 15. That takes you from about 8.26 at night on the third through to about 8.18 on the fourth, so it covers a 24-hour period approximately?-- That's

correct.

Are they all in the low sevens still?-- Yep.

If you had seen the eight parts that Mr Clair was talking about, an alarm at that level, and then within half an hour it had gone back to the low sevens, would that have had some impact on the way you assessed the significance or otherwise of the eight parts?-- It would have had because I keep on eye on the Unor, but if the value goes down there are a number of reasons why that could be.

Equally a number of reasons why the value might go up temporarily?-- That's right.

If we know from records that on that day, that is 3 August, there were not only the miner charged with changing the toilets over, taking a PJB down into the section, but also some gentlemen working on oil drums and oil sampling talking PJBs down into the section, do you think that might account for a temporary rise in CO, a couple of PJBs being down there?-- I think that if a couple of PJBs went down there or if there was an Eimco that could account for that rise just through normal emission - engine emissions.

Just have a look at this document, please. This is underground shift report for 3 August 1994, day shift. If we look down in the comments section do we see that Mr Kelly went down?-- That's correct.

He would use a PJB, wouldn't he?-- He would.

If we look further down we see Mr Bentham was conducting some Century Oil reps underground to do oil samples?-- Yes.

They would use a PJB too, wouldn't they?-- Yes, they would.

If you look down on the very bottom left-hand column we see personnel allocated to transport, there is a Mr Robson allocated there, bottom left-hand corner of the report?-- Yes.

He would have a PJB too?-- Yes.

So any one of those things could account for a temporary bump up in CO, couldn't it?-- Yes, even some cleaning up - I don't know if it was conducted on this day, but some cleaning up of the ratio feeder by the Eimco could have an impact as well, of that nature.

Whether or not -----?-- For that length of time.

Whether or not it's a good or a bad practice, in your experience is it the fact that sometimes people like that leave the PJBs running while they are doing their work?-- That could happen, yes.

I tender that underground shift report day shift, 3 August 1994.

XXN: MR MORRISON

WIT: SCHAUS A H

WARDEN: Exhibit 206.

ADMITTED AND MARKED "EXHIBIT 206"

MR MORRISON: That's on the Wednesday. When you were down with the Board, who was the deputy on shift that day; do you recall? I think we see it's Mr Moody?-- It could be.

From that shift report we were just looking at, without showing it to you again, 512 personnel, K Moody seems to be the deputy. Now, did Mr Moody raise any problems about 512 with you on that occasion, that's on the Wednesday when you had the Board down?-- No, he never did. I was underground for at least half an hour there with the two parties.

On the following day which is Thursday the 4th, can you say whether or not you have any particular memory of following your usual practice about checking the Unor screen?-- Like I said, that practice would be followed, you know, 90, 95 per cent of the time.

Was there anything you saw or experienced on the Thursday or anything anyone said to you that they had seen or experienced on the Thursday that suggested any problem with 512?-- I never heard anything about a problem in 512 for the Thursday.

On the Friday, 5 August?-- Yes.

Does the same position apply?-- Yes, I was underground in 512 for half an hour, three quarters of an hour or so, and no-one said anything to me, or for that matter in any other section, or on that day.

On that occasion of inspection I think you told the Inquiry you went down on the belt road to almost 3 cross-cut?-- Well, that's how I recollect, but since then I've been sitting through these proceedings and I am aware - I've heard a number of people saying - and that's Mr Mason and Mr McCrohon, that they went in No 2 heading to 3 cross-cut. Now, that could well be the case. My perception at the time was that it was the belt road they went to 3 cross-cut, but it is quite probable that they went in No 2 heading to 3 cross-cut, that I was told that, but I had in my mind it was the belt road.

We are talking about two different things. I am talking about your inspection on the Friday, your own inspection on the Friday?-- Sorry. My inspection, yeah. Sorry, I got confused there. I was talking about -----

Yours was down the belt road?-- Yes, on the Sunday - on the Saturday by Mr Mason, yes, sorry, didn't concentrate. I went to - only went down to 2 cross-cut in the belt road and Phil Shorten was following me not very far behind walking in the centre of the roadway because of the ribs and the widths

XXN: MR MORRISON

WIT: SCHAUS A H

involved.

I take it you didn't go further in because of the danger in the goaf?-- I wouldn't advise anyone to go further in.

Did you have a good look around?-- Yes, I had.

Was there anything inhibiting your view into the goaf or your experience of the goaf condition?-- I specifically had a look with Phil Shorten to see if we could see the roof fall that I was told occurred before we entered the section. So I had a good look around, not just - you know, it's all right - and there was nothing there, and at the time no-one else saw anything either, otherwise I guess they would have brought it to my attention.

Certainly no-one said anything?-- No one said anything and I didn't see anything.

So when you left the mine on Friday, when you went to go home on Friday, did you think that there was anything wrong with 512 or any problem?-- I had no reason to believe that there was anything wrong in 512 when I left on Friday.

At that stage I think you said in answer to Mr Clair, that your anticipation was that the panel would be sealed over the weekend?-- That's correct, but I never communicated that to Mr Mason.

No, but that was your expectation?-- That is in line with what had happened on previous sealings.

You say that was in line with what had happened in other panels. You were asked by Mr Clair about the notation you had made in the record book about the panel being sealed as soon as possible, I think in brackets "possibly this weekend" or "this weekend" or something?-- Yes.

You had in fact made notations of that sort before, hadn't you, in the record book, about other panels?-- I can't recall if I made those notations before, but I just meant that it was going to follow good mining practice.

Let me just show you one for 16 April 1993 in relation to the 511 section. Do you see that?-- Yes.

What does it say?-- "511 section completed. Preparing for sealing. Starting this weekend as soon as the equipment left in section is recovered." That last statement is between brackets.

That's in accordance with normal procedure, panels finished, equipment out, panel sealed as soon as possible?-- Yes, and that appears even to be the way I always say it.

Can you turn over to the entry for 20 May 1993? I think it should have a marker on it?-- Yes.

Bottom of the page in relation to 403?-- 403, "No mining

taking place. .2 per cent CH4 at goaf edge. Panel will be completed tomorrow and sealed soon after all equipment is removed."

That again, just in accordance with normal practice?-- That was my understanding of what was happening at Moura No 2 underground.

Certainly comments by you in the record book about the panel being sealed either as soon as possible or soon after equipment is out, very much standard?-- Yes, that is so.

Now, can I take you to a slightly different point, if I may? On Saturday when you had the phone call from Mr Mason, gone through what you were told by Mr Mason and how Mr Mason informed you that he had gone to the mine?-- That's correct.

And conducted an inspection?-- Yes.

And that that inspection was together with George McCrohon?--

Yes.

And gave you the results of that inspection over the phone?--
That is correct.

Now, what did Mr Mason say about the smell? He mentioned earlier in the list of events Caddell had got a smell on Friday. Did he say anything about his detection or otherwise of a smell?-- No, he was quite positive. He said that he and George McCrohon didn't detect any smell or see any haze during their inspection at around 5 p.m. that Saturday afternoon.

And did he also tell you the opinion that he had come to?-- Yes, and he reinforced that he was in agreement with George McCrohon about that opinion. I think I might have asked him what George McCrohon thought, but, anyway, he volunteered that even before I asked him probably. I understood that both were in agreement, that it wasn't one saying, "Oh, maybe.", or-----

Both of them had concluded the same thing?-- Both of them had concluded - had come to the same conclusion that there was nothing untowards.

And whatever you felt about or reacted to in terms of Mr Mason's opinion, did you draw any comfort from the fact that another experienced person had also reached the same conclusion?-- Well, I knew that Mr McCrohon had been working at Moura No 2 Underground for an extensive period of time and I would weigh heavily his opinion, especially when it's in conjunction with my undermanager-in-charge that has been at the mine for a long time as well.

Did Mr Mason say anything about whether he would stay on or not that night?-- I understood that he was staying on until the sealing was completed. I don't know if he said so much in so many words, but that was my understanding after I asked him how long it was going to last - to take, sorry.

And I think you mentioned to Mr Clair that Mr Mason told you that George McCrohon had taken a CO reading of 7 parts in the return?-- I'm not sure. I cannot recall who took the reading in the return. I just can recall that a reading in the return was taken and it was 7 ppm. I cannot recall who took it.

Did you at the time make any assessment of what that parts reading meant in terms of your knowledge of what the level was on the Friday?-- Well, I drew a lot of comfort from the fact that it appeared even 1 ppm lower than what I recalled on the Friday.

In terms of what Mr Mason told you about Caddell's reading, he mentioned that Caddell had got a smell. Did he also mention to you anything about Caddell getting a CO reading?-- Yes.

Did you hear anything about where that was?-- The way it was conveyed to me I understood that it was taken in the cross-cut.

I think you said it was 7 or 8 cross-cut?-- Yeah. I cannot - at the time of my statement and still now, to me it's 7 or 8 cross-cut. I've got no better definition than that.

All right. Now, did it make any difference in your mind that it was described as having been taken in a cross-cut as opposed to a return?-- Well, you could expect a slightly higher value of CO in the cross-cut due to the reduced velocity, if there was any. I don't know if there was a door through that cross-cut or not, but you would expect where he was taking it there would be a door. I don't know, I am only surmising here, but if there is a velocity - if there is an air flow, you could expect a slight increase in parts per million. That was my opinion at the time anyway.

Now, when you were having that discussion Mr Mason told you about how they couldn't get in the top return because the baskets were up on - where the seal was being constructed?-- Yeah, I recall him saying that the baskets prevented access in that top return.

Consistent with what you told us earlier - remember I asked you some questions about whether your understanding at that time was if you got a smell from a heating, the smell would stay; that a haze, it would stay too - persist?-- Well, that was my understanding prior to the incident, yes.

I am talking about your understanding back then, not now. If there was a smell from a heating or a haze from a heating, would you have expected it to be there and stay there?-- Yes, and if there had been a heating since Friday I would have expected it to be registering some parts per million in the return.

And did you see any such registration that caused you to think that?-- Well, the parts per million on the Drager, as I understood, on the Saturday was even one lower than what I recalled reading on the Unor on the Friday.

Now, did Mr Mason say anything to you about his view of the sealing in terms of bringing it forward or the necessity for it to be brought forward?-- Yes. What he conveyed to me was that he went along with the sealing because Michael had started the arrangements of the sealing, but he - I think he might have even used the word, you know, "It's an overkill." I'm not sure that he used those words, but in his opinion it was - he conveyed to me that he really thought that the sealing wasn't required and he just went along with it because Michael had started the arrangements, and he was a bit annoyed of having to stay at the mine actually because he felt it was not necessary.

Did he mention anything to you about Len Graham's inspections and view?-- I cannot recall any mention of Lenny Graham by George in that phone conversation.

Now, can I move then to the Sunday when you were out at the mine for not an extensive period, somewhere between 3, I think

you said, and 3.40 or 3.45?-- I think I arrived around three because it was a change of shift, so it's plus or minus 15 minutes at the most.

All right?-- And I would have stayed there for 30, 45 minutes - probably 45 minutes.

Now, you had a conversation with Mr Squires that afternoon?-- That's correct.

And he told you a number of things about what he was doing?-- Yes.

Did he tell you anything about whether he was keeping a watch on the CO readings?-- That was my clear understanding, that Mr Squires was keeping a close watch on the CO reading, because he was able to tell me the figure that I now cannot recall of CO per hour and methane per hour, so that indicated to me that he was keeping a very close watch in regards to the CO and CH4 in order to assess how the situation was evolving, if there was anything.

We have heard from Mr Squires that his memory is that he told you something like 6 or 7 ppm CO per hour. Does that ring a bell with you?-- At the time I made my statement to the Inspectorate I could not recall, but it was around those figures, yeah.

Now, at the time you spoke to Mr Squires did he exhibit to you anything that would indicate he was himself concerned over what was happening in 512?-- Not at all.

Did you ask him his opinion of the situation or did he proffer it?-- I cannot recall asking him his opinion of the situation. I cannot recall him telling me his opinion of the situation, but I'm sure that if he was worried he had the opportunity to say so.

Was there anything you saw in terms of the readings on the CO - on the Unor screen that afternoon that caused you to think in any way there was a problem in 512?-- At that point in time, no.

And did you have any reason to think that Mr Mason had changed his mind at that time?-- I didn't know - I better correct that. I think that Michael told me about a phone conversation he had with George afterwards but not the detail, but I understood that he had got in touch with George, and I certainly clearly understood that George was of the same opinion that he was and I was.

And that was?-- That was there was no cause for concern.

If you had had the slightest thought that there was a problem down in 512, would you have let men down?-- Of course not.

Now, in terms of the discussion that we have heard about and the question that might have arisen, namely, men wanting not to go down when in fact the undermanager was satisfied the

mine was safe, in terms of that sort of disagreement on a safety issue, what is your attitude about that? I am talking about your attitude you had back then in August 1994. Is that the sort of thing on which there should be disagreement?-- I still hold the same attitude now. I feel very uncomfortable about disagreement over safety attitude. I know it does happen throughout the industry. I feel sad that it does. I've never personally been fronted with such a situation in my career in Australia, but had there been such a disagreement I wouldn't have sort of laid it to rest. It's something I cannot really come to grasp with. If we, as management, believe the place is safe, and even if it's only one or two that feel strongly enough about not going underground and advising others not to go, even if some of the workforce thought that that particular person was a wimp or something and went underground but that particular person didn't want to go, that would get me to rethink my position.

It's something that really people should all be of one view on, isn't it?-- I think so, yes. If someone feels so strongly about not going underground, I would feel very comfortable - uncomfortable to let the men go and go myself. It would depend on the circumstances and his knowledge and involvement and background - of course, if he knew nothing about the issue at stake - but I can't see how that would happen.

In terms of knowing something about background, you were asked some questions about whether individual miners would know about Mr Caddell's smell or individual miners would know about something else. In your experience, did the miners check the Unor system themselves?-- Some miners do, some miners don't, but as I said to Mr Clair, when a panel had been sealed and when it was going through the explosive range, the perception and the view I held, and still hold, is that not necessarily all people but a significant amount of the workforce would know about it because it was a subject of conversation on the surface. So, there might be, I don't know, 2 or 3 or 4 per cent maybe that were in there at the time and went underground without knowing because they had no interest, they just grabbed their lamp and went underground, but then they probably would hear about it while underground.

We know that one of the miners at the mine on Sunday and underground conducting all sorts of tests was Mr Caddell himself?-- Yes.

The man who had got the tar smell on the Friday?-- Yes.

Well, could you imagine him not mentioning that to other people?-- I don't know. That's a question you have to ask Mr Caddell. It really depends on his perception of the signs. I cannot speak for Mr Caddell.

Right. In your experience, when a panel is sealed is there a topic of conversation that assumes more prominence amongst the miners, namely the seals?-- The fact that the seals are erected and that the gases are going up, I believe that a significant part of the workforce is aware of that. I'm not saying they all do take that into account but.

Is it a topic of conversation amongst miners after seals?-- Yes, but I - I honestly think that not all of them understand it either.

Your Worship, I'm going to move to a different point now and I'm not going to finish in 15 minutes, I suspect.

WARDEN: It might be a convenient time, if that's the case, rather than break it up. Thank you, gentlemen. Could we adjourn till Monday, 11 a.m.? Thank you.

THE COURT ADJOURNED AT 3.02 P.M. TILL 11 A.M. MONDAY, 13 MARCH 1995

WARDEN'S COURT

MR F W WINDRIDGE, Warden and Coroner
MR R J PARKIN, General Manager, Capricorn Coal Pty Ltd
MR P J NEILSON, District Secretary, United Mine Workers' Union
MR C ELLICOTT, Training and Development Officer, Department of
Mineral Resources, New South Wales
PROF F F ROXBOROUGH, Professor of Mining Engineering, School
of Mines, University of New South Wales

IN THE MATTER OF A CORONIAL INQUIRY IN CONJUNCTION WITH
AN INQUIRY (PURSUANT TO SECTION 74 OF THE COAL MINING
ACT 1925) INTO THE NATURE AND CAUSE OF AN ACCIDENT AT
MOURA UNDERGROUND MINE NO 2 ON SUNDAY-MONDAY, 7-8 AUGUST
1994

GLADSTONE

..DATE 13/03/95

..DAY 42

THE COURT RESUMED AT 10.59 A.M.

ALBERT HUBERT SCHAUS, CONTINUING:

WARDEN: Witness, you are still under the former oath you took some days ago; do you understand that?-- Yes, I do.

You are still regarded as being bound by that oath, thank you.

MR MORRISON: Mr Schaus, can I just ask you - take you to one point that's mentioned in your statement? I think it is right at the end. You mention the use of a chromatograph to analyse samples from behind seals?-- Yes.

I will just try and pick it up. You say it was for a special project that that was done?-- Yes, the Brisbane office asked me if I could organise samples to be taken behind sealed areas of Moura No 2 underground and Moura No 4 underground to estimate the gas content behind those seals.

And was that in about September 1993?-- It would have been around that time, yes.

And do you say it was a special project, so it wasn't the normal thing - this was a one-off?-- It was a one-off, yeah.

Did you get the results?-- Yes, I got rescue personnel to collect samples. I believe there were three goafs in No 2 and three goafs in No 4.

All right. Did you send the sample - fax the samples off to Brisbane?-- We put them through the chromatograph and sent them to Brisbane.

It was Brisbane who requested them in the first place?-- That's correct, yes.

One last thing: can I ask you about the use of the Tecrete seals which we have seen from - heard about from time to time? What were the advantages that you perceived in the use of the Tecrete seals?-- I perceived a few advantages. After Tecrete got in touch with me, I was quite keen in trialling them and see if those advantages would have actually come of age. The first advantage was - it is not in order of importance - but one of the advantages I saw was the speed of the erection of those seals. I think that with proper training and with all equipment being available, potentially those seals could be erected faster than the brick seals. Their strength was an advantage that I perceived as well. They are a monolithic structure and therefore they are a lot less likely to leak within the structure.

Now, if you compare them to brick seals-----?-- They used to leak between bricks, you know, due to the cement.

Bricks have mortar?-- Mortar between - you have got mortar between the brick seals and you could find leakages through these joints. The third advantage that I saw is their anchorage into the site. Standard brick seals were basically wedged into a trench that was dug out on the ribs and on the floor. Those seals - to construct those seals we dug out the same trench, but in addition to that, there were roof bolts that anchored the whole seal into the ribs, the roof and the floor. I think in all there were two on each side of the rib, three or four on the floor, and the same number on the roof.

And in terms of the risk of injury to men, did you perceive some advantage there?-- Yes, those blocks were fairly heavy to handle and awkward, and I saw some advantages in reducing the number of injuries relating to carrying and manoeuvring those blocks around, because Tecrete technology used 20 kilo bags, if I recall it right, and in batchers, so the product itself was actually being pumped into the relevant area and the batcher could be somewhere else handy to the delivery of the material.

Was there some advantage in terms of preparation of Tecrete mesh sheets for very fast sealings?-- Yes, and that would have actually been one of the main reasons why I choose to go that way. I perceived, since I had been at Moura No 2 underground, that the brick seals, although complying with the legal requirement, were always going to be a very difficult task in an emergency to complete those seals within the three hours as required by the legislation.

That's a brick seal?-- Brick seals, yeah. Using that type of Tecrete seal I saw an opportunity to reduce that time substantially. By that I mean that you could construct the seal and leave a doorway of minimum size for machinery which was about four metres wide and 2.4 metre high maximum. In case of an emergency, the Tecrete sheet that we used - that's a standard material to build Tecrete stoppings - could be tacked on to the frame of that door and sprayed. We have never had to do that, but in case of an emergency, I evaluate that that could have been done within one or two hours at the most; that's the tacking of the sheet and the spraying to make it air tight, which is what the legislation requires.

That wouldn't be a final seal as we have been discussing it; it would be a temporary seal?-- That's correct, that would only be to make it air tight as the legislation requires. After it would have gone through the explosive range, we would have still - we could still put - either build another seal or put the mesh baskets in it.

Were some of these Tecrete sheets prepared and kept down at the seal sites?-- That is correct. But I would like to add that for the next panel, which was 4 South level, the extraction time was going to be significantly longer than for the 512 area and I had decided to get steel doors prefabricated and hinged to the roof; therefore, in case of an emergency, those steel doors could have been dropped in place and just the edges being sealed with Tecrete, so that would have again fastened or quickened the whole process.

The idea was to have an actual seal door hinged to the roof so it could drop down instantly?-- That's correct, so you didn't even have to use the Tecrete sheet mesh then. The door was there and you only had to seal the edges of the door.

Did you actually get to a stage of trialling that door, or was it simply in planning stage?-- The seals were being built and I was - within the next three or four weeks after the incident I would have asked the mechanical department to build me those doors as required.

In relation to the use of Tecrete for the seals, did Mr Walker have some involvement in that, or knowledge of it, that you are aware of?-- I can't recall approaching Mr Walker specifically about the use of those seals, but I am aware that on more than one occasion we drove past those seals, and towards the end of the life of the panel, we walked past those seals. So, Mr Walker would be aware of those seals. I think I might have mentioned why I wanted to use them to Mr Walker, but that's as much as I can recall.

To your knowledge, is Tecrete used for seals in another places in Moura?-- I was told by the representative from Tecrete that that material was used in New South Wales and it was used, as well, in hard rock mining as bulk heads.

I have nothing further, Your Worship.

CROSS-EXAMINATION:

MR MacSPORRAN: Mr Schaus, is it the case that your background before coming to Queensland in mines was in areas that were not liable to spontaneous combustion?-- That is correct.

Was Moura No 2 the first such mine you had been involved with where the risk was substantial?-- That is correct.

Before you came to Moura, you had some knowledge of the concept, at least, of CO make; is that so?-- As I explained before, yes.

But that knowledge, at that stage, did not extend to an awareness that such a - such an item - CO make - could be used as a tool to control spontaneous combustion?-- Well, I understood that it could be used as a tool to control spontaneous combustion, but I was not aware of the limits until I came to Moura No 2 underground where I learned about the limits.

Was Moura No 2 the first one where they had in place a monitoring system that monitored constantly for CO make?-- As far as I'm aware, yeah, that's the first mine I worked at where such a tool was used.

And you were aware of that when you took over at No 2, obviously?-- I became aware of that when we extracted 511, which was the first lifting section that-----

And when was that in terms of when you took over in December 1992?-- Within two or three weeks after I started.

And you have told us, I think, about a two day period you had with Mr Reed, the previous manager, when you took over?-- That's correct.

And that was no doubt to familiarise yourself with various aspects of your responsibilities and managing No 2?-- Yes, but I would like to add that's usually not the case. It just happened that Mr Reed was still on site doing another job, otherwise it is very rare when the oncoming manager meets the outgoing manager, in my opinion.

In your experience, it has been rare that that happens?-- Yes.

On this occasion, though, it did happen?-- That's correct.

And you spent two full days with Mr Reed during that change-over period?-- That's correct.

And you think it was then that he mentioned to you something about a figure of 12 lpm in relation to CO make?-- That's correct.

And the level of significance?-- That's the best that I can recall.

In what context can you tell us did that conversation arise? How did you come to be talking about CO make, litres per minute and levels of it?-- It is very hard for me to really recall the circumstances of that conversation because it happened three years ago, but to the best of my recollection it happened somewhere in that instrument room while Mr Reed was showing me the Unor, the gas chromatograph, and he then mentioned the 12 lpm. It was not as a result of a question that I asked.

Now, at that stage, that is the time at which you were inside the Unor room, you were aware that Moura was an area liable to spon com?-- I became aware that Moura was an area liable to spon com at my interview and before I took the actual position when I talked to John Sleeman about it, yes.

I think you said that was over dinner one night?-- That's correct.

And was it explained to you that there had, in fact, been a heating at No 2?-- No, at that time I didn't know there had been a heating at No 2.

Were you aware at that time of the Kianga incident in 1975?-- Through my tutorials at technical college in Wollongong I was aware of some of the circumstances at Kianga, yes.

Did you update that knowledge when you came to Moura - that is, the knowledge about Kianga?-- No, I did not, as I was - while I was at Moura. Kianga is fairly south of that lease.

Have you ever read the Kianga Inquiry report?-- I've read the Kianga Inquiry report after 7 August 1994.

Did you know before 7 August and when you came to Moura that Kianga had involved a heating and loss of life during a sealing process?-- I understood the circumstances of Kianga in broad terms, yes.

And did those broad terms include that there had been a heating at Kianga?-- Yes.

And that the loss of life had occurred when men were underground sealing or in the process of sealing when the explosion occurred?-- I'm not sure if I recall those specifics, but I knew there was loss of life. I'm not sure if at the time I knew they were actually sealing Kianga.

And you understood that at No 2 the main tool for monitoring and detecting spon com was CO make?-- I understood that was one of the tools; not necessarily the main tool.

Did you have any perception of some tool being more significant than another for monitoring and detection of spon com?-- In my opinion, because CO make was only read once a week, the Unor, as I saw it, was the main tool to control spontaneous combustion. That was my perception.

That's when you first took over at No 2?-- That's correct.

Did that perception change at all at any stage?-- Not really.

When you say "the Unor", do you mean parts per million CO?-- That's correct.

But you have conceded, I think, that CO make is a more accurate and reliable way of determining the presence of a heating; is that so?-- Yes, CO make takes into account the ventilation for the section, so it gives a more complete picture in that sense.

Because if your ventilation is fluctuating, you can't simply rely upon the Unor picking up parts per million and telling a story, can you?-- It depends a lot on the fluctuation of ventilation in the panel.

But the fluctuations in ventilation will be reflected potentially in the parts per million?-- That's what I would expect, yes.

And that's the advantage of CO make, because it takes into account such variables?-- That is correct.

So that you can compare from whenever you take such a - or make a calculation of the CO make, you can compare one

situation with another quite accurately?-- That's correct.

Because you are using the figure of make as opposed to parts per million?-- Yes, but I believe parts per million still gives you a good picture as well, although less complete than the make.

The picture given to you by the parts per million would only be worthwhile if you took into account what the ventilation was doing, is that so, otherwise it can be completely misleading?-- I don't think I disagree with your premise that parts per million can be completely misleading. It is less accurate, but I do not believe that it is completely misleading.

Well, Mr Reed told you in the Unor room, you think, about 12 lpm in relation to make?-- That's the best I recollect, yes.

And that level was related to you as being the level where you would perhaps have some concerns and more vigilantly monitor the situation?-- Are you talking about concerns? I never said I perceived that there were concerns. I perceived the need to be vigilant above 12. That was my understanding.

Well, what were you told - or what did you think at that time would be a level where you might have some concerns if it wasn't at 12 lpm?-- To answer that question, in all honesty, I didn't ask myself that question prior to 7 August 1994.

It didn't occur to you that if 12 was a level related to you as being the level requiring more vigilant monitoring, that there must be a level above 12 where you would have to take some positive action?-- I was not aware of the existence of such a level, and prior to 7 August 1994 I hadn't asked myself that question.

Mr Schaus, how, as manager at No 2, did you expect to monitor for spon com if you didn't have in mind figures of CO make that were relevant?-- Through the change of levels of parts per million or CO make.

Which was to, I suppose, coin the phrase, the old technology - the old system of looking at parts per million; is that so?-- All my formal education has been in the old system, yes, and I probably come back to that-----

Still?-- Well, prior to 7 August, yes.

Even though you were aware that CO make had been introduced as a better tool for monitoring the situation?-- It gave you another dimension, but as I said to you before, I do not think that CO make, as I perceived it, could rise exponentially without parts per million not changing, because the ventilation in the section could not account for that alone.

You say that you weren't aware before 7 August of the levels of CO make that would cause concern; is that so?-- I was not aware of 10 and 20, no, that have been mentioned here.

When did you become aware of that?-- After the incident when - I don't recall exactly who, but someone in my staff gave me a photocopy of the - I believe Mackenzie-Wood literature.

And was that a photocopy from the first edition of that book, do you know?-- I don't know if it was a photocopy of the first edition or the second edition.

Were you given that at the mine?-- Yes.

But you can't recall who it was that gave you the photocopy?-- I believe it was in the engineers' office, but there were a few people around, but I cannot recall exactly who gave me that photocopy now.

You say that's the first you knew of the figures of 10 and perhaps more particularly 20 lpm as being parameters for CO make?-- That is correct.

Were they the parameters for German coal?-- As I read it in that photocopy, yes.

Do you recall making the statement to the inspectorate; in particular, Mr Walker?-- That's correct.

And you have that in front of you, I think?-- Yes.

Can you turn to page 11 of that statement? Do you see the second paragraph? There is this question: "Can you explain your interpretation of the CO make trend for the 512 panel?"?-- Yes.

That was a question asked of you by Mr Walker?-- Yes.

You replied, "I understand that, according to standards developed for German coal, a CO make of 12 lpm requires vigilant monitoring."?-- Yes.

You then go on the rest of that page to talk about the conditions inside 512; is that so? I don't need to take you to that, but you can see that there?-- Yes.

The last paragraph, "The rate of increase in the CO make in 512 was higher than that in previous panels that I have been involved with at Moura because of the mining method employed at the time."; is that so?-- Yes.

And then - this is on page 12, now, about the middle of the page - there is a question to you by Mr Walker: "Accepting that a consistent trend in the CO make graph may indicate a problem does not exist, at what point, in terms of the absolute value of the CO make, would you consider that a problem may exist?" Do you remember that question?-- Yes.

You reply, "At above 20 lpm the absolute value of the CO make would have taken on more importance in my mind than the CO make trend."?-- Yes, but I mentioned to Mr Clair already that that value of 20 lpm would have been contaminated by that

reading I had done after the incident and before that question was asked.

Well, do you agree that your response that I've just read to you - and that is this: "At above 20 lpm the absolute value of the CO make would have taken on more importance in my mind than the CO make trend."-----?-- That is what I said at the time, yes.

And do you agree that that seems to be referring, as you say it, to before the incident - that is, that the level of 20 would have taken on more significance?-- You haven't been listening to what I've been saying. I said to you that I hadn't turned my mind as to that question before the incident. If you read the question from Mr Walker, it says, "Accepting that a consistent trend in the CO make graph may indicate that a problem does not exist, at what point, in terms of the absolute value of the CO make, would you consider that a problem may exist?" I have said to you before and I keep saying to you that I did not ask myself that question prior to the incident. When Mr Walker asked me that question, I gave him an answer, but that was after the incident and after having read Mackenzie-Wood.

But you expressed yourself in a way to indicate that would have been your thought at the time - it would have taken on more significance?-- You might perceive it that way, but that's not the way it was.

There was no confusion, was there, at the time of the interview with Mr Walker?-- Confusion about what?

About anything? Was there any confusion in the way you - the questions asked of you - any confusion about whether you understood what you were being asked, any confusion about the way you expressed yourself to Mr Walker?-- I can only tell you what I knew before and what I knew after and that 20 lpm comes from the reading I had done after.

Well, the bottom of that page, the last paragraph, you talk about, "Between 12 and 20 lpm CO make I keep the absolute value in mind but examine the trend carefully while at values above 20 CO lpm I would keep the trend in mind while watching very closely the increase in value. In all this analysis, I also include the incubation period as an important factor."?-- That's what I said.

Do you say that that information you are relating there was contaminated by things you had read after the explosion?-- That's what I'm saying, yes.

Page 13, top of the page, the question: "How do those factors relate to 512?", and your response was this, wasn't it: "Considering the short time it took to complete second working of 512 in conjunction with the consistent trend in the CO make and the absolute CO make value being less than 20 lpm I did not consider that any unsafe condition was present in 512." They are your words?-- Yes, they are.

You say you did not consider - you "did not" - not "you do not" - you did not consider that any unsafe condition was present in 512?-- I did not consider that unsafe conditions were present in 512, that's correct, but before the incident I did not refer myself to 20 lpm because I didn't know about it.

Well, your answer there, though, you see, suggests that you did know about it, doesn't it?-- You might read it that way.

That's how it reads, isn't it?-- You might read it that way, I agree. I am only here to tell you the truth.

But you agree that what you said to Mr Walker in that response - the way it reads - the way you said it - indicates a knowledge you had of the figure of 20 lpm before the event?-- You could say that. You might read it that way. I understand what you are saying.

After the interview, you received a copy of the statement, I take it?-- Yes, I did.

And during the interview, you had a legal representative of your choice with you?-- Yes, I did.

I take it before you signed the statement, you read through it and satisfied yourself it was true and correct?-- That's correct.

And there was no alteration apparently to that response by you before you signed the document?-- No, there was not.

Can you explain why there wouldn't have been?-- I couldn't see the point in changing what I said.

Mr Schaus, it's a fairly significant matter, isn't it -----?--
Yes, it is.

----- your knowledge of the level at which you would become
concerned about a CO make; is that right?-- Yes.

In the statement which records the interview you had with
Mr Walker you were saying that at the time, that is before the
explosion, you were aware of a figure of 20 lpm?-- I did not
say that. It doesn't say that.

That's how it reads?-- You might say that's how it reads, but
I didn't say that.

Well, are you saying you didn't say what's typed there or you
didn't mean to say that?-- What is typed there can be read -
and I can understand - as I knew of the 20 lpm and I'm telling
you where that 20 lpm comes from.

Well, are you saying Mr Reed didn't mention anything about
levels of CO make other than 12?-- Well, I cannot recall him
mentioning another level than 12.

As far as you can now recall you didn't inquire of anyone or
do any research yourself to ascertain anything about levels of
CO make where you would need to be concerned?-- I usually
don't inquire about some parameters that I do not know exist.

Well, isn't that the very point, that you want to find out all
about CO make if it was the tool being used at your mine?--
At the time prior to the explosion I had no reason to believe
that my level of knowledge of CO make would be any different
from anyone at the underground.

Were you made aware when you changed over with Mr Reed in 1992
that he himself had been taking a personal interest in CO make
at No 2?-- No.

That didn't arise in conversation at all as far as you can
recall?-- What do you mean by - can you repeat that question,
please?

Well, as I understand what you are saying the only mention of
CO make by Mr Reed was this figure of 12 lpm as requiring
vigilant monitoring?-- Yes.

But there was nothing else said about the significance of CO
make and the way it could be used by Mr Reed to you?-- At
that time I cannot recall anything else, no.

At any time before the explosion?-- No.

And you took no steps yourself to increase your knowledge of
the topic?-- Yes, I did.

What did you do?-- I talked to Mr Sleeman, I talked to people
at the mine, Mr Morieson, Mr Abrahamse, Mr George Mason. I
went through some literature that was in Phil Reed's office,
and maybe a year or so before the incident I became aware of

the 1986 events. So I did take some steps.

What literature did you peruse from Mr Reed's office, I think you said?-- When I talk about literature I talk about what was available in his library, if you wish, or his reports and I came across - I think it's Mr Kerr's report about the event of 1986 that has been tabled at this inquiry.

What about the Strang Mackenzie-Wood book?-- I did not see a Strang and Mackenzie-Wood book, but I've said before that I've got one in my possession at home.

If you wanted to learn anything about CO make that would be the obvious place to go, wouldn't it?-- I don't think it's the obvious place to get it. If you don't know it's there you don't go and look for it. Strang and Mackenzie-Wood spends 400 pages talking about a lot of other things and two lines about CO make. So you have to know it's there to look for it.

One of those lines refers to the figures of 10 and 20 lpm, doesn't it?-- That is correct.

You see, surely now you must realise that those figures of 10 to 20 lpm were quite important in the use of CO make as a monitoring tool?-- Of course I realise that now.

You didn't at the time, you say?-- I didn't at the time and I believe that there are a lot of people at Moura that didn't realise it at the time either.

You said you spoke to Mr Morieson and Mr Abrahamse, I think?-- Yes.

Did you say the other day that you couldn't recall them saying what a figure of CO make for 512 should be?-- I cannot recall having any conversation with Mr Morieson and Mr Abrahamse about expected CO make in that section, no.

You know the evidence here is, I think from them, that one of them mentioned a figure of 12 lpm or so as being the appropriate level or cut-off level for 512 and the other, I think, 14 lpm or so, but you don't recall?-- Yeah, I've heard that here, but I don't recall any specific level mentioned in the conversation I had with them. The conversation I had with them related to the reason for the increased rate of CO make in that panel.

Did you think they, either of them, was qualified to express an opinion about the reason for the increased rate in CO make in 512?-- Mr Morieson had been, at the time, at the mine for a long time. Mr Abrahamse started before I did. I can't see why I wouldn't take into account what they say and make my own judgment on that, and that's what I did.

But you certainly wouldn't have regarded them as being qualified, would you, to express an opinion about an increase in CO make being due to a greater quantity of loose coal, or did you?-- Again you don't look out for a problem that you do not know exists. That was the explanation given to me and I

accepted it and I concurred with it. It made sense to me at the time.

Do you mean by that that what may have been a problem, that is an increasing CO make, was not perceived as such because of this opinion about it relating to loose coal?-- I'm not saying that may have been a problem. All I'm saying is it was an explanation of a situation that we noticed was different as compared to the other panel.

You noticed it because a rise in CO make is something to watch, isn't it?-- Yes, we were watching it.

And you were wondering what might explain the way it kept going up?-- No, that's not what I was wondering. I was wondering why the rate of increase was faster than in previous panels.

And the rate of increase being faster than other panels might, in the absence of a explanation, have caused you some concern?-- That is a very hypothetical question.

Well, it's not hypothetical, is it, if you were dealing with it at the time. You noticed at the time, as I understand your evidence, that the CO make was increasing at a faster rate than the other panels?-- That's correct.

And as part of the monitoring process you sought an explanation for such a rate of increase?-- Yes, but I still considered we didn't have a problem unless we had the exponential rate of increase that I mentioned before.

The explanation that you received came from discussions you had with Mr Morieson and Mr Abrahamse; is that so?-- Yes.

Was that the extent of it?-- George Mason might have been involved too, I'm not sure.

Did it ever occur to you to look elsewhere for an explanation, to some expertise?-- At the time I did not consider that that rate of increase was a problem, so I didn't look for expert opinion outside.

You didn't consider that to be a problem because of this notion you had that unless the rise or rate of increase was exponential there was no cause for concern. Does that fairly summarise your view at the time?-- Yes, basically.

Where was it that you got this notion of the rise having to be exponential before it was cause for concern? Where exactly did you get that notion from?-- It's an understanding I got from my studies in Belgium and going through the tutorials at technical college at Wollongong and I think it's an impression that everyone in the industry agreed to - an understanding they got before CO make came into fashion.

You first came across the notion during the course of your studies in Belgium?-- Yes.

Was that pointed out to you in some literature or was there a person lecturing who told you that or exactly how did it come about?-- I've made my studies in Belgium 13 years ago; you cannot expect me to remember exactly where I got that understanding, I believe.

Well, can you at least assist us this way, whether the understanding came from literature or something you were told? Can you distinguish between those two in respect of your time in Belgium?-- It came from both.

So you have seen somewhere, have you, in literature, reference to the rise in CO make having to be exponential before concern should be raised? In some literature somewhere in Belgium you think you had seen that?-- You develop an understanding about a subject. How you come to that understanding 13 years later is very hard to pinpoint.

Well, you came across the same understanding in the tutorials at - in New South Wales, did you?-- It did not change my understanding, yes.

Was it dealt with specifically in those tutorials as the exponential rise notion?-- It dealt with events that had developed exponential rise and that reflected an incident of spontaneous combustion like '86.

When you say '86 are you referring to 5 North, are you?-- Yes, that - I became aware a year before the incident or so.

So that was up at Moura?-- When I was at Moura, yeah.

We will come to that in a moment, but just dealing with your tutorials at - was it Wollongong, you said?-- Yes.

Was the topic there specifically raised that you should look for an exponential rise in CO make before you had cause for concern?-- Again that's the understanding I developed.

Again can you recall whether it was in literature that such a concept was expressed or was it given to you orally?-- Same as before. Those courses were 10 years ago. I cannot recall or I cannot pinpoint how I got that understanding.

Then you came to Moura and you say about a year before the incident here you became aware of the 5 North experience?-- That's correct.

That was firstly through documents you received from Mr Reed's library which included, I think, Kerr's report on 5 North?-- That was - I read Mr Kerr's report on 5 North, yes - I didn't look at it from front to back, but I broadly looked at the circumstances.

Was there any other knowledge you gained about the 5 North sealing in 1986 to reinforce this view you had about the exponential rise? I'm talking about the explosion obviously?-- Well, it showed another incident where it was related to a heating and the exponential rise had been

experienced.

Did you ever see, for instance, a CO make graph or graphs relating to the 5 North sealing in 1986?-- In the documents I read from Phil Reed's office there was no mention of CO make or CO make graph. There was no graph. I can only recall the first part of the document that was tabled here with the different readings at different times in parts per million. There was no reference of CO make in the document I saw.

And none you saw in document form before 7 August last year?-- That is correct. The documents related to CO make as being relevant to 5 North were after 7 August 1994.

They are the ones you saw, you mean?-- Yeah.

And in what you saw in the documents you had before the incident, was reference being made to a rapid increase in CO parts per million?-- That's correct.

At the time of sealing?-- That's correct, yeah.

Did you understand the circumstances of the sealing from those documents?-- Can you be more precise by "the circumstances"?

Did you understand the CO parts per million had risen dramatically on the very day that the panel was sealed?-- Yes, that's what I recall, I believe.

That is that the reading had been something like 13 or 10 parts per million in the morning and then simply taken off?-- Yes.

And did you understand that at 5 North in 1986 the sealing had been done under extremely traumatic circumstances by those working on the seals?-- Reading through the report I probably did not perceive so much that part of the equation. I understand that people would be working under difficult conditions, but I didn't come to understand what I've sort of learned here through evidence.

When you say you understood that the men were working under difficult conditions, do you mean that they were sealing in a race against a clock?-- Once you have parts per million that gets up it is always recommended to seal as soon as possible.

And why is that?-- So you can keep the situation under control as soon as possible.

Isn't there a risk in a situation such as that that the explosion can occur during the process of sealing?-- That is why I took the steps in introducing Tecrete and the prefabricated doors, so that process, if it was to take off, would have been made easier and quicker than the 5 North under less strenuous conditions.

So if you wait for an exponential rise in CO parts per million or make you have a very potentially dangerous situation on your hands?-- I believe if you stick with brick seals you

might have, but I took steps to reduce the time for sealing in an emergency, and I think I'm confident that had 512 - if we had detected a heating in 512 with an exponential increase we would have been able to seal 512 before the levels of parts per million that were reached in 5 North.

But isn't the point that you shouldn't be waiting for that sort of exponential rise before you take action? Isn't that the lesson?-- That is a lesson you might draw after the event, Mr MacSporrán. I'm not aware of anyone anywhere that says that a section has to be sealed when parts per million or CO make reach a certain level. I never sort of saw the need. Apparently my predecessor didn't see the need to implement such a system. Check inspectors visit the mine, district check inspectors - check inspectors are at the mine, district check inspectors visit the mine two or three times a year, they never said anything to me. I'm not aware of any direction being issued by the chief inspector that says at a certain level of parts per million or CO make you have to seal a section. I'm not aware that Mike Walker has ever approached either my predecessor or myself and said that at a certain level you had to do something. I've never read in the literature, and even now I'm not aware of any literature that says at a certain level you have to seal a section.

You, of course, were not the sort of manager who would wait to be told to do something in relation to safety before you acted, were you?-- If I perceived there was a problem I would do that.

You knew about the '86 sealing of 5 North; is that so?-- I've just told you the terms I heard about it.

Did you know about the 5 North West sealing in 1991?-- Before the event I heard some of the circumstances of the '91 sealing. How it came about is that - I believe it was around the time of sealing 402/401, George Mason brought to my attention that - he said we could expect miners approaching us in not wanting to go underground while the panel was going through the explosive range, and I remember asking George Mason then, "How come?", because they have been through 511 and to my knowledge there had been a lot of sections at the mine that had been sealed and people went underground through the explosive range, so what would be the reason? I think it's under those circumstances that I recall him mentioning a section in '91 where people did not go underground while it was going through the explosive range, and that was explained to me as being concerns about frictional ignition, nothing to do with a heating.

But did you understand in what circumstances the panel had been actually sealed?-- No, I didn't talk about that fact to Mr Mason. I only understood that the workforce had approached Mr Reed in 1991 and their concerns were about frictional ignition while it was going through the explosive range.

Well, could the witness see Exhibit 187, Your Worship? Do you see that's a copy of the mine record book relating, I think, to 1991. The front might relate to '86, I think, but further

in there are some entries referring to 1991?-- That's correct.

Do you see there is an entry there relating to the sealing of 5 North West in September, I think it is, 1991?-- What page is it?

On my copy it's the third sheet from the back. Just turn that up and see if we have got the same reference. The bottom reference appears to be 20 September - or it looks like 27 - 1991?-- Yeah, okay.

Do you see that entry there appears to relate to 5 North and is signed by Mr Reed?-- That's correct.

Do you see the entry? Have you seen that entry before?-- I saw that entry made by Phil Reed in the record book after the event when we were gathering relevant documents we were giving to the Inspectorate. Those documents, by the way, were given by us to the Inspectorate. They were not required by the inspectors. We thought they had some relevance in the case and we gave them those documents.

Do you see the sentiment expressed in the entry by Mr Reed, your predecessor?-- Yes, I read that now.

Would you agree that that seems to reflect a more caution or conservative approach than the one you seem to have had in mind before the explosion?-- That is correct, but he never mentioned anything about '91 to me.

Wouldn't that have been a relevant matter for you to have found out about as manager at No 2?-- How was I to know the existence of '91 when I talked to Mr Reed?

You knew of the existence of '86?-- No, I did not. When I talked to Mr Reed I didn't know about the existence of '86 or '91.

No-one brought it to your attention?-- No-one brought it to my attention. I knew about '86 by reading through some old documents that Mr Reed had, and '91 - I became aware of it after some discussion with George Mason and those discussions evolved about the reasons why men stayed on the surface while the panel was going through the explosive range and that was due to frictional ignition and that was the extent of the conversation.

You see, the sentiment expressed there is this, isn't it, that although the rise in CO make was not rapid it was increasing, and that, based on the knowledge that CO make can rapidly rise at some given point, you decided to seal rather than wait for a rapid rise?-- That is correct. I'm not disputing that Phil Reed's understanding of CO make is better than mine. After all, Mr Reed has gone to a conference organised by SIMTARS in '89 and I did not.

Mr Reed brought back the material from the seminar, didn't he, to the mine?-- That's correct and he gave it to someone and I

didn't know it existed.

And you didn't know it existed right up until after the explosion?-- That is correct. Had I known it existed I would have probably gone through it.

And you heard reference made to it in evidence here, the contents of those papers?-- Yes, I heard some reference made in the content of those papers and I'm not discussing - or disagreeing with those contents.

In any event, as well as CO make what you would be looking for in terms of signs of spontaneous combustion would be things like smell and haze, and I think you've agreed with that?-- Yes.

As it turns out, as I understand it, if a smell, whether it be benzene, tarry or whatever, was detected on 17 June inside 512 you were not informed of that until after the explosion?-- That is correct.

Furthermore there was apparently a written report of a strong benzene type smell reported by deputy Reece Robertson on 24 June, that is the week following, on his deputy's report. You didn't read that before the explosion?-- That is correct.

You did become aware of a tarry smell and some sort of haze on Saturday, 6 August?-- Yes, when George Mason rang me.

If there was a smell detected inside 512 on Saturday night, 6 August, you were not told about it until after the explosion?-- Can you repeat that question, please?

If there was a smell detected inside 512 - or from 512 on the night of Saturday, 6 August, you didn't hear about it or find out about it until after the event, after the explosion?-- Are you talking about a smell detected on the night while it was sealing?

Yes?-- I was not aware of such a smell being detected.

And, of course, when you are looking at CO make or even parts per million and trying to make an informed decision about what is happening inside a panel, things such as smell and haze can be rather significant, can't they?-- I think things such as smell and haze are significant and play a part, but what the CO is doing is just as important if not more important in my mind.

Well, you see on the Saturday you learned of the tarry smell that had been detected by Mr Caddell and a haze that apparently - may or may not have been associated with such a smell?-- The smell was on Friday, the haze was on Saturday morning. So they were not concurrent.

But a tarry smell, for instance, how else other than through a heating or error in judgment would you explain a tarry smell? What would that indicate other than a heating or someone being mistaken about the nature of the smell?-- I cannot speak for

Mr Caddell.

But you had the report orally to you via Mr Mason that he had smelled a tarry smell inside 512?-- Yes.

Well, didn't that report to you assume some significance?-- It did, but you have to put it back into context. There were a lot of other reports that were made to me at the time by Mr Mason as well and they come to a conclusion, in conjunction with the people that were there, that there was no problem at the time and I concurred with that conclusion.

Do you agree that seems to have been on the basis that no-one could repeat detecting the smell, that it wasn't detectable after the Friday as far as you were aware?-- That is part of the answer, but again those smells or hazes could not be detected again and the CO, in parts per million, I know, but in parts per million CO did not change either.

When you say it did not change, they were going up, weren't they? They were rising?-- They were not rising because I was told on that Friday afternoon the CO parts per million was seven and I knew there were eight - it was eight on the Friday.

The eight you obtained off the Unor?-- That is correct.

And the seven related to deputies' Drager tube readings underground, didn't it?-- That's correct.

Surely you weren't relying upon a comparison of those two to indicate to you the CO parts per million was not going up, or were you?-- Why should not I rely on those two? As far as I understood, if George Mason had noticed that the Unor had had higher readings he would have mentioned them to me as well.

In any event, what did you conclude then about the smell that Caddell claimed he had detected on the Friday?-- I didn't have any conclusions for the smell of Mr Caddell on Friday. That was part of a report that was given to me. It had been assessed at the time and I agreed with that assessment.

The tarry smell is a sign of spontaneous combustion, isn't it?-- The tarry smell is a sign of spontaneous combustion, yes.

Is it a sign of anything else that you know of that might be happening underground in a panel such as 512? If we accept it was a tarry smell, properly so described, what else could it indicate in your knowledge before 7 August but spontaneous combustion?-- I don't know what it can indicate, but it is a qualifying statement and I was looking for, and so was my staff, looking for something else than qualifying statements.

And think you told Mr Morrison that with smells and hazes you would expect, or your state of knowledge was before the incident that, once detected, they would remain; that's what you believed prior to 7 August?-- I find it hard to understand that if coal was burning, that you wouldn't get some of that strong smell in the return even after, yes.

That was your belief prior to 7 August?-- That was, again, an understanding I had through my formal education.

Well, you maintain that in light of the sort of ventilation quantities we are talking about going through 512? Does that have any significance to you in terms of whether you would have a haze and smell that would remain?-- I can't see why they wouldn't remain. Spontaneous combustion is a reaction that has an avalanche effect, so why wouldn't it get worse and remain?

The avalanche effect you are talking about occurs when it goes exponential; is that so?-- That is my understanding, yes.

Which is the period when it "takes off", to use another term?-- Yes.

And can be too late?-- It can be too late, but it was not too late, and I had taken steps to make sure it was not too late by using these Tecrete sheets. If we had thought it was too late and the sealing was under duress, I would have acted quite differently.

You see, there was always a very large - or most often a very large quantity of air going through 512, wasn't there? That was the history of the panel?-- I expected 40 to 45 cubic metres per second to flow through that section at all times, yes.

And is that what you would properly describe as a significant quantity of flow ventilation?-- It is a significant quantity, but I believe it was required to ventilate the goaf.

Well, did you see that in any way potentially having the effect of masking such signs of spon com as haze and smell - in the early stages we are talking about - the early stages of a heating?-- Prior to 7 August 1994 I did not consider those quantities would mask signs of spontaneous heating. I would expect to see some registration of those signs in the - at the monitor head, whether it be slight or lower than the 5 North experience. 5 North had exactly the same quantity, if not more there.

And in 5 North nothing much happened until the day of sealing, did it - in terms of the parts per million going up?-- I can't - I cannot recall really the circumstances from that site.

Didn't you understand from looking at the 5 North report that by the time it was detected in 5 North it was almost too late? Wasn't that the effect of the 5 North experience - detected on the day it was sealed, under duress, basically?-- Yes, but I

understand sitting through the Inquiry that there were signs before.

Well, to come back to 512, the smell of 5 August, you didn't find evidence elsewhere, you say, to support the smell may have related to spon com?-- What is the question?

Well, you didn't find evidence elsewhere to support the proposition that spon com - that the tarry smell would lead to spon com?-- If that smell had been related to spontaneous combustion, I would have expected some increase in parts per million at the monitor head or albeit being small.

Perhaps you would have expected some signs of activity with respect to the CO make; is that so?-- If parts per million go up, CO make would change too, yes.

But do I understand you to have said that at no stage over that weekend did you ever look at CO make levels?-- That is correct, because I said before as well that I do not consider that the effect of a heating could be masked by the changes in the ventilation system - with CO make taken into account.

Did you ever discuss that view with anyone else - that view you had that you could revert back to the parts per million as opposed to the make for an accurate assessment of the situation?-- I cannot recall discussing that view with anyone.

So, that was your personal view?-- I have used CO make as an extra tool. As I said, it was the Unor that was my - our day-to-day monitoring of the system, and I do believe it is still an adequate tool. It had been used by the industries for years before that.

And you didn't use CO make as an extra tool on this occasion. You ignored it?-- I did not ignore it. I didn't use it as a tool because I probably didn't understand the full scope of this tool - or of the tool. What I find hard to understand is that if CO make had been introduced into Queensland for such a long time, how is it possible that staff that I had at the underground mine for many, many years, working in the Queensland industry, don't appear to have understood it either.

Well, you say you didn't ignore CO make that weekend, but did you see the graph on the Friday, 5 August?-- As I said before, I believe I saw the graph from Steve Barnes on the corner of my desk on Friday, I think.

Did you have regard to what it was displaying?-- Well, if I noticed it, I didn't notice anything untowards on that Friday.

The following day when you heard about the tarry smell and haze, you didn't go back to the graph of the 5th or any figures of CO make to check them?-- I did not.

And at no stage, as you have told us, before the 7th - the night of the 7th, did you?-- No, I did not.

When you came back to work on 2 August after your holidays, you didn't read the record book?-- I might have read the entry as relating to the inspection by Mike Walker the previous week, but I did not read Joe Barraclough's entry before the Sunday afternoon.

Do you now say that you had, in fact, reference to the record book before Sunday the 7th?-- I don't know if I had reference to that record book or to that entry that was on a typed form on my desk, but I had reference, I believe, to the results and the report of Mike Walker's inspection the previous week.

See, wouldn't one of the things you would want to know on your return from holidays be what, if anything, had been happening inside the panel in your absence?-- If anything had been happening in that panel during my absence, knowing Joe Barraclough, if it was important in his opinion, he would have let me know.

And you discovered, you say, on the Sunday that something had been happening inside 512 in your absence, namely this high reading on the 22nd?-- I understood by readings through Joe Barraclough's report on the Sunday afternoon that there had been a reading of - can I refer you to the report?

Yes, certainly, Exhibit 160 I think it is?-- I have got it here.

Yes?-- Had been a reading of 8 ppm on the 22nd of the 7th 1994 and that Joe Barraclough had thought it appropriate to take - or to instigate a system whereby daily reading of Drager will be done on a daily basis, and I understood at the time, that being the fact, that he wanted to check the Unor with the Drager - just to make sure that the Unor was not missing something.

Again-----?-- Was accurate.

-----relating to the need to be accurate, so you could detect spon com?-- Had Joe Barraclough perceived that being a problem, I'm sure he would have let me know. He did not. If he had - and he did not because I'm sure in his mind the problem was adequately dealt with.

And you didn't discover anything about that or the proposal to take daily readings until you read the book on Sunday?-- That is correct.

Well, at that stage, the Sunday, it didn't occur to you to carry out a more thorough investigation of what had been going on inside 512?-- I had no concern as to the panel, so, again, why should I go looking for something that I do not know exists?

You found out there had been a high reading which you found out initiated a system of taking more frequent Drager readings in the panel?-- In order to check the Unor.

Well, did you obtain those readings taken by the deputies and compare them with the Unor readings over the period?-- No, I did not.

Did you ask anyone whether or not there had been any further discrepancy between the Unor and the Drager readings over the period 2 August through to 7 August?-- You have to put yourself back into the time there, Mr MacSporran. It was Sunday afternoon at 3 o'clock, Michael Squires was the only person at the mine with a couple of deputies and miners. I did not. I did not perceive the need for it at the time.

Well, at the time, that is 3 o'clock Sunday, the 7th, you had been told of smells and a haze inside the panel; is that so?-- That's correct, but they were adequately dealt with by further inspection.

Well, it comes right back then, does it, effectively, that because you could not repeat the detection of the smell and/or haze, you had no lingering concerns about the possibility of a heating inside 512?-- That, in conjunction with the CO reading - that was taken.

You mention in your evidence on Friday, I think, two propositions: you either seal normally and the men continue working whilst it goes through the explosive range?-- That's correct.

Or you seal under duress when the men stay out of the pit whilst it goes through the explosive range?-- That's right, and they are the only two options I would consider. I feel it is ludicrous to just withdraw people as the panel is going through the explosive range - whether it be one monitor head or half a dozen monitor heads in that section.

You had here on 7 August a situation where you had reports of signs consistent with there being a heating inside 512?-- Those signs had been checked at the time and found not to be there and a decision was made as to the safety of the mine.

They were found not to be there at the time they were checked; is that so?-- That is so, but that's not the only thing that was taken into account.

So, you couldn't confirm with subsequent evidence that the - a smell, whatever it was, related to spontaneous combustion. You couldn't confirm that with investigations?-- I could not confirm or deny it.

Well, doesn't that leave you in a position of some uncertainty about what was happening inside 512?-- At the time it didn't leave me with that position because those signs had been checked, as I said, by experienced personnel, and I concurred with that conclusion - that there was not a problem.

You see, as opposed to having the two situations where you seal under duress or you seal normally, you can seal in a state of some uncertainty, can't you?-- That's not the perception I had on that Sunday afternoon. Had we sealed

under a position of uncertainty, I would have taken the same steps as sealing under duress, which means I would have gone to the mine, I would have informed the relevant authorities - that means mines inspectorate and my superior, rescue station - and I would have not left the mine - let the men go underground under that position. When you are in a position of uncertainty, you do not want to wait until the panel goes through the explosive range to take the miners out of the mine. It just doesn't make any sense.

I know you have told us that you were satisfied after the inspections that George Mason and McCrohon had done, but isn't it really the case that you were left, in fact, in a state of uncertainty about what was going on inside 512? You couldn't be confident that the situation was totally safe?-- At the time I was confident that there was nothing there, and I acted accordingly. Your perspective is very much one from hindsight.

Could I ask you a little about the Friday, the 5th? I think you said you went underground with George Mason; is that so?-- That's correct.

And the inspection encompassed areas such as 5 South and 520?-- Yes.

Did you learn of any report of a methane layering inside 520 on that morning - Friday, the 5th?-- I'm not aware of being made aware of any layering problem in 520 before the event.

Did you find out afterwards there had apparently been some problem with layering inside 520?-- Yeah, it was after the event and before it was brought up here in Court.

Did you learn of that through someone telling you, or did you see some report - some written report of such an event?-- I think George Mason mentioned it to me after the event and before it was tabled here in Court.

Did it tell you that the matter had occurred on that Friday morning, 5 August - the layering problem had occurred?-- That's what I understood, yes.

So, you knew nothing about that on the day underground?-- No, I did not.

You have never seen such a report subsequently relating to such an event?-- I cannot read any report relating to such an event, bar what I heard.

You say you "cannot read" - you mean you haven't seen any report?-- No, I haven't seen anything in writing, bar what George Mason told me. Well, that's not in writing.

I don't want to take you to the CO make graphs of 512. You acknowledge having seen those week to week, do you? You were shown those-----?-- While I was at the mine, Mr Morieson always gave me one on my desk, so I would have acknowledged them every week, yes.

As I understand it - correct me if I am wrong - wherever there was a rise that was steep or somewhat steep, your approach was to revert to the parts per million to see whether that trend upwards was confirmed in that evidence?-- No, you are wrong in that approach. I said that when a rise occurred in the CO make, to me they were related to some inaccuracy in the measurements that we took underground, and that was related to the position of where the miner was in relation to the width of the panel, because those rises and falls have been experienced in other panels.

That explains, I think you told us, the peaks and troughs in the graph's appearance?-- I cannot see that 512 has got more peaks and troughs - or the peaks and troughs are much of a different nature than the peaks and troughs being experienced in other panels.

Your approach was to, if you like, level out or average the peaks and troughs so that you would have a straight line trending upward?-- That was my understanding and my approach, and for the sake of being complete, I mentioned so in my entry in the record book, yes.

And whenever you refer in your record book to monitoring the CO closely, what you are really referring to is not the CO make but the parts per million from the Unor?-- That is correct.

That was your approach at the time before the explosion?-- That was my approach at the time before the incident. When I referred in my record as CO being monitored closely, it was the Unor that was taking a sample every 15 minutes.

Again, I don't want to go over all this again, but you saw no problem in looking closely at the CO parts per million in such large air quantity - air volumes?-- No, I did not, because, as I said before, the ventilation in the section - I expected it to be within 40 to 45 cubic metres per second, so CO make and parts per million tell exactly the same story.

Just finally, in terms of after the event when the inspectorate collected documents from the mine, that was with your cooperation, was it?-- They had my full cooperation. It was an exercise that lasted over 5 or 6 weeks, and I believe that I gave more than what Mr Walker asked for. For example, these mine record book entries for 1986 and 1991 - Mr Walker, for example, never asked about them. We saw some relevance in those records, and we gave those records. We gave anything that we thought had relevance.

All right. But, that's the point I was making. It wasn't a case where the inspectorate seized documents as such, was it?-- The inspectorate seized the documents just after the second explosion - the very important documents were seized, like deputies' records and a copy of the disk of the Maihak was seized straight after the explosion. So, the very relevant documents were seized, but all the other documents were done on a full open-----

All right. Perhaps we are at cross purposes?--
-----cooperation.

What I am meaning to suggest to you was that the way documents were obtained was the inspectorate's requirements were relayed to you and the documents were produced by you to the inspectorate?-- That was after the explosion - after the real important documents, like deputies' records and the Maihak records were seized, yes.

There was no independent search by the inspectorate of the mine premises for documents, was there?-- There wasn't, but I never prohibited them to do so. If they wanted to do it, they were quite well invited to do so, but that did not occur.

I am not suggesting that you prohibited it, but the fact is that there was no independent search by the inspectorate of your premises?-- That's correct, and I don't understand why they didn't do it. If they thought we were hiding something, they could have done it.

Could have done it, and could have closed the whole place down and seized everything?-- That's correct.

But they didn't do that?-- That's right, and I had no problem with giving them all my documents.

They took what you call the "most relevant documents" initially: the deputies' reports, and the shift reports?-- Yes.

The Unor disk containing the Unor readings?-- Yes, to make sure that we were not losing them or tampering with them, but the rest was done on a full cooperation between the inspectorate and the company and myself, and that relationship carried through after the incident.

And relied upon, obviously, a degree of trust?-- That's correct.

That the documents that were thought to be relevant would be produced to the inspectors?-- That's correct, and I think I trusted - I trust the inspectorate and the inspectorate trusted me.

In fact, you had a fairly good working relationship with, in particular, Mr Walker, didn't you?-- That is correct.

He was the one you dealt with in relation to the Part 60 submissions?-- That's correct.

And that involved exchange of correspondence that dealt with matters that he required to be done for your submissions on Part 60 matters?-- That's correct.

You would, if necessary, discuss those items with him and then submit your proposal, amended if it needed to be?-- That's correct. I never perceived Mr Walker as being a policeman

that came to the mine. He was there to help me fulfil my statutory requirement and help me and my staff to make the mine safer and I think that is the right attitude.

Mr Schaus, the procedure generally when Mr Walker came to the mine when you were present was that there had been initially a meeting with yourself as manager and perhaps others?-- That's correct.

Where there would be general discussion about any matters of concern; is that so?-- Yes.

That was the usual procedure?-- Yes.

And that preceded the underground inspections?-- Yes.

The case was, wasn't it, that at those meetings you always felt able to raise with Mr Walker any concerns you had?-- If I had concerns with Mr Walker, yes, I had no trouble in raising them to him or even giving him a phone call if I had to.

And from his conduct and conversations he had with you, he clearly had no qualms about raising his concerns with you?-- That's correct. I never felt that he sort of held back in raising his concerns. If he was - if he had concern about a particular subject matter, he would have no trouble raising it with me, either on the phone or through the mine visit.

Thank you. Thank you, Your Worship.

CROSS-EXAMINATION:

MR MARTIN: Mr Schaus, is there a library/index at Moura No 2 or No 4 office?-- I don't know if you can call it a library as such. The mine has been operating for 24 years, so it has got a number of documents that it has accumulated over that time, being seminars, reports, and other more formal documents and, you know, they are sort of a bit all over the place, but some were in what is referred to as my formal office, which is over No 4 bathroom, and some would be at the engineer's office. There is no index as such or a library. I have never seen one.

How would anybody at No 2 know what existed? They simply wouldn't know, would they?-- Unless you go right through it you would not know where to find certain things, that's correct. The engineer would have a pretty good idea what's in his library, but I don't think there was an index and - I never came across an index.

As I understood Mr Reed's evidence, he said that five BHP mines had been destroyed by explosions, or had explosions in them; two in Queensland, and three in New South Wales?-- I don't think that is correct. I don't think that's correct at

all. Kianga was not owned by BHP as I understand.

Owned or operated, then?-- It was not operated by BHP at the time of the explosion. I believe it was Peabody. I thought in 1986 it was operated by BHP at the time, but I'm not sure about that. You would have to ask someone else. I am aware in New South Wales one that was owned and operated by BHP and that's Appin. I don't know where the other two come from.

In relation to spontaneous combustion detection, can you say what BHP or any of its enterprises or entities now does in relation to gas detection?-- As you can imagine, after the incident, I've been heavily involved with this Inquiry.

I was only asking-----?-- And in all honesty, I know there is something happening, but I cannot give you the details of what the company is doing right now about that particular matter. I know that something is happening, but.

All right. I take it you agree that an underground mine explosion is just a terrible calamity because of the risk involved?-- That is correct.

Did Mr Mason tell you on the Saturday night that the sealing was being done as a precaution?-- He did not use those terms at all and that was not my understanding. He came clearly through me saying that - as I said, I don't think he used the words "overkill", but in his mind he was convinced that the sealing was not required and he went along with it because Michael Squires had started the arrangements. He was a bit angry, actually, at having to sort of stay there during the sealing because he definitely thought that it was not required; so I didn't get the understanding that it was a precaution.

You were educated in Belgium, and wasn't Germany and Belgium the standard setters for the 10 lpm and the 20 lpm?-- My understanding from Mackenzie-Wood is that it comes from German standard, but you have to remember that those standards came only known to Australia in 1987, I understand, and I don't know how long they had been in Germany, but through my formal education in Belgium, I cannot recall any mention of CO make and of those limits, nor, for that matter, when I studied at Wollongong, because it was before all my formal education, including my rescue training education, before CO make was known and used in the industry.

What you had at Moura No 2 over time, leading up to 7 August 1994, was a number of people looking at signs and not knowing what they were looking at; is that a fair assessment?-- I disagree with your premise there. That's very much a hindsight perspective.

Well, it's not hindsight, is it, that the mine blew up?-- No, but your valuation of why it blew up is very much a hindsight perspective.

Well, what's your valuation -----

MR MORRISON: Excuse me, of what?

MR MARTIN: Of why the mine blew up.

MR MORRISON: I object to that. If we are going to indulge in that sort of business then I would incite all the panel members to go home now, and the warden. That's your job.

MR MARTIN: I won't pursue it.

WARDEN: Thank you, Mr Martin.

MR MARTIN: You knew of SIMTARS as an organisation before 7 August?-- I heard about SIMTARS, yes.

You more than heard about it, you knew that it existed and you knew what its function was, I suggest?-- I heard it existed and I heard some of the functions. If you can be a bit more specific - I don't think I knew all of its functions.

Well, for one thing, they published literature, didn't they, and some came to the mine in the form of magazines?-- I've seen some magazines of SIMTARS on my desk, that's correct.

Did you ever see a magazine containing the CAMGAS and the SEGAS system before 7 August?-- I cannot recall reading those particular systems through those magazines. Those particular systems cannot catch my eye at the time.

You knew that your gas chromatograph system was fitted with a CAMGAS system, didn't you?-- Prior to 7 I did not know the name of the system that was fitted to our chromatograph. I knew that it was linked to SIMTARS through modem. I knew that, but I didn't understand the different sort of systems that operated between SIMTARS and the chromatograph.

Well, you knew that the gas chromatograph could analyse a sample and if there was any doubt in anybody's mind at No 2 as to what that analysis meant that a Telecom modem could be sent to SIMTARS immediately?-- I understood that a sample could be sent to SIMTARS, yes.

By that means?-- Yes.

A 24-hour a day scientist available to inform -----?-- I'm not sure that prior to the incident I understood that there was a 24-hour a day scientist available, but I'm not surprised

that that is the case. I would like to add that during my time at Moura No 2 underground I never spoke to a single person from SIMTARS apart from Mr Bell that came for a visit about some other matter, and it was at the restaurant at Moura. I've never seen anyone from SIMTARS while -----

You've heard of the telephone, haven't you? You could simply ring up SIMTARS at any time at all, you personally?-- Had I perceived the need to inquire about the services that SIMTARS gave to the mine, yes.

Had you ever driven past the old No 1 mine at Moura?-- From time to time, but usually I would take the southern road, so not very often.

Had you done so you would have smelled a tarry smell or a burning coal smell, wouldn't you?-- I've never smelled a tarry or burning coal smell on that road. The first time that I smelt something that I related to what I call a bitumen smell was after the incident.

The sealing on Saturday, 6 August, and early into Sunday was done at an increased cost, wasn't it?-- Not really. My understanding is that we always have people on overtime during that weekend, and if we hadn't used those people on the seals we usually use them for some stonedusting or other purposes.

You do know, don't you, that special men were brought in who weren't working, who weren't scheduled to work?-- At the time that George Mason gave me that phone call we did not discuss those matters or - I could only assume that he was using the labour that he had organised. I did not realise that he had organised some extra labour.

Did he usually have to get your approval to add to the cost by bringing in overtime men?-- No, not to that extent. That is a decision that he can make well within his authority. We are only talking about three or four people, Mr Martin.

Do you know anything about a meeting between some management people and the men generally, including deputies, to the effect that the future of the mine was in doubt because of a drop in the price of coal and that production was required to combat that?-- I've got no specific recollection about such a meeting, but I know that from time to time whenever coal prices were negotiated, usually what I call the lease manager had a talk with the different people about coal prices and how it affected the operation, but coal prices are not sort of the problem of it all either.

At any time that you saw CO make graphs did you consider Mr Reed's information given to you about the 12 lpm?-- Can you repeat that question?

Yes. At any time you considered a CO make graph did you consider what Mr Reed had said to you about the 12 lpm?-- What do you mean by "consider"?

Think, think about it?-- As I said in my evidence before, I

knew that above 12 lpm, as I understood it, one had to be vigilant.

But you didn't know what to be vigilant towards, did you, if we accept - or if I accept what you are saying, because you didn't know what you were looking at. You didn't know what you were looking for?-- I - yes, I was looking for an exponential rise.

But you've already told us that then it's an avalanche and it's then out of control, isn't it?-- Yes, but the experience in 5 North has shown that it takes a while to get to that stage and that's why I was using these new seals to get it before - well before it was too late. I'm confident that we could have sealed those sections within one or two hours after the first sustained rise.

You didn't need Tecreté for that, did you?-- Yes, in my belief.

Do you know a man called Dr Gente, G-e-n-t-e?-- I've never heard that name.

Were you not taught or did you not see in your European mining experience the construction of temporary plywood seals with a hole in them over which a piece of conveyor was dropped, conveyor belt that is, of course, so in the event of -----?-- It's so long ago that I might have seen it but I certainly don't recall it. It's not common usage and practice in the Australian industry.

No, I was talking about the European -----?-- Yes, but at the end of the day you have to use what's available in the country as well. I don't think that type of material is available in the country.

Plywood?-- Plywood is, but I can't recall that type of thing.

Just for the information of the Inquiry in any case, that's entirely feasible, isn't it, in terms of future matters?-- I think -----

A plywood seal with a hole with a piece of conveyor belt hung over it so if there is an incident in the panel it won't blow up, it will escape through the seal, through the raising of the conveyor belt?-- Well, I just achieve the same purpose with Tecreté and my steel doors hanging from the roof, exactly the same purpose, and stronger, and that could be used as a final seal eventually, as plywood could not. It doesn't comply with the 345 kilopascals.

Neither would the Tecreté, I suggest to you?-- It does. If I can refer you to the relevant section of the Act, it says under "General Rules for Underground Coal Mine", 3.5, "Every stopping that is constructed as a final seal shall comply with the following additional requirements: the stopping shall be capable of withstanding a pressure of at least 345 kilopascals." It does not say anything about curing time, and the other matter I would like to mention is that brick seals

are only as strong as what binds them together which is cement and cement needs 28 days curing as well.

Do you suggest that Tecrete, the Tecrete seal which was erected on 512, when cured would have withstood 345 kilopascals?-- The information I received from Tecrete is it will be well over that, and the anchorage into the rib is a lot better than brick as well because the seal is only as good as its anchorage. Brick did not have anchors in the ribs, roof and floor. This one was anchored.

Where was the information about the 345 kilopascal strength of Tecrete?-- I think it has been tabled in this Inquiry before. It says when it's cured it's 600 megapascals, from memory.

That's only the hardness of the final product, isn't it, surely?-- That's the hardness of the final product with a steel mesh in it which makes it even stronger.

Surely it depends on the width of the Tecrete?-- I'm aware that -----

Rather than the hardness?-- I'm aware that those Tecrete seals were used as bulk heads for metalliferous mines, that means relevant for fairly high water heads, and their representative showed me an example of a metalliferous mine where such a seal was building over a 20, 25 metre high roadway and something like seven or eight metres wide. So -----

What has that told us? What sort of pressure did that contain?-- If it was holding water it would be well over 345 kilopascals.

If it was holding water?-- Yes. The information is that curing is above 345 kilopascals.

You did some spontaneous combustion learning whilst in Belgium, and I don't want to go over that again, but there has been a lot of spontaneous combustion incidents in Europe and in England, hasn't there?-- In some seams - I understand that in England and Europe, especially with advanced longwalls, there has been incidents of spontaneous combustion, yes.

You knew that, you worked in New South Wales and received some information there, you transferred from there in 1992 to Moura No 2?-- That is correct.

That's a fair resume, and you knew, if not need immediately, very soon afterwards that you got there, that you were in a spontaneous combustion area?-- That's correct.

And a gassy area?-- That's correct.

And what did you do to inform yourself about the particular problems that that might give rise to?-- I've answered that question before, Mr Martin.

Well, tell me again?-- I said that I spoke to senior

officials of the company. Mr Sleeman was a person I respect greatly due to his expertise and he told me that we were - Moura No 2 underground as a mine control method was relying on incubation time. When I arrived at the mine I spoke to the people at the mine. I had no reason to believe that their knowledge was not up to the standard of the industry in Queensland. I had no reason to suspect that.

Sleeman, what was his position or qualification for that matter?-- He was manager in New South Wales and - of Harrow Creek coal mine which is a seam liable to spontaneous combustion as well, and he was senior engineer for underground development within BHP Australia Coal. He has had extensive experience in Australia and Europe.

I think you said in your evidence that you understood Mr Squires was keeping a close watch on carbon monoxide and CH₄, that's on the Sunday?-- Yes.

In relation to carbon monoxide, what was he looking for that you understood?-- He was looking at the rate of increase per hour, and with the information he gave me he had no concern, that didn't give me any reason to be concerned either because that rate of increase was the same.

Do you agree that on your state of knowledge before, immediately before 7 August, that there was no fixed incubation period for any particular seam of coal?-- I disagree with that statement. Incubation has been - the incubation period has been recognised for many, many years by the industry as a main control factor for spontaneous combustion and I still - I think it still does now to a concern extent.

I'll take you to a number of questions, if you wish, but isn't the principal thing about spontaneous combustion that it can happen, and particularly that it has happened before?-- That is correct, but you have to go on what has happened in the past, and we have had sections at Moura No 2 underground that have gone well over 11 months without having any problem with a mining method very similar to the one I was using which is taking a row and leaving a row.

You learned of Graham's Ratio at university?-- Yes, I did.

Did you understand then and did you continue to understand that its purpose was to determine the location of a heating perhaps?-- No, I never understood it could determine the location of the heating. Like a lot of other ratios it determines the possible presence of a heating.

The onset or the commencement?-- It's another monitoring tool, as I understand, yes.

In fact do you understand it to be capable of measuring or differentiating between a heating and a fire?-- I might have learned that at school, I'm not really sure. I know that according to the different values, and again you were looking at trends, it might have been able to make that difference,

yes, I'm not sure.

Did you learn at university or subsequently about the CO and CO2 relationship?-- I heard about the ratio and I heard about other ratios as well.

The CO/CO2 ratio can be used, I suggest, to estimate the temperature and hence the advancement of a heating?-- That is possible, yes.

Did you ever utilise that?-- I've never utilised those because through my studies at universities I was left with the clear impression that although all those ratios had advantages and disadvantages, and they were different for different types of ratios, but it depended a lot on where you were mining and where you were educated. For example if you were born in Poland and working in the Polish industry you would use one ratio. If you worked in the American industry you were convinced and use another ratio. If you were working in England or some other part of the world with an English background you probably use Graham's Ratio, and I understood that all those ratios had some values, they had some advantages and disadvantages, but they had their limitations as well.

What did you use at Moura No 2, which of those?-- I said to the Inquiry before I was aware that Graham's Ratio was on the Unor. However, I did not keep a close eye on the Graham's Ratio because I perceived that no-one previous to me had kept an eye on that ratio.

We heard the other day about the Moura grapevine -----?-- You are using that term, I never used that term in this Inquiry.

The word of mouth then; what term did you use?-- I used "word of mouth", yes, and that is something I have experienced.

But that surely would be a totally unreliable way of communicating any form of knowledge?-- In the formal sense, yes, but it's very effective, I can tell you.

Yes, but is it quality assured?-- Like any form of oral communication it would be very hard to quality assure that.

One thing you were aware of was the basic education standard of the ordinary miner/deputy, very basic?-- I disagree with that perception of yours, Mr Martin. The average miner has got a brain and he can think for himself and he is a lot smarter than what you have been making it out.

But not as well educated as you, for instance?-- He is not, but he is not a fool either, by no means.

You didn't recognise the pending calamity and the signs giving rise to it, did you?-- At the time I did not.

How would you expect the men to?-- I never said I expected the men to. I had a report that was made to me, I made a decision in those regards, and I concurred with the experience

of other people at the mine at the time.

What was the electronic noticeboard usually used for?-- It was used for safety messages.

Why wasn't there a safety message put up on 7 August?-- I did not consider - at this time I did not consider it was required because I know that most of the people that would have gone underground would have been aware of the situation that 512 had been sealed and was going through the explosive range. That is what I experienced before.

Did you continue to refer to the approved plan of extraction for 512 after it was sent to DMR?-- What do you mean by referring to?

Look at it, did you?-- Yes.

Can you tell the Inquiry then why it is that the velocity meter recommended in the plan wasn't used?-- Yes, I can.

Please do so?-- The first point I want to make is in accordance with the Part 60 submission there is no requirement of a velocity meter as part of - a legal requirement for extraction. I was aware that my predecessor had made arrangements to buy a velocity meter. That velocity meter was bought and I agreed that we should use that tool because it gave us an extra monitoring device in the lifting section. That is why I put it in the Part 60 submission, although it is above legal requirement. I remember vividly, just before the panel started extraction, at a daily meeting where - Dennis Evans, mine electrician, Max Robertson, foreman, Gary Kunst, senior foreman mechanical, Ted Long, mechanical engineer, and Jacques Abrahamse was there as well. I did ask the electrical department to install that velocity meter. Now, I have some vague recollection of being approached by the electrical department some time after that request, but I do not know exactly when. They were reporting to me that they wanted to install that velocity meter, but to the best of my recollection they had trouble with some connection between the velocity meter and the power supply and they needed some hardware to put it through the computer.

Is this implementing Mr Reed's proposal that there be a monitoring on the computer of CO make litres per minute?-- I never understood at the time that the computer would be making the calculation of CO make, although I am not denying that that is a possibility. My understanding was at the time I wanted a velocity meter reading on the computer all the time so that any small variation in the parts per million could be referred to - related to any changes in the ventilation without having to do an anemometer reading underground. That was the extent of my submission.

But it didn't take place?-- It did not take place because of the reasons I have just outlined to you.

Because the electricians wanted some further piece of material?-- When I approached them it was still in its box

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and they hadn't realised they didn't have the whole nuts and bolts to put it altogether, as I understood it.

Why didn't you see that that was taken further?-- I cannot exactly recall the time when Dennis Evans approached me, but you have to remember that I went three weeks on annual leave as well.

I'm about to move to some other point, Your Worship.

WARDEN: Thank you. It might be a convenient time then. We will resume at 2.15, thank you.

THE COURT ADJOURNED AT 12.56 P.M. UNTIL 2.15 P.M.

THE COURT RESUMED AT 2.16 P.M.

ALBERT HUBERT SCHAUS, CONTINUING:

WARDEN: One small matter: we are working with two court reporters at the moment. We are one down. The only change will be the transcript may be a little bit later than usual tonight, perhaps 15 minutes or so. Subject to our finishing time, you may get them roughly the same time. We will be back to normal tomorrow morning.

MR MARTIN: Mr Schaus, if I could just take you please to 2 August, the alarm on the Unor of carbon monoxide. Do you remember giving evidence about that the other day?-- Yes, I do.

What I want to suggest to you is that if you looked at that Unor screen at any time between 1 minute past 6 a.m. and 54 minutes past 9, you would have seen it in alarm state - that is, red - red square, the word "alarm" active in red?-- Yes, I do not deny that had I had a look at it during that time, I would have probably seen it in red, but I cannot recall seeing that particular alarm.

I have nothing further, Your Worship.

CROSS-EXAMINATION:

MR HARRISON: Mr Schaus, just a few things: if I can talk to you about the regular inspections normally conducted by Mr Walker?-- Yes.

Was it the case that he invariably spent a considerable amount of time with you during the course of those inspections?-- Yes. Generally speaking, Mr Walker came to the mine around 8.15 or so. We had a general discussion as to the state of the mine, or different areas of concern, then usually in the company with George Mason we had a visit underground that involved, most of the time, working sections, but sometimes sections that were on standby as well. Generally speaking, we would come out of the mine at around 2 o'clock or so and then Mr Walker would enter his report into the record book, and if there was anything arising from that, we would discuss those matters as well.

Now, would it be the case that on these occasions when you were present, you were basically with him for virtually all of the time that he was at the mine?-- That is correct. The only time when we sort of separated, if I can put it that way, would be when we got changed. I changed in a different bathroom to Mr Walker, and maybe when we came back from

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underground during lunch, that could be half an hour or so when we were not together, but that would be at the most, usually.

Invariably at a time after the inspection had been completed; is that the case?-- Well, again, we got changed and took a shower separately, so, you know, there could be a half an hour or so there when we were not together, but during the bulk of the time, we would be together, yes.

Now, you have heard evidence in these proceedings that Mr Reed first became aware of the use of CO make as a tool in about 1987; do you recall that evidence being given?-- I heard that here at the Inquiry, yes.

As I understand his evidence, he went on to say that after the SIMTARS conference in 1989, he appreciated the importance of CO make in terms of being able to interpret it and what it was used for; is that your understanding of his evidence?-- That is what I understood he was saying, yes.

Now, did you also hear through his evidence and through other suggestions put to witnesses that there was a change in emphasis in relation to the use of CO make as opposed to CO parts per million towards the end of the '80's?-- That is my understanding, yes.

Now, was it also your understanding of Mr Reed's evidence that he initiated the practice of having the CO make graphs prepared in panels that were being extracted, and that he used to interpret the information that was contained in those graphs as collated by the ventilation officers?-- Through his evidence, that's what I understood he was saying, yes.

Now, was it the case that he ever explained to you in the detail that he did here in Court how he initiated that system and how these people reported to him and how he interpreted the information?-- During the two days we spent together, I do not recall him going through that system with me.

And I take it not only on those two days, you had no recollection of it being brought to your attention after that?-- After those two days, the only time I met Mr Reed would be to discuss matters relating to Quality Assurance, not specific to the mine.

So, I take it you never saw the need, for instance, to indicate to any particular people in management there that their task was to interpret the information contained in the CO make graphs?-- That is correct, I never indicated to anyone it was someone else's duty to interpret those graphs.

Now, through the contact you had with Mr Walker, did he ever discuss with you the fact that there had been a change in emphasis from CO parts per million to CO make in the late 1980's?-- I cannot recall Mr Walker mentioning anything that would led me to believe what you are sort of saying.

You already told Mr MacSporran this morning, did you not, that

if there were ever any matters of concerns to Mr Walker, he would raise them with you?-- That is correct.

I take it - perhaps I should put it this way: were there ever any occasions when he raised with you any concerns at all about the CO make levels in the 512 panel?-- I can never recall an occasion where he raised concerns about CO levels in 512, or any other panel for that matter.

It is clear you weren't present for his inspection on 27 July, but I take it you were present for his inspection at the end of June; is that the case?-- That would be correct, yes.

And at that stage did he raise any concerns at the levels the CO make had reached in 512 panel?-- He did not raise any concern about the CO level reached in 512 panel on that occasion.

To your knowledge, during the course of those inspections, did he himself ever have regard to the CO make graphs that were displayed for panels being extracted; in other words, did he look at them?-- That is a question you would have to ask Mr Walker. The only thing I can say is that I'm not aware of him mentioning anything to me with regards to the level of CO make in any section while I worked at Moura No 2 underground.

I take it you have no knowledge of him ever bringing to your attention any information contained in any of those graphs?-- That is correct.

Now, you mentioned earlier that - or what Mr Reed had told you about CO make generally in those two days you spent with him when you took over?-- Yes.

It was suggested to you by Mr MacSporran this morning that you did nothing further in relation to CO make, and you went on to say that you did talk to a number of people, including Mr Sleeman, Mr Morieson, Mr Abrahamse and Mr Mason; do you recall that?-- Yes.

I take it that the other undermanagers were not party to those conversations; is that correct?-- You are probably right. They wouldn't have been party to those discussions.

Now, if I can turn to your knowledge of events at the mine on Sunday, 6 August last year?-- Yes.

You have given evidence that Michael Squires told you that there had been an increase of about 6 ppm in the CO readings from the Unor for the 512 panel that day?-- Well, I did not recall at the time of my statement the particular level he gave me, but, yes, I remember vividly him telling me that there was a certain amount of parts per million per hour since the increase - since the panel had been sealed - for CO and CH4.

On Friday when Mr Clair was questioning you, you did say that there had been readings of up to 170 ppm CO in other panels that had been sealed; do you recall that?-- Yes, that's my

recollection, as I put in my statement for other panels that I have been involved with at Moura No 2 underground.

Now, from what Michael Squires told you about the CO parts per million readings in 512 on that Sunday, was that panel behaving in any way other than what you would have expected in the normal course of events?-- At the time when I spoke to Michael, Michael and I agreed that there was nothing unusual about that level that he was mentioning to me - that was my understanding.

So, your state of knowledge was such that from what he was telling you, that's what you would have expected in the normal course of events?-- At that time on that Sunday neither Michael nor myself saw anything unusual about the rate of increase after the panel was sealed.

Now, you have been asked some questions about the gas chromatograph?-- Yes.

You were aware, I take it, that it was calibrated regularly and that there was the modem connection to SIMTARS?-- Yes, I was - I was a person that instigated the training of Kenny Selff to make sure that that chromatograph was - the maintenance of it was kept up-to-date.

Now, in your capacity as mine manager, were you ever contacted by anyone from SIMTARS in relation to the use - or what I might term the "lack of use" of the gas chromatograph?-- I was never contacted by anyone from SIMTARS on any matter relating to the chromatograph or any other matter for that-----

I take it that no-one from there contacted you inquiring, for instance, as to why it was being calibrated regularly, but only being used very rarely?-- No-one from SIMTARS ever approached me to ask me that question.

For that matter, did anyone from the inspectorate ever make any inquiries along those lines?-- No-one from the inspectorate ever raised that to me and I'm not aware of any circular being handed out by the Chief Inspector requiring the use of the chromatograph behind seals.

Now, just one final matter: you have given evidence of a conversation that you had with George Mason referring to a conversation he had with Neil Tuffs on that weekend; do you recall that?-- Yes.

Would it be fair to say that there was nothing in that conversation you had with George Mason that alerted you to the need to tell Michael Squires, as the undermanager on shift that weekend, of what had transpired between George Mason and Neil Tuffs?-- That is correct. At the time I spoke to Michael I did not perceive the need to tell him about Neil Tuffs' approach.

And I suppose it is obvious, but you never told him?-- I never told him.

Thank you, Your Worship. I have nothing further.

RE-EXAMINATION:

MR CLAIR: Mr Schaus, just one matter: when you were contacted by George Mason on the Saturday night and he told you that 512 panel was being sealed, did that come as a surprise to you then?-- Not really, because as I said in evidence before, I was expecting 512 to be sealed on the Sunday, knowing that Tecrete contractors were kept on during the weekend to do that work. So when George told me that he was actually sealing the section on that - or during the weekend, that did not come to me as a surprise.

I have no further questions, Your Worship.

EXAMINATION:

MR PARKIN: Mr Schaus, when you first arrived at Moura No 2, did you update yourself with regards to the history of Moura?-- During the two days that I spent with Phil Reed, he gave me a rundown on what was happening at the mine, what he had in mind for the improvements of the mine, and of some of the different projects that were underway but had not been completed. For example, I'm aware of him telling me about the ventilation survey that had been done and work that still had to be done on that in monitoring from ACIRL. After that I had intensive discussions with Jacques Abrahamse and George Mason about where sort of the mine was coming from and where they perceived it going to.

So, you did know that it was a gassy mine and indeed liable to spontaneous combustion?-- That is correct.

Because I think you would agree with me that if you were to understand the mine when you first arrived there and you are going to successfully manage that mine, then you certainly need to know the history of the mine?-- I knew that the mine was gassy and I knew it was liable to spontaneous combustion.

The question I'm asking you is: is it sensible to know the history of the mine in order to manage it successfully?-- I think that at the time I took steps that were relevant to find out about the history of the mine.

Well, let me put the question a different way: is it sensible when a man arrives at a new mine - in order for him to manage the mine successfully and safely, he needs to understand the history of the place?-- I do not disagree with you.

The undermanager in charge, we have heard in evidence, didn't know the significance of the CO make in litres per minute?-- That is something that came out through evidence. I did not realise that at the time.

You stated by your own admission that over 12 lpm requires vigilant monitoring?-- That is correct.

You stated that you did not understand CO make in litres per minute?-- I had some understanding of CO make as expressed in litres per minute, and I've explained the extent of that understanding.

Well, the ventilation officer understood the CO make, didn't he?-- From listening to evidence, it does appear that he did, yes.

He completed the graphs, so one would presume that he understood what he was drawing when he did the graphs?-- That would be a reasonable assumption, yes.

Who did he report to - the ventilation officer?-- At the time the way I saw the ventilation requirements of the mine being managed was two-fold: as registered manager, I am in charge of the ventilation of the mine; as far as the long-term planning of the ventilation of the mine, Jacques Abrahamse was the person mainly to assist me to deal with that; by that I mean the carrying out and the following up of the recommendations of Mr Selff's report, ventilation consultant. That includes the installation and the erection of the north-west overcast and the driving of a second return from the bottom of 510 to 9 cross-cut, more or less, that hadn't been driven before. Now, that is something that had to be done. There were changes that were proposed to an existing overcast over the north-west as well where there was a big loss of ventilating pressure. Allan Morieson was part of that team as well, but to a lesser extent. As far as the day-to-day ventilation requirements of the mine were to be controlled, I understood, and I've operated along the lines that George Mason was in charge of those, and the way they were to be reported to him was through shift undermanagers and Allan Morieson - that were making the relevant changes and reporting of those small changes to him.

So, if you could be a little more specific, how many people did Allan report to then?-- Allan mainly reported to George Mason. I did not consider that Allan Morieson reported to me, and I have said so in my statement.

So, he took all his orders from George?-- That is correct, apart from the fact when I told him to do something, but then I would let George know - like, the likes when I asked him to open that door in the 12 cross-cut stopping at the top of the 512 panel, but then George was well aware - that was an instance, for example, when I gave direct instructions to Allan Morieson, which is fairly rare, but then I would let George Mason know what I would have done, too - he would have been well aware of it. But, generally speaking, Allan Morieson was taking instructions on a day-to-day basis from

George Mason.

How were ventilation changes reported to yourself?-- I expected the small changes in regulators to go into the undermanager's report book as stated in the Quality Assurance procedure. So, I would become aware of them through reading that book.

You have heard me mention on numerous occasions - and to save time I will just make the point that I think on around about the 22nd of July there was a loss of 10 cubic metres per second of air. Would those kind of things being reported to you?-- If you are talking about the 22nd of July, I can hardly make a comment on that because I was not present at the mine. What I would like to say is that if someone had been aware of that, I would expect that such a drop in the ventilation quantity would be reported to me, yes.

Because when-----?-- Or at least through the system.

Because when that question was asked of the people concerned, they couldn't answer the question?-- Again, I was not at the mine at the time, so I cannot say what was the cause of that, but I would expect that such a drop - it depends what level it would come from as well, but, yeah, I would consider that as a significant change in ventilation. I would like to be made aware of that as registered manager.

Sure. And just to refresh your memory, I guess on the 15th to the 23rd the ventilations dropped by something like 20 cubic metres per second?-- That's something I would have liked as registered manager to be made aware of if I hadn't sort of seen it through the standard reporting system myself, yes.

I think we know about the one from the 22nd to the 23rd, because that's when the - I think the bottom return was closed at that time?-- That may be the case, yes.

But we have still not found out where that 10 cubic metres went from the 15th to the 22nd?-- I was not present at the time, so I can only speculate, but-----

I'm not trying to be critical, all I'm trying to say - it is the system of reporting I am getting to - how the information is coordinated?-- Well, the information was supposed to be coordinated like is set out in the Quality Assurance manual. Any change in ventilation was to be reported in the undermanager's report book.

The system of the CO make graphs was initiated by Mr Reed?-- I understand so, yes.

And Mr Reed - you spent two days with him. He never took you through that system of reporting?-- He did not because at the time we did not - I don't know - that's because - but at the time I know that we did not have an extraction section, so there was no graph being produced and I can only remember him mentioning the 12 lpm and the understanding I got from that.

Well, see, the problem I've got is that - I mean, why have graphs on the wall if the undermanager-in-charge and the manager do not fully understand what the graphs represent? I mean-----?-- At the time, Mr Parkin, you have to realise that we did not realise. I thought I understood them. I understood something about them. I never said I didn't understand those graphs. Those graphs might not have been completed, maybe, to the standard that one would expect. Like, again, with the benefit of hindsight, why not put limits on it, like 10 and 20, or a legend, or something like that, but I cannot speak for that, but at the time I had an understanding of the graph and I was not to know that my understanding was not complete. I don't think my understanding was wrong; it was not complete.

The point I'm trying to get to is that the ventilation officer certainly knew, and certainly during the evidence that's been given here, a lot of the deputies knew what the significance of 10 to 20 lpm was?-- Could I make a comment on that, Mr Parkin?

Yes?-- I find that very hard to understand as well. If those people had those limits in the front of their head during all that time, and if we look at the graph we went over the 12 lpm, or 10 lpm two months before the incident, I find it very hard to understand that not one of them, not one of them has approached me - myself - George Mason or Michael Squires. I find that very hard to understand.

What I find hard to understand, Mr Schaus, also, and I don't want to labour this point at all, is that you are the manager of the mine, with ultimate responsibility for the safety, the welfare and the health of all the people employed there?-- That's correct.

And yet we have got graphs that are produced on a weekly - on a weekly schedule that you don't fully understand and comprehend?-- At the time I thought I understood what they meant. I had some sort of understanding of those graphs. I was not to know that I did not understand them fully. I was looking at the trend, and I knew about the concept of CO make.

Because I think you said in evidence earlier that you were concerned about the rate of CO make in 512 compared to other panels at Moura?-- I was not concerned about the rate of CO make. We were wondering why it was the case, and the explanation that was given to me and - or that we agreed upon was that it was due to the mining method and the rate of extraction at the time. It is not that we had concerns about that rate of increase. That was an explanation given for the difference that we noticed at the time.

So, what you are saying is that because of the rate of extraction of the panel, you put it down to that reason?-- And the different mining method, yes, and at the time that was an explanation that not only I, but the people at the mine were satisfied with.

Well, if we can go back to this ventilation business, did you

ever discuss the graphs with the ventilation officer? I mean, did he just drop them on your desk and that was the end of it?-- Generally speaking, that would be what he would be doing; however, I remember on occasions - I don't know exactly how often he did it in 512, but if there was a reading that was higher or lower, he would generally come back to me and try to give an explanation for it.

Because, you have said that - I mean, in your report you recorded, I think, on the Friday, 19 lpm CO?-- That is correct, that is the level that I equated to the 8 ppm that I saw on the Unor.

And you require additional vigilance when you get in excess of that 12 lpm?-- That is correct.

So, is that what you were doing over that weekend?-- At the time I thought the level of vigilance I had was adequate through the Unor monitoring system. That was with the understanding I had of the CO make at the time.

Well, it would seem to me, Mr Schaus, that the previous manager set up a very good system for monitoring CO and it would appear that some people ignored it?-- It appears to me that the previous manager set a very good system to monitor the CO, but he kept it all in his head and never bothered about explaining it properly to other people, and what I find very hard to understand is people that have been in the Queensland industry for so long are not aware of those limits.

But, again, when you just arrived - I mean, wouldn't you want to find out about that system? Here we have got a system that's put in that's beyond its time, I guess, in Queensland, and nobody takes any trouble to find out what it was and how it was operated?-- I was not to know there was more to the system than I understood.

No, I'm asking should you have found out?-- That's very much a hindsight perspective, Mr Parkin. With the benefit of hindsight, you know what the answer to that question would be.

The decision to seal the panel 512 was brought forward. You didn't know that at the time, though, did you?-- Through the conversation I had with George Mason, I understood that it was brought forward compared to what he would have done, but not as in what, sort of, I understood was going to happen, because I had no discussion with George about that particular matter.

I think the decision was made without consulting you?-- That is correct.

Is that strange, do you think?-- Under the circumstances, because it was perceived by the people that checked those signs at the time that it was not under duress, I have got no problem with them letting me know at the time. If those people had perceived it was done under duress, yes, I would have expected to have been informed earlier and I would have acted accordingly by informing the relevant people and going to the mine myself.

From approximately June to August 1994 there were approximately 11 different reports of smells and haze, and yet you only knew of one reported tarry smell from George Mason the Saturday afternoon on 6 August?-- That is correct, but I'm not sure that there were 11 reports.

Well, going into the Highton report, there are, if you include the McCamley and Robertson reports?-- Yeah, I'm not going to debate how many reports of smell there were, but I was only aware of the one from Mick Caddell that George related to me on the Saturday afternoon - night.

Well, let me say this to you: I mean, what does that say about communication at Moura No 2?-- When I joined the mine, I tried to formalise the system and I thought we had a reasonable level of communication at the mine. If people do not follow procedures, any system will never be better than the people using it. If they are told in black and white they have to put information in a report and they do not do that, I cannot help - that's not an excuse to explain the situation, but an auditing system hopefully would have come across it, and it did not at the time.

Well, the tarry smell from Caddell on - I think that was on the Friday, and then you had a haze on the Saturday reported, and I think you mentioned that smell could not be detected again; is that right?-- That was my understanding, yes.

Did you ever consider trying to find out for yourself where that smell was?-- You have to remember that when I was told about those instances it was at nine o'clock on the Saturday, the seals were being erected. So experienced personnel had come to a decision and I agreed with that decision. At the time I did not perceive the need to go and find out for myself.

So you were aware of one reported tarry smell, you knew that Moura No 2 coal is liable to spontaneous combustion, you knew that the rate of the increase was higher than previous panels, CO that is?-- Yes.

And on the Sunday afternoon at 3 p.m. you understood that the CO had increased from 12 ppm to 110 ppm in approximately 14 hours?-- That is correct.

What do you say about that? Does that give you any concern?-- It did not give me any concern at the time because if there had been anything untoward behind those seals I would have expected higher levels of CO and a change in the rate of increase.

Yeah, I guess what I'm trying to say is - and I think Mr Harrison said that previously there has been 170 ppm recorded?-- That was as far as I recollect it, yes.

But it's the time frame, and we are talking here of 800 per cent increase in 14 hours?-- I understand what you are saying, but at that time on the Sunday the absolute value was what I had in mind. I did not know, and I did not question myself as to the time frame when that particular level of 170 was generated. I had no means to sort of do that either.

Did you have that in mind at the time, the 170?-- I believe I had unconsciously the 170 in my mind, but I did not have in my mind the time that it took to go to 170 and I had at that time no way to find that out.

Because I would suggest to you that, you know, that kind of a rise in CO in that time frame is very large?-- I think you are coming from the hindsight perspective as well, Mr Parkin.

Well, I guess it's not hindsight, it's experience, I guess?-- Your experience is different from mine.

Yeah, well, Mr Reed did say under cross-examination, and it wasn't a hindsight question, the question was put to him because he had been manager of Moura No 2 of eight years?-- That is correct.

That had he known that time frame he would have acted differently?-- Mr Reed has gone to the SIMTARS course and knows a lot more at the time about spontaneous combustion than

I know. What I find hard to understand is how Mr Reed never transferred that knowledge to his staff at the time. What I find hard to understand is how come the Department never transferred that knowledge down the line either.

Sure. I accept that. What I find hard to understand is why you, as manager, have got a system that's implemented - and it's a first class system, I must confess - and nobody knows how it operated properly?-- That's probably because the system was not put in properly in the first place. Had there been lines or a legend on that graph I might have remembered.

Well, Mr Schaus, I would suggest to you that the graphs were posted up on a weekly basis outside your office or -----?-- I do not deny seeing the graph and interpreting them. You seem to have trouble to understand the state of mind I was in at the time prior to the incident.

No, I don't have any trouble trying to understand that, all I'm trying to do is to ascertain the facts?-- The facts were that I didn't go and look for what was beyond that understanding of that graph that I had.

Okay?-- Because I did not know there was something beyond it, but I would have expected my staff to know about it if there was.

I guess the point I'm coming to is at 3 p.m. that afternoon, taking due recognisance of our discussion regarding the CO, you knew that the CH4 was 3.5 per cent at that time?-- Yes.

You also knew that the Graham's Ratio was .6 at that time?-- I didn't look at Graham's Ratio at the time.

You didn't look at that?-- No, sir. My understanding was that Graham's Ratio after the section had been sealed was not applicable.

So the Graham's Ratio on the Unor, you didn't bother to look at that?-- On that Sunday I did not look at Graham's Ratio on that Unor, correct, because I did not understand the relevance of the Graham's Ratio once the section had been sealed.

I have no further questions at this time.

EXAMINATION:

MR NEILSON: Mr Schaus, can you enlighten me or the Inquiry as to just what your understanding was about SIMTARS prior to 7 August last year?-- As I said, could you be more specific in some of the questions?

Okay, sorry. Did you understand what they represented and the service they provided to the industry?-- I understood some of the service they provided to the industry and why they were created, yes, but I do not believe that as at 7 August 1994 I

had a full understanding of what they could give to the industry and to Moura. I've never been taken formally or informally through what their services was, directly or indirectly. So it's another thing I had to go and find out for myself, yes.

I guess the question I'm asking you is prior to 7 August could you tell us just what your understanding was, limited or whatever it may be, if you can recall that?-- Well, I've said in evidence that I understood that there was a chromatograph bought after the events of '86. The main reason for that chromatograph to be bought at that time was because '86 had shown that - and perceived the need for a chromatograph to be on site to deal with emergencies, and that was my understanding that I had, and I believe, listening through this evidence, a lot of other people, including a very experienced predecessor, Mr Phil Reed, had the same understanding. So how was I to get a different one?

Yes, I've heard you say that many times. In a question put to you by Mr Clair, I think in respect of all of the things that might have been available at the time, you know the CO make graphs, your understanding of what CO meant in parts per million?-- Yes.

The fact that there had been a tarry smell indicated - you gave an answer somewhere along the line of that questioning that you didn't have the knowledge or experience to really interpret all of that as to what it could mean could possibly happen. Can you remember saying that?-- That's not really the way I meant it to come across. During that conversation when I learned about those events I said that I had a list of events related to me and they had been subsequently checked by experienced personnel who - I had no reason to doubt their judgment and I agreed with that judgment.

No, no, no, I think we are at cross purposes. I think - and I haven't got the exact question in front of me, but I think you were asked on the basis of all of those things being present, the knowledge of the CO make, what the readings were in terms of CO parts per million, what did that mean to you? Did it mean - how would you interpret that as to what it could mean, and I think your answer was with your experience and knowledge in terms of carbon monoxide you weren't in a position to be able to determine what might happen because of the presence of those things?-- I cannot recall that question specifically, sorry. I obviously had an interpretation at the time with the state of my knowledge at the time, and at the time I had no problem. If I had had any doubt or any problem I wouldn't have let anyone go down that mine. Why would I?

Well, that's not the question I was getting around to?--
Well, I'm -----

If you can't remember it, then that's fine?-- No, I cannot remember that question.

You answered in respect to a question put to you by Mr MacSporran, that it would be ludicrous to just withdraw the

men from the mine simply because a panel was going through the explosive range. Do you remember saying that?-- I would like to qualify that by saying I meant that if you had any doubt as to the state of safety or level of concern in a particular panel, yeah, I cannot follow that logic. I personally for one would not rely on one monitor head or half a dozen or a dozen monitor heads to tell you it's time to get out, let's get out now. What safety factor are you going to use, for example? It's just - to me that is not a valid proposition. You either seal - at the time of sealing you have no concern, and then men can work through the explosive range, or you have concern or you have doubts and then men are not allowed underground straight after sealing. You inform the relevant departments, you get help, you - after the panel has been through the explosive range with the Unor system you send - well, I would probably go underground with George Mason, take a gas chromatograph sample, put it through the - take a sample, a bag sample, sorry, put it through the gas chromatograph, confirm the Unor reading, and once I was satisfied that the danger zone would be well behind us then I would allow the men to go underground.

So what you are saying is that if there was any perceived danger by way of an ignition point or something like that then you wouldn't allow men to work down a mine while it went through the explosive range?-- That is what I am saying, yes.

Given that there may not be - or there may be the absence of any known ignition source, once you seal a panel off, particularly one that's been subjected to extraction - by whatever method, by whatever method, and that panel is sealed, you really don't have any way of knowing whether or not there is going to be a possible ignition source, and before you answer that question I will put one to you and it's one that readily comes to mind because the men actually did withdraw from the mine in the 5 North section because there was a fear of frictional ignition from a roof fall. Why would that element be not present in 512 knowing that the atmosphere was going to pass through the explosive range?-- I understand what you are saying, but I think again you are coming from a hindsight perspective.

Well, can I just say this to you before you go any further? We are all here because of hindsight, aren't we?-- That's correct. Would you let me finish my answer?

Well, you can, but you are answering the wrong question?-- No, I'm going to give you my perception at the time. All I'm saying is it's very easy to sit here and find what should have been done. I'm trying here to expose what I did do at the time with the perception and understanding I had at the time. That is what I am trying to sort of say. Now, you have to remember when I joined Moura No 2 underground the mine had been operating for 22 years, and at that time I did not know anything about an incident where the men were - where the men had come out of the mine because of some concern. It's only later that I learned about the 5 North, and no-one in their right mind would argue about that, but about the '91, I knew about the frictional ignition. Now, I don't know what the

practice is at other mines while panels are going through the explosive range, but I'm just trying to point out to you that at the time I did not perceive that need because 28 sections had been sealed at Moura No 2 underground and only two sections where men have come out of the mine. Now, you can draw other conclusions - or it's up to the panel, and you are one member of that panel, to draw conclusions as to the future of those practices. I'm just trying to point out to you that at the time, if it was good enough for my predecessor who was an experienced mining engineer like I've been reminded, why would it be different for me? I'm not aware of any letter by the chief inspector or check inspectors saying that we shouldn't be going down that mine while the panel is going through the explosive range. Now, district check inspectors came and visited the mine on more than one occasion, not necessarily when it was going through the explosive range, but I would like to point out to you that I might be the guy that's hanging on the end of the rope, but not necessarily the one that's going to have to take the blame for everything that has happened in there.

Mr Schaus, I hope you appreciate my question is not aimed at apportioning blame to anybody?-- I know, but you -----

And I'm not expecting you to answer these questions in hindsight because that's all very easy to do?-- I'm trying to give you my state of mind at the time and that was my state of mind at the time.

That's exactly what it is that we need to know, what your state of mind and your knowledge was at the time, not anything other than that -----?-- Well, I've just answered your question then as to my state of mind at the time, and my knowledge at the time. At the time I did not perceive a need in the practice - a need to change that practice that had been in place for 20 odd years before me.

Can you answer me this then, and it's not a critical question, it's simply something that may be beneficial for us to understand. You've been asked by Mr Parkin and by many other members around the Bar table about what your knowledge was and what your reaction was to the system that had been put into place by your predecessors, about the - you know, the fact that there was a system put in place to calculate CO and -----?-- Yes.

And then refer it to a CO make graph et cetera?-- Yes.

Now, I appreciate the fact that a lot of other people come to the mine, I appreciate the fact that your predecessor put the system into place and he may have done it with the benefit of knowledge that you may not have had in terms of what spontaneous combustion is about. I appreciate the fact that you have local check inspectors and deputies. I appreciate the fact that the mine is visited by district check inspectors and by the Inspectorate, but don't you think that as manager of the mine and with the responsibility that goes with it that there was an onus upon you to make sure you understood what that system was? Don't you think that would have been

reasonable at the time?-- -----

MR MORRISON: I object to that. Really, you are going -----

MR NEILSON: It's a pretty simple question.

MR MORRISON: You are going beyond the proper bounds of investigating what happened at the time. You are now asking of onuses, whether they are under the Act or otherwise, and whether something is reasonable or not. We are now trespassing into questions of competency that have been ruled out before.

MR NEILSON: I won't carry on. I accept the objection, but it's probably not the way I meant - I'm not a barrister, so sometimes I might ask questions in a bit of a different way. Can I just put it to you this way then, Mr Schaus, quite simply: at the time when you became aware of these things being present, did it or did it not enter your mind to fully investigate, to bring yourself up to speed with what it might be all about?-- I thought I had no reason to believe that my understanding of those features were any different or less than the standard required by the industry.

Well, does that then follow that in your opinion you knew all you had to know about CO and CO make? In other words, you were satisfied that you were up to speed with it?-- At the time I was satisfied that I was up to speed with it, otherwise I would have done something about it.

Mr Schaus -----?-- That is if something had been available as well. A book is always available.

I understand your answer. Mr Schaus, you were present during Mr Mason's time in the witness-box?-- Yes, I was.

You heard Mr Mason refer to a Mr John Grubb attending the mine and addressing mine officials?-- Yes, I did.

Were you present at that meeting?-- Yes, I was.

I appreciate Mr Mason's comments about the word "fanatical" being somewhat subjective, and I suppose I would have to agree with that, but nonetheless they were the terms that were used?-- That's correct.

And those were the terms used?-- They were the terms used, yes.

At the time, as manager of the mine, what did you believe Mr Grubb was trying to say? I mean what message do you think he was trying to get across?-- I got the message loud and clear and my actions have shown that I have interpreted that message correctly and I have done everything in my power, when I perceived a problem, to deal with that in a fanatical way. What I perceived being a problem I attacked and went on an overkill.

Can you tell us what you perceived the problem to be then?--

The problems I perceived to be were the problems that everyone at Moura No 2 underground perceived to be at the time, them being (1) roof, but not so much roof, probably rib control as being the main one; (2) cable flashes. In those two instances I've shown to the Inquiry that I went more than would have been even required to try to address those problems and in that sense I considered myself that I have been a safety fanatic. If I did not perceive another problem that's another matter.

Okay. To follow on from that, when Mr Grubb made the comment was he talking in general terms or was he specifically talking about those two issues that you referred to?-- He was not talking about any specific issues, he was talking in general terms to open-cut and underground staff.

And you say that in your view you then became fanatical and you related to those two instances?-- It's not I became fanatical after that, I was very concerned about safety before that. This just reinforced the message to me and I tried to reinforce the message to everyone else, that goes to my undermanagers, undermanager-in-charge, deputy or mine worker, that safety was not to be comprised for production and those messages were very often repeated.

When Mr Grubb made that comment or that request or demand, whatever it was, did you perceive that he was trying to indicate that some people were maybe being less than attentive towards safety?-- You would have to ask John Grubb that question. I cannot comment why John Grubb made -----

So he didn't elaborate on it -----?-- That statement -----

He didn't elaborate on what he was saying at the time? Was it because of the order or -----?-- It was following the double fatality at Moura No 2 open-cut, but I knew that Mr Grubb wasn't happy with the safety performance, not only of Moura as a mine, as a whole, but all other mines within the group, and I understand that.

Was it -----?-- I could understand that.

Was it your perception that other people, other mine officials at the mine, were also as attentive as you towards safety or did you find that there may have been some laxity or whatever?-- I did not find any laxity, but at that meeting it happened to be - I vividly remember the meeting because it was during a coal strike about price cuts, so all the staff, all my staff - the majority of my staff was present, 90 odd per cent of it.

After that meeting and after the comments by Mr Grubb did you perceive - or did you notice any difference in attitude towards safety?-- I think I did, yes. I requested that daily - weekly safety contact would be introduced, and that was a suggestion by Mr Grubb, and not just stick to the monthly safety meeting, and undermanagers started doing them, dealing with those issues, yes. I think everyone at the mine became even more safety conscious than what they were before and it

shows in the results.

When -----?-- Up until 7 August.

When Mr Grubb made that comment, and this is just a question to you, I'm not trying to put words in your mouth, but did you perceive that he might have been trying to say or indicate - and I mean this word "fanatical" is one that - probably one that I don't use and probably one you wouldn't either?-- That's the term he used, that's correct.

It could be easily conceived that he might be trying to say - and this is what I'm asking you, if you perceived - was he trying to tell people to adopt the worse case scenario whenever they were confronted with something? Is that the sort of indication you would have got?-- Yes, that would be my understanding, yes.

That's all I have, thank you.

EXAMINATION:

PROF ROXBOROUGH: Mr Schaus, you told us early in your evidence that on your return from annual leave, I think it was on 2 August, that Mr Mason telephoned you, and in his words, to tell you what was going on at your mine; is that correct?-- That's not on 2 August.

Was it not?-- That was on the Saturday conversation at nine o'clock at night.

Okay, okay, but I think you said that he emphasised the phrase "your mine"; you said you remembered it because of the words?-- Yes.

Why would you remember that?-- I just remember that sentence.

Did it convey an attitude to you?-- Yes, it conveyed to me that he was just informing me about what was happening at the mine and he had made decisions. It was an information call rather than him checking with me if he had done the right thing, if I can put it that way.

Was your -----?-- That's how I perceived it.

Was your relationship with Mr Mason a fully and mutually co-operative one?-- Yes, it was. I have a great deal of respect for the integrity and the knowledge of Mr Mason.

Do you think he always kept you adequately informed?-- On the relevant matters, yes, he did.

Were the relationships, to the best of your knowledge, between the management team as a whole a good and a healthy one?-- In general, yes.

Because we have heard uncomplimentary comments of some members of the management team?-- In what respect?

Well, I think we heard Mr Graham speaking uncomplimentary about Mr Squires; we heard Mr Mason saying uncomplimentary things about Mr McCamley. There was no festering ill feelings or bad blood between anybody in the management team to your knowledge?-- In a mine you live in the real world. There could always be what you can call personality clashes, but I would never perceive them as being to the extent that it would impede the operation. It's quite normal to find in an operation where 12 people relate to each other every day people that get along together a lot better than others, but at the time I never perceived that if there were frictions there that it impeded the safe operation of the mine.

So you would be satisfied that the team would be fully co-operative in terms of exchanging information and ideas?-- Yes, they could put these frictional points behind them when it come to safety, yes.

When George Mason made his inspection on the afternoon of 6 August he telephoned you, and this presumably was the same telephone conversation, to say that 512 - I think the words used were "all clear" or "nothing untowards"?-- I don't think the words "all clear" were mentioned, but I remember him saying that there was nothing there more than once.

Were you aware of the nature and extent of Mr Mason's inspection? Did he tell you exactly what he had looked for and where he had been?-- Well, as I said in my evidence, I knew about him going - to the best of my recollection it was 3 cross-cut in the belt road, but I might have that wrong after listening through evidence here, so he told me about going to No 2 heading, probably to 3 cross-cut to try to go into that goaf and find out about Mr Caddell's smell, and he told me about the reading and he told me that he was not the only one of that opinion either and that played a big part in my judgment of the situation.

But would you call that a thorough inspection that he undertook, sufficient to come to the conclusion that all was well?-- At the time, with the access he had into that place, I could not see at the time what more he could have done.

I'm sure it's as thorough as he could have undertaken?-- At the time, yes.

In the absolute sense was it sufficiently thorough to dissipate the disquiet that had been expressed the day before in terms of hazes and smells?-- At the time I thought it was, yes, because I would have expected the CO in parts per million to increase had there been anything untoward. So at the time I thought it was good enough.

You said in evidence that in your opinion it was illogical for Neil Tuffs not to take his crew into 510; can you remind us why you found that illogical?-- It's the perception I had at the time of what Neil was saying. What I understood - he was

not saying that he would not go underground, he was asking us whether we would send him underground because 510 was in the inbye side of 512. That is - it's the nature of his question that I found illogical if he had any concern about it.

But if he is inbye of 512 he must have had concerns about the safety of 512?-- That would be a reasonable assumption.

So the fact that it was illogical to be concerned about being inbye of 512 didn't discount his concerns over 512? What -----?-- Not necessarily. I agree with what you are saying.

What I'm understanding from what you are saying is if there was a problem with 512, whether you were in 510 and wherever you were in the mine, you were at risk?-- That is the gist of what I said to George Mason, yeah, and I could not follow that logic, yeah.

So the illogicality of it is to do with his perceived or his planned location in the mine rather than the fact - there was nothing illogical in the idea that he had that something might be unsafe about 512?-- At the time if Neil had had something to say about the 512 as far as expressing a concern I would have expected him to be more straightforward.

Okay, thank you?-- That's the only thing I can say.

No further questions.

EXAMINATION:

MR ELLICOTT: I would like to revisit for a time your period at Charbon?-- Yes.

During that time were you a member of the New South Wales Coal Mine Managers' Associates?-- I was and I still am and I went to every meeting.

So you attended regular meetings?-- Yes, I attended the three meetings they have every year.

You've also indicated that you were active in Mines Rescue and I think you said that you joined the rescue station at Lithgow, I gather, early in 1986 soon after you started at the mine; is that correct?-- That is correct. To the best of my recollection I got trained in February/March or so.

Can you tell me for how long you remained active as a rescue member?-- I remained active until I left the position, so -----

Until you left Charbon?-- Charbon, yeah, which is '92.

So you probably would have been aware of any responses made by the rescue station during that period?-- Yes.

You have no doubt heard of Ulan No 2 Mine?-- That's correct.

You would class that as being in the western district in New South Wales?-- Ulan - as far as classification I've heard it's classified in the western district and north of Singleton, so you could argue the debate of fact.

I think for the purposes of Mines Rescue it's responded to by the Lithgow station; is that right?-- That is correct, yes.

Would it surprise you if I told you that at about the time you joined Charbon Ulan had a heating in a pillar section?-- I'm not aware of a heating in the pillar section at Ulan in around '86.

I think it was some time around '85/'86?-- If it was '85/'86 I wouldn't have known about it. I started in '86. I'm not aware of a heating in Ulan at that time.

You didn't subsequently hear of it?-- I never heard about a heating in Ulan at that time, no.

You can take it from me that rescue teams did respond to that from Lithgow?-- I'm not denying that, but I'm -----

Nobody told you?-- I'm not aware. It's the first time I've heard that there had been a heating in '85/'86 at Ulan. It would have been in '85 because '86 I was there - March '86 I was there.

You've indicated that in March 1988 you assumed the position of deputy manager at Charbon?-- That's correct.

Would it surprise you to hear that at about that time there was a heating at Ulan near pit bottom and rescue teams from Lithgow responded to that?-- I know nothing about that one either.

Would it also surprise you to hear that in December 1990 there was a heating at Ulan?-- I know about that one.

In their longwall blocks?-- Yeah, I know about that one. I was actually on call for that one. We never went underground, but I got called for that one. That's the only one I know of.

Would you be aware that in August 1991 the whole of Ulan was sealed?-- Yes.

As a response to a heating?-- Yes.

It was closed for some eight months?-- Yes, I was aware of that.

So I think in your earlier evidence you left me with an indication that you didn't appreciate that the western district had any propensity for spon com?-- Yes, but Ulan, as I say, is a bit out on one side there, but I don't disagree that it's western district, that that rescue station that responds to that.

You have obviously had some knowledge of this?-- I had knowledge of the 1990 event because I was there. I got called and I know that the mine was subsequently sealed for eight or nine months and I was briefed on the re-entry procedures, yes.

Are you aware of subsequent events at Ulan since that sealing and re-entry?-- I really left New South Wales a bit after re-entry had been completed, so I'm not aware of the latest development of Ulan now.

And you haven't taken steps to attempt to keep abreast with what happened as a result of that?-- I've joined - as I say, I'm still a current member of the New South Wales Mine Managers' Association, and while I was doing some business on the cut and flit on one - visiting one mine down there, I took the opportunity to attend another meeting since I've been up here, but it wasn't dealing with the Ulan event, it was a gas management thing.

Nothing further, thanks.

MR CLAIR: I have no further questions, Your Worship.

MR MARTIN: I think I have just one question, Your Worship.

WARDEN: By leave.

FURTHER CROSS-EXAMINATION:

MR MARTIN: When did you find out that of 28 panels, only two didn't have the men underground?-- That number was after the event, yeah, but before the event I knew that a significant number of panels had been sealed, and until I read through '86 and I was told by George Mason of '91, as far as I understood at the time men stayed underground during all those sealings, but you are correct in saying that I didn't count them and didn't know those numbers at the time, except there were a significant number of panels.

Thank you.

MR MORRISON: I have nothing.

WARDEN: Thank you, gentlemen. Can we take a short adjournment before we start the next witness? This witness is stood down and excused.

WITNESS EXCUSED

THE COURT ADJOURNED AT 3.32 P.M.

THE COURT RESUMED AT 3.52 P.M.

MR CLAIR: May it please Your Worship, I call Alan McMaster.

ALAN EDGAR McMASTER, SWORN AND EXAMINED:

MR CLAIR: Your full name is - or at least your name is Alan McMaster; is that correct?-- Yes.

Alan E - Edward?-- Edgar.

Alan Edgar McMaster. Mr McMaster, you are an electrical inspector of coal mines?-- Yes.

Whereabouts are you based?-- Rockhampton.

Now, you are, of course, aware of the incident that occurred on 7 August of last year at Moura No 2?-- Very much so.

You have since then carried out an investigation and prepared a report as a result of that investigation; is that so?-- Yes.

That report, Your Worship, is Exhibit 3. Do you have a copy of it, Mr McMaster?-- I don't have it with me here.

I will ask that the witness see that so it is there in front of him. While that's being obtained, the purpose of the report was really to look at the question as to whether there were any possible causes of an electrical nature for the occurrence on 7 August; is that right?-- Yes.

When you carried out your investigation and made your report, you were relying to some extent on some other evidence that you were aware of at the time; is that right?-- Yes.

You have the report there in front of you now; is that so? I don't intend to go through it in great detail, but I do just want to pick up the highlights, as it were. Mr McMaster, if you can follow the report and we will just deal with the sections of it there. Now, at the time of the explosion - that's the first explosion on 7 August - there was a main circuit breaker on - supplied to the borehole substation and that tripped off on over-current and earth leakage protection; is that right?-- Yes.

Also the circuit breaker controlling power to the borehole cable tripped off on over-current at the same time; is that right?-- Yes.

And those trippings were consistent with damage to the high tension distribution system below ground; is that right?--

That's correct.

Now, you looked at the position with electrical equipment in the 510 and 512 panels; is that right?-- Yes.

And you discovered that the high tension isolator supplying the 512 panel was switched off?-- Yes.

Prior to the time of the explosion?-- Yes, the substations were to be relocated and the high tension isolator was switched off so that could be done.

So, that isolated power from all the electrical equipment inbye of the 5 South - the main 5 South travelling road?-- Yes.

In 4 South panel there was a high tension cable, but that hadn't been connected or energised, so you conclude that no electrical ignition source could have existed in that panel; is that right?-- That's correct.

You looked also at the position in 5 South and 520 panels?-- Yes.

520 being that small panel that was towards the inbye end of 5 South; is that right?-- Yes.

Now, there was at the time of the explosion a high tension power line available in 5 South panel and there was an explosion-protected transformer there; is that so?-- Yes, that was supplying the miner and shuttle cars in that area.

There was a second transformer located in the panel?-- Yes.

That transformer, was it placed but not connected so it therefore could be eliminated as a possible source of ignition?-- Yes.

Now, looking at the power that was being supplied then from the first of those transformers, there was power being supplied through the trailing cables that supplied the continuous miner and shuttle cars; is that right?-- Yes.

Now, in your experience, were those trailing cables considered, as a matter of practice, a higher risk area for electrical ignition?-- Yes, as we have heard earlier on in the Inquiry.

You have had occasion over a period of time to consider a number of trailing cable damages on shuttle cars, which have resulted in cable flash; is that right?-- Yes.

They're reportable incidents that you have become aware of?-- Yes, the mine management are to notify the Department if a flash occurs external to any cable or flameproof equipment, and in 1993 there had been a number of these cable flashes, and that aroused my attention, and I had got to the stage where I was about to draft a letter to the mine manager and, by chance, he rang me that particular day on another matter,

and once we were finished that conversation, I mentioned about the draft of the letter and he said, "Oh, I'll send out a memo immediately.", and with the promise of that, I scrapped the letter, and I'm pleased to add that Mr Schaus did do everything that I required, and did it very thoroughly too.

You say that there was a number of incidents during 1993 that led to your concern?-- Yes.

Do you remember how many reportable incidents there were during 1993?-- I would say six.

Now, was there ever any discussion between yourself and people at the mine, whether it would be the electricians or other members of the management, about just how a reportable incident was to be defined?-- Yes.

When did that take place?-- Oh, at regular intervals - each time there was one, but my interpretation was if you consider it possible to be a reportable incident, report it and we will note down the circumstances, and if it needs a full investigation, it will get the full investigation. If not, we can discard it.

Now, you were involved with the investigation of those six incidents during 1993?-- Yes.

Is that right? Okay. Now, you mention that when you had the telephone conversation with Mr Schaus that he said he would send out a memo. Was there some discussion between the two of you as to what sort of direction should be given?-- Roughly, but he went a little further than what I intended to write in my letter.

Well, if you can just say what discussion took place and then what you understood was directed in the memo?-- Well, it was a matter of stopping production in that section. Once the incident had occurred, stop production and hold the equipment - don't touch anything until I arrived and I, in conjunction with the management, the mine electrician and miners' union people, we would do an investigation to try and determine the cause, and the main reason for doing that was to impress upon the general workforce the seriousness of the incident and make them all more aware of what can happen.

Did you, as a result of the incident in 1993, form any view as to the difficulties that were creating this number of cable flashes?-- Well, the most evident one in 1993 was the last one that occurred when a cable was pulled apart at a joint, and I took a section of that cable and had an outside opinion, and their report I took back to the mine and they used that - those points in their repair schedule. There were certain defects, of course, and that's the thing-----

Defects in the cable?-- In the method of repair.

In the method of repair?-- Yes. Actually, the vulcanising tape that they used wasn't wound on tightly enough and when it is vulcanised, it left voids in the rubber material.

The insulating material around the outside of the cable?--
Yes.

Well, you say that was the last of the incidents in 1993?--
In 1993, yes.

Was there a difficulty with the fact that cables were put under strain, either because of anchor points or some other reason?-- There is a number of problem areas there, the first of which is the hydraulic reeling mechanism. If the valve is adjusted too high on that, it stretches the cable, or it can stretch the cable, and we were addressing that problem by having gauges fitted to the shuttle cars adjacent to the item, and there was a red mark to indicate the maximum pressure allowable, so that all persons passing by that shuttle car could tell whether the valve was set correctly or not. That was for the over-tension. You mentioned the anchor points, and there is a number of problem areas there: one is the selection of the positioning of the anchor point, and I think we had a couple of occasions where the anchor point was too close and too high, and the angle of pull from the - where it comes out of the shuttle car up to the anchor point was too sharp, and the cable was damaged in that regard. Also, if the cable reel doesn't reel in the cable by some problem with the mechanical reeling device, it leaves a loose cable on the ground and the car can run over its own cable, and to that end, Moura had fitted to probably 50 per cent of their cars a device which gave an alarm when the cable reel didn't move when the car moved. So, that was to eliminate that possibility.

So, you say that about 50 per cent of the cars had been fitted with those devices?-- Approximately.

Were you aware whether the cars in 5 South at the time of the explosion was fitted with those devices?-- At least one was. I can't be absolutely sure of the-----

What about the hydraulic pressure gauges? You said there was a program in place for those to be fitted?-- Probably 75 per cent of the cars were fitted.

They were being done in conjunction with you, or at least you were being advised as to what was happening with those programs?-- I would ask at each inspection how they were going.

Now, after the end of 1993, or at least after December 1993, there were some investigations then prior to 7 August of further incidents of cable flash; is that right?-- Yes.

You deal with those in your report, in fact; is that right?--
Yes.

Two on-site investigations; is that right?-- That's right.

Then there was a third incident of shuttle car cable damage which caused a cable flash; is that so?-- That's correct.

You mention that there, and on that occasion was it found that a fitter who had replaced a roller omitted a spacer washer, and that was what-----?-- That's correct, the cable had become wedged between the fair lead roller and the cheek-plate and I - at my next visit to the mine, I checked on the progress of their investigation and made a recommendation that in the stores they make a package of this fair lead roller, the pin and the spacer washers so that the total - it was a total unit to be replaced.

Now, I take it from what you say that you had full liaison with either the mine electrician or - that's the foreman electrician and also with the management about difficulties that you perceived; is that right?-- Yes, Albert Schaus-----

What sort of response did you get to the suggestions that you made about how the difficulties could be overcome?-- Very good.

Who did you liaise with most?-- The mine electrician, Dennis Evans.

And there was the other electrician, Max Robertson?-- Yes.

Did you liaise with him too?-- He was part of the team.

You mentioned Mr Schaus; is that right?-- Yes.

Now, you mention the cable flash incidents, '93, and then some in 1994. Were there other dangerous situations which arose and which had to be addressed - difficulties with either electrical equipment or - apart from that, that you had to address from time to time?-- Well, apart from the shuttle car cables there was the miner cables - we had a couple of occasions where the cable handler was either watching the condition of the rib and not watching the cable and the shuttle car jammed the cable against the miner - I think the miner cable got caught underneath the back of a shuttle car too, but that was classed as a miner cable, and the problem was a little easier there than, say, the shuttle car problems that we had.

Was there a difficulty at one stage with a motor being wired wrongly, or something like that in recent times?-- Wired wrongly?

Wired wrongly, or some difficulty with a dangerous situation created?-- Righto, you are probably referring to an incident where a thermal cut-out device was shorted out in a motor.

How do you mean "shorted out"?-- Well, it didn't operate. It was made deliberately not to operate, and the motor did heat up and cause a little bit of a smouldering of loose coal sitting on the surface of it.

Coal was sitting on the surface of the motor?-- Yes.

What sort of motor was this?-- It was the conveyor drive on a

continuous miner.

And this was a matter that you dealt with as an inspector?-- Yes.

And when was that?-- 11th of the 2nd, 1991.

In terms of possible causes of the explosion - 7 August 1994 - then, in that 5 South area there were both - well, the shuttle cars, and, as far as you were aware, the shuttle cars and the continuous miner which were being supplied by the cable; so, in the absence of all the other evidence, just looking at it from the electrical point of view, did that remain open as a possible cause?-- If the source of ignition was in 5 South, yes, it could have.

Now, all the high tension isolators you mention in your statement - substations, distribution control boxes and conveyor belt starters - were all of explosion protected design; is that right?-- That's right.

So, they couldn't have been a possible source?-- Not unless there was some-----

Damage to them?-- Damage, yes.

Which took away that protection?-- Flameproofers.

You do mention in your statement that the only items of equipment that were not explosion protected were the fluorescent light fittings down in the man and supply drift to 28 cross-cut from the main portal?-- The main travelling road, yes.

You also mention that it was apparent from Mr McCrohon's statement that the outbye section of lights from 10 cross-cut to the surface were illuminated after that initial blast on the night of 7 August?-- It would appear from his statement that they were.

You say that the lights should have been de-energised at the same time as the borehole substation tripped off?-- Yes, there was obviously a malfunction in the intertripping device.

Did you ever investigate that yourself?-- No, I wasn't able to get to the site.

There has been some evidence given about that. Are you aware of that?-- Yes, I think Dennis Evans did mention that in his evidence.

In respect of the main fan - that it may not have slowed down sufficiently to cause that tripping?-- Yes.

You wouldn't - at least at this point you wouldn't dispute that as a possible explanation?-- That's quite true.

Okay. Now, in any event, from the evidence that was available to you, the explosion was quite obviously initiated much

further inbye than where those fluorescent lights were?--
Yes.

So, you were able to eliminate that as a possibility; that is, the existence of the power to those fluorescent fittings?--
Well, the evidence of the persons that survived would indicate that they weren't the cause.

Okay. You also ruled out anything happening in 6 South and 1 North-west panels because of the evidence that indicated that the initial explosion was further inbye?-- That's right, yes.

Well, that left open then the possibility of those shuttle car trailing cables in 5 South section?-- That's correct.

And trailing cables supplying the continuous miner in 5 South?-- Yes.

And then you said that a third possible electrical source would be the short-circuit of wiring on a PJB vehicle if it had a collision. That was really one you exercised your imagination about?-- That's correct.

But that was really the only other possible one that you could think of?-- Possibility.

Is that so?-- Yes.

Now, I want to go back to the time prior to the explosion and just ask you about what other areas you may have covered in your operations as the electrical inspector. Did you have anything to do with the Unor system at all?-- Only to the extent of checking that they were doing their span gas tests and those leak tests.

And what did you find?-- Well, I found that one point was missing on a couple of occasions and I did raise it with Mr Evans, and he said that their investigation to date had indicated that it was in a bundle section, but it required quite a deal of manpower to isolate which section it was and repair that - not necessarily - but bypass that section of damaged tube, and it sort of received a low level of priority.

What point was it that was missing out, do you remember?-- I couldn't be sure. I just recognised that there was a point there and then I checked on their work book, and it was registered in the work book that there was work to be done on that.

How did you go about checking on the span gas - first of all, the fact that span gas testing had been carried out and, secondly, what was indicated by that as the integrity of the system? How did you go about checking that?-- It was just to look at the sheet to see there wasn't any long delays.

Were there sheets presented to you when you went to the mine?-- By the Unor - I think they were stuck up on the wall.

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Did you look at those every time you went there?-- Not necessarily, no, no.

Would you have seen every span gas testing sheet?-- No.

We have been told it was carried out once a month?-- Yes.

Did you make a point of checking to see that it was carried out once a month?-- Not - I didn't check the sheets once a month when I went there for my inspection, but sometimes I might check the cap lamps or the statutory tests that they are supposed to record. I didn't do everything every time, but I would pick on certain points at each inspection and sort of audit them.

This is a random type check?-- Yes, random.

Did you make any notes as to the results of your inspections when you, for instance, found that the span gas testing indicated that one point was not registering?-- I don't believe -----

Do you have notes or anything like that in relation -----?-- I don't believe I made a note of it, but I certainly brought it up with my electrician and -----

Do you remember when that was?-- Probably the second last inspection, I think.

So it was during -----?-- Second or third last inspection.

During '94?-- Yes.

How often did you go there?-- Once a month.

That was a routine visit?-- Yes, we are supposed to go to underground mines once every month, open-cuts every three months.

I take it that apart from your once a month visit you would go there if there was any specific problem that you had to investigate?-- Yes, if there was a cable flash, that was an extra.

Now, you've referred to raising that aspect of the span gas testing points - or point at least that appeared to be - Unor point that appeared not to be showing up on the span gas tests, raising that with Mr Evans?-- Yeah, well, I asked for an explanation why it should be like that.

Were you satisfied with what he told you, that it would be attended to, but not yet more or less?-- Yes. Yeah, well, it depended on manpower, the available ability of manpower, and he was the best one to judge that.

Did he give any indication as to how long it might be before it was attended to?-- No, he didn't.

Did you ask him?-- I just told him, "As soon as you can possibly do it."

Obviously if there was a Unor point that was supposed to be registering a finding and it wasn't, that could be a difficulty, then that affected the monitoring system, the integrity of the monitoring system as a whole?-- Yes.

Is that right?-- Well, it wouldn't give the correct information for that sampling point, so if the mining side were to consider that was important the priority would have been raised and a job would have been attended to more quickly.

Did you look to see whether there were any occasions when the apparent readings that were taken on the span gas tests were not consistent with what you would expect, that is whether there was some indication that the time taken for the sample

to come back was either very slow, or alternatively that there was some sort of leakage from the system?-- There was an occasion where there was one indicated along the length of time and that had been repeated by the time I had come around on my inspection.

Do you remember when that occasion arose?-- Not -----

Within '94, during '93, or -----?-- I would say towards - early part of '94.

Now, you've said in respect to the Unor system that you looked at the span gas tests and you raised matters in relation to that. What about other aspects of the Unor system, the actual operation of it at the computer screen, did you take any interest in that?-- I wasn't terribly conversant with how it operated, you know, just a superficial overview of it. I did know that they got the Maihak people in at regular intervals to do a calibration - or look over the machine anyhow.

Now, just moving a bit away from the Unor system, but not too far, there was an alarm siren system?-- Yes.

That was connected both to the Unor and to a whole series of other alarm devices; did you take any interest in whether that was functioning properly?-- I knew to a large degree where the points that were being monitored. I didn't have a - as it turns out in the investigation that we did I didn't have a full understanding of how it worked because, as you probably realise, it was fairly complex, the acceptance and cancelling of alarms.

I'm more interested at this point though in the siren and how that was deactivated and - or at least how the siren or alarm which registered at the siren was accepted?-- Yes, I didn't actually hear the siren, but I was told there was a siren connected to the Con Log system.

Did you ever ask for a demonstration of that part of the system at any time?-- No, no.

Did you take any interest in what items were actually connected to that siren and whether or not the integrity of that system was in place?-- I did ask at one stage there about - I think it was a fan stop and I asked whether they did get that up on the alarm and they said, "Yes.", and I said, "Well, that proves that that part of the Con Log works."

Now, you've mentioned the monthly visit which was your routine visit. When you made that visit what was your practice and who would you take-up with when you arrived there and -----?-- Generally the mine electrician, Dennis Evans.

How long would you spend there and what would you do?-- We would generally get underground by about eight and be on the surface by about 12, and then after that we would go through any points that were of interest in - that had come up at other mines, and also these statutory tests. I checked that they recorded them as they should be done, quite a number of

Statutory tests?-- Yes, insulation and continuity tests of cables and machines.

Was that something that had to be done on a regular basis?-- Yes.

Was that done by mine personnel?-- Yes.

Or were they tests that you carried out yourself?-- No, they were done by mine personnel.

And there was a record kept?-- Yes, there was a log book and I just checked that it was done at the specified intervals and that the readings were as they should be.

Go on. You were talking about your inspection. What would you do after that?-- Well, the final thing was to write the report, of course. There was a number of things that I would check from time to time and one was the - their records of the hand-held instruments. They have to be sent away to be recalibrated every six months, and I would go through the book and make sure that there was - if there was work to be done on one of the instruments they had a sheet there, a test certificate to show what work was done on it, and when it came back to the mine, when it was put back in service, and just make sure that the records were correct there and that everything looked as if - as it should be.

How long would you spend there at the mine?-- At the mine, probably six, six and a half hours.

Did you feel that that was adequate time to carry out the sort of inspection that was needed?-- Well, you could always spend more time, but by randomly checking certain items each time we tried to maximize the effect of an inspection.

You say you could always use more time; I take it Moura is not the only mine you had to inspect?-- Quite a few more.

I have no further questions, Your Worship.

WARDEN: Thank you.

CROSS-EXAMINATION:

MR MACSPORRAN: Mr McMaster, just one matter, when you spoke of carrying out random checks on your visit to maximise the effect of your inspection, I take it you mean by that that the mine management and personnel of the mine would not know what items you were going to check on a particular day?-- No, no.

Did you have a set schedule drawn up yourself for items you had checked or did you just choose on the day you were there

which items you would look into?-- I would choose on the - at the particular time.

And they would be ones that were usually different from ones you checked on the other occasion you had been there?-- Yes.

Was there any sort of program as to how long it would take you to check most items that you had to check over a given inspection period?-- No, there was no set formula, but if there was a number of points to be discussed, points of interest or incidents at other mines that needed to be communicated to the mine personnel there, if there was a lot of those items, well, there was less time spent on -----

On others?-- On others, yeah.

I take it from what you've told us already that the major concern you have as an electrical inspector was the incidents of cable flash and problems with trailing cables?-- That was the major concern.

And you took action in relation to that?-- Well, as I suggested before.

As you've told us, I think, the mine manager responded and the difficulties were to a large extent overcome?-- Well, they were well in hand. You could see there was progress being made.

I have nothing further at this stage, thank you, Your Worship.

MR MARTIN: I have no questions.

CROSS-EXAMINATION:

MR MORRISON: Mr McMaster, can I ask you a couple of things, you mentioned in the 5 South that a potential source of ignition is the - any defect of operation of a transformer down there?-- Yes.

Because that breaks down from about 6.6 Kv to 1,000 volts?-- That's correct.

That's a high voltage to have down in the mine, isn't it?-- It's fairly normal.

Sorry, it is normal, but it is nonetheless a high voltage. It's much greater than we would ever get in a home?-- Well, we have to drive the equipment by some means and electricity is the most convenient.

If there is a defect there, damage to it or there is some difficulty with the cables that lead out of the transformer, you can get sparking or arcing, can't you?-- It is possible. We have shown that the shuttle car cables in previous

incidents -----

I don't mean to cut you off. The only way you can tell if that has occurred or not occurred is actually to go down and have a look at the machinery itself, isn't it?-- Damage to the equipment, yes. The cables, they are either reportable or they come up as normal damaged cables and go through the repair shop.

In terms of the physical signs one might see would be blackening of the outside sheath or even melting of the internal wiring from either arcing or - well, arcing would do?-- Well, the cables are normally fairly black down there, but -----

You know what I'm talking about, blackening by the actual burning process of the arc?-- Yes, if there is damage there is a blackening, a carbonisation.

In relation to the transformer down in 5 South you obviously haven't had the chance of inspecting that or any of the cables to or from it, and likewise none of the cables that led to or from shuttle cars and miners?-- No.

Absent that sort of inspection am I right in thinking that you can't rule them out at all?-- No, that's what I said in the report, that if the ignition took place in that section I would have to say that that could be a possibility.

Speaking still from the electrical point of view, there is no way - to draw the contrast with the No 4 mine where you had an absolute full chance to inspect everything, you are not in that position here and therefore I think I'm right in saying you really can't rule out almost any of the appliances in the mine unless they fall into that category, for instance, the lights which remained on or the flourescent lights which were flameproof or remote possibilities such as the PJB?-- I discounted the flourescent lights because the survivors came past that area.

With the exception of those areas you really can't rule out anything?-- Okay.

Would you agree with that?-- Yes.

In relation to a PJB there are a number of ways in which it could generate heat, isn't there?-- Generate heat, yes, yes.

There could be malfunctions in a number of categories in the engine, and in fact it is possible for a PJB, if it malfunctions, to generate enough heat to cause burning?-- It's a possibility.

And without inspecting, again you can't rule that out either, can you?-- No.

We know that there was two of the men down the mine that night had a PJB for the purpose of transferring some material - just from memory now it's from around the 512 section across to

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4 South prep seals?-- That's why I mentioned the PJB because I knew that was being used at the time.

Now, there is an obvious problem, would you agree, that if the PJB had developed a fault sufficient to generate enough heat and came in contact with an ignitable fuel there is a possibility that it was the source?-- It's a possibility, but it's fairly remote.

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I am thinking in terms particularly of the Wal's Workshop area. You are familiar with that area, aren't you?-- Yes.

You have in fact inspected it yourself?-- Yes.

Were you aware that there was a methane blower in the floor in the stub end of Wal's Workshop?-- I wasn't aware before the investigation.

But you are now?-- Yes.

A methane blower in the floor in an area where equipment was located of the category that was required for the purposes that night; do you understand that to be the case?-- Could you repeat that question?

Well, did you know where the site of the blower was? Were you aware where the blower was?-- In rough terms, yes.

And it was a blower in the floor pushing out methane at quite reasonable percentages?-- Mmm.

Do you understand that to be the case?-- Yes.

Percentages which, if they accumulated if there was some fall down in ventilation in that immediate area, could easily generate over 5 per cent?-- If you get the right conditions, yes.

And that is an area into which a PJB could drive, that stub area?-- I don't know that.

You don't know that?-- No.

Now, can I ask a couple of other things? You mentioned the number of reportable incidents in relation to cable flash, and you have said in relation to a completely different question that you travel around the mines in Queensland?-- Yes.

Do you see all the mines in Queensland?-- No.

Only which area, central Queensland area?-- As far as Gordonstone, Crinum, Gregory in the north and Moura in the south, of course.

So, only those four mines?-- No, no, underground mines.

I am sorry?-- Underground mines.

Are you defining it by way -----?-- Moura, Cook, Laleham, the new Kenmare, Crinum, Gordonstone. That's the underground mines in my area.

Can I ask a general question about those? You are familiar obviously with the electrical systems at all of those mines?-- Yes.

Are there any staggering differences between the electrical systems operated at each of the mines?-- Not really.

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They are pretty much routine mine to mine, aren't they?--
Yes.

And the systems to deal with electrical maintenance and electrical repair, would you agree that they are pretty much standard mine to mine too?-- Some are better than others, but, yes, they have all got systems of preventive maintenance.

And Moura No 2 had such a system?-- Yes.

And you were involved in effectively auditing that system from time to time on your visits?-- Yes.

And it was a system which, can I suggest to you, was operating apparently efficiently to you?-- Apparently.

You certainly did not see it as any part of any necessary report by you to criticise or bring forward the upgrading of, say, the electrical maintenance?-- No, if I had felt it was necessary it would have been mentioned in the record book entry.

And, likewise, are there other mines that operate a Unor system like No 2 has?-- Not exactly the same, no.

But of similar nature, that is, a tube bundle system which operates by drawing gas out continuously?-- Most of the newer mines have got an electrical system whereby the impulse comes to the surface via electrical means.

That's the newer mines?-- Yes.

Those that have been operating for a period, do they have a Unor system too?-- No.

Are you familiar with the Unor system at all except by contact with No 2?-- That's the place I have had most contact with the Unor system.

Well, you certainly haven't been distracted by any other Unor system, you could pay full attention to this one in all your inspections, couldn't you?-- Yes.

Did you never feel it appropriate to sort of become fully familiar with the way it operated, or was it simply something you regarded as not your province?-- It was a - I felt that the inspection that I gave that system was sufficient to indicate that it was operating successfully.

That was the conclusion you reached?-- Yes.

That the system that governed the operation of the Unor was one that was operating successfully?-- Yes.

There was nothing you saw which led to a contrary conclusion?-- No.

And did you regard it as being adequately operated in terms of

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its frequency of calibration?-- Yes.

Its maintenance?-- Yes, well, the Maihak people did the main part of the maintenance and they were the experts on that piece of equipment.

And its operation?-- Pardon? The operation?

And its operation?-- The day-to-day operation?

Yes?-- It appeared to operate successfully.

In terms of the records that were generated by the Unor system, you would have been aware that when there was an alarm which was acknowledged there was an automatic print-out of an alarm report?-- Yes.

And that the alarm information was kept in memory in the machine itself?-- I was aware there was a memory.

I am sorry, did you not make any inquiry about what that memory contained?-- No, I didn't get a full print-out as we have seen which came out from the SIMTARS manipulation of the records.

Were you ever concerned to find out how much that memory would retain at any time in terms of its SNIP program, or is that again an area that you didn't feel was within your province?-- I think I did ask one time how far the memory extends.

What answer did you get?-- About a year or something like that. I'm not too sure. I couldn't be sure of that one.

Whatever answer you got, you obviously regarded it as being -----?-- Sufficient.

----- sufficient for your purposes. Well, what about the tracking of alarms and who had acknowledged them, did you turn your attention to that at any time?-- No.

Was there some particular reason for that? We have heard in this Inquiry over and over again how terribly significant it is to be able to track one of those alarms?-- Yes.

Did you ever turn your attention to that?-- No, I didn't, but I have since drafted a memo to go out to all mines about protocol.

Is it fair to say then that it was something that was not apparent to you as requiring attention?-- That's correct.

You did not perceive the need to look at that area?-- Not at that time.

It would be right to say then that no direction, either oral or otherwise, was given by you to this mine in relation to that area?-- No.

Did you ever see the machine operate in terms of looking at

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the sequence of acknowledgment?-- No.

Did you at any stage ask to be given a run-through to see what the limitations on the machine were?-- No. You would need to know a lot more about it than I had time to investigate, and I just couldn't do it.

Well, we heard from month to month your inspections would turn up random or haphazard checks?-- Yes.

And this one never surfaced in all those checks?-- No. They were random, not haphazard.

All right, I will accept that correction, but let me ask about this: you say you took no notes of those inspections?-- It depends what you mean by "notes". Notes in a notebook or notes as in the mine record book?

Let's deal with each category. Notes in a notebook?-- Notes in a notebook. I tend not to - I keep notes in a notebook but I tend to make cryptic remarks so that if the notebook turns up at another mine they don't get any inside information on it.

I see, all right. Those cryptic remarks end up being translated in some form into a letter by you that gets pasted in the record book?-- Yes.

How can we check then in relation to any particular inspection just what it was you saw and did?-- The more important points would be noted in the mine record book.

But that's the product of some dictation by you at some later time, isn't it?-- In the case of Moura most of the reports were written on the day of the inspection.

And the typed ones, when were they produced?-- Beg your pardon?

The typed ones that get stuck into the record book?-- Yes, they are - could I explain that in the case of Moura I used to write the record book entry, I take the copy back to the office, they would type it up and send another copy to the mine that could be pasted in the mine record book and copies made and placed on the noticeboard if necessary.

Was there occasions when you would not have an entry handwritten in the record book but later on you would send a written form?-- There was the odd occasion, yes.

What was the system of recording what you saw at the mine? Was it merely whatever cryptic notes you made in your notebook?-- Yes.

What happens to those notebooks?-- Some of them probably go through the wash, but, no, they are discarded.

Are all your notes of what you inspect fully transcribed, or would they make no sense because of their cryptic nature?--

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I translate them into readable English and they either appear in the mine record book as handwritten entries or the typed ones that come from the office.

And then all that's retained in the department files would be the copy of whatever it is you put in the mine record book?-- Yes.

With no way of checking whether that's an accurate assessment of your inspection or not?-- There are generally more items discussed during an inspection than appear in the mine record book, that's normal, but they are not of a serious nature as the items that have been put in the mine record book.

But obviously, nonetheless, significant enough to be discussed at all to spend your time?-- Yes, things that may be of a housekeeping nature or something like that. If it's not a serious item it would be discussed but not entered in the record book.

You obviously didn't, or the department doesn't see it necessary to have some fully blown system whereby you record every detail of what you do and then track it through, say, a QA system. You don't see that as necessary?-- No, we haven't progressed to that stage yet, but there is an element of trust between the Inspectorate and the people we deal with.

Quite?-- And if an item is not of a serious nature it is mentioned and generally it's acted upon.

I accept that, I accept that fully, but there is still no system - when we are talking about systems in order to track information, there is no system that the department has beyond whatever ends up in your report?-- Not at this stage.

And if you fell under a bus, there is no way of telling what you discussed, apart from what appears in your report or the cryptic notes?-- No.

Is there any system for, in any way, tracking what oral conversations you have had that don't appear in the notes? We have had a number of questions directed here about the auditing of oral conversations. Is any system in the department for auditing oral conversations?-- Not at this stage.

Is it intended to have one, do you know?-- I cannot speak for the Chief Inspector.

Do you see it as being particularly helpful to you in the performance of your job to be able to audit the oral conversations with numerous people on numerous occasions?-- Not necessarily.

Tell me, when you were - turning back to the Unor again, is it fair to say that your perception of the way in which the Unor system has operated was that people were adequately trained on it?-- There were a limited number of people trained on it.

It's not the sort of system that you would like to see every man Jack being able to do things on, is it?-- No, certainly not.

And you don't want dirty miners - if you pardon the expression - wandering around in the equipment room, do you?-- No, it's to be kept clean.

And, likewise, you wouldn't want every man Jack able to work on the chromatograph and, likewise, bring in whatever amount of coal dust he had on him to interfere with that equipment either, would you?-- That's not ideal.

In both of those cases the appropriate way to approach it would be to have a limited number of people only who work on those machines?-- So long as there is sufficient coverage of various shifts and so forth.

That's right, and it may be that as long as you had a person present at any one time to operate those machines, that would be sufficient?-- If you had one person at all times, that would be sufficient.

And, likewise, your perception of the way in which the Unor system was operated would have led you to the conclusion, can I ask you, that there was adequate control over the use of it by reason of the fact that there were only a limited number of people who seemed to use it?-- When you speak about control, I did audit the fact that samples were sent through to SIMTARS Mondays and Fridays, and I think there was one other day that they did a test, but there is other days when they did tests but they weren't transmitted to SIMTARS.

But from your assessment as an Inspector, the system is both successfully - on a number of scores was successfully operating, people were adequately trained and it was adequately controlled?-- I think you could always have a few more persons trained just in case you have persons going on holidays, might be sick, you need to have sufficient people trained.

And you are here -----?-- Not just three shifts, you need a few extras.

You are talking now about the gas chromatograph in particular, aren't you?-- Gas chromatograph or knowledge of the Unor.

Once again, it is a question of having sufficient people to cover the period of time?-- Yes.

As long as you do that, then you are covered at the mine, aren't you?-- Yes.

Now, in relation to the problem you discovered to do with monitor points, you mentioned that that was either the second or third last inspection you did this year?-- Yes.

So, we are talking a period back two or three months at the most - from August that is?-- As best I can remember.

And, in fact, what was the difficulty, one point was not registering the correct amount of gas on a span, was that the problem? It doesn't sound -----?-- Yes, it wasn't -----

Not the delay time?-- It wasn't showing the right span, the 44 ppm.

In relation to that, you said you had in fact raised that with Dennis Evans?-- Yes, I mentioned it to him and he showed me where it was mentioned in the workbook to be attended to, and he did explain that it was a matter of the labour force available to track it down.

Because, in fact, it could be quite a time-consuming exercise to backtrack a leakage in one of, say, 15 or 18 tubes?-- There is a number of junction boxes en route down the mine and one has to work from one box to the next to ensure that the integrity of the tube between those boxes is intact.

And, in fact, as one progresses through the mine, it's one thing to check a single tube, infinitely more complex to check it once it's in a contained bundle of seven tubes?-- When it comes to a junction box it's a little easier, the tubes are coloured.

From what you said, you were satisfied with the explanation you got in relation to that?-- Yes. If it hadn't been attended to in reasonable time in the future, I would have probably raised it again because I had it in mind.

Well, what system was there for bringing it up again beyond the fact that it was in your mind? From the department's point of view how were you going to keep a record of it?-- No record as you point out.

It seems the department had very similar systems to No 2 Mine, would you agree? Not everything committed to writing but trusted to people with experience; would that be a fair comment?-- There is an element of trust between the people involved, yes.

And it's worked successfully in the past?-- To date, yes.

And you have no reason to think it wouldn't work in the future?-- Well, we can probably all find improvements to the two systems, but it was working, yes.

True, we can all live with counsels of perfection and no doubt improve our performances, but you would, no doubt, see it operating successfully in the future?-- Yes.

Now, we heard in relation to the span tests that one of - I was going to say the only one, but I won't go that far just yet - one of the points that did register less than the appropriate span level of gas was point 8, which was on the way to North-west, opposite the junction of the 5 South entrance?-- I can't remember which number point. It was just that there was one point and that was the crux of my discussion with Mr Evans.

And from your point of view, it was sufficient to give effectively the direction that it was to be done as soon as it could be done within the scope of manpower availability and so forth?-- Yes, as soon as it was practical.

Now, you mentioned that - in the Unor room the record of those points in the span tests was on the wall beside the Unor machine?-- It was stuck up with sticky tape - masking tape.

No difficulty in recognising what that document was from your point of view?-- I don't believe it had a title on the top of the sheet. It was just a sheet of paper ruled with columns and - it was a working document.

It was a working document. So, from your point of view, was it adequate in order to let you do your job that next to the Unor machine the records of the span gas tests be kept?-- I could see the various points on the test that were carried out, yes.

I take it from what you said before that you did not at any stage think it necessary to check through to see whether the sequence of acknowledgement could or could not result in the siren being disabled?-- No, I didn't get around to that.

All right. Did you at any stage test any part of the alarm system?-- I don't believe so.

All right. Can we draw from that that you didn't think it was necessary to do so?-- By the tests that were carried out and the various questioning that I did of the people - Max Robertson, Dennis Evans - the answers that they gave to me were consistent with how it should operate, and I didn't feel it was necessary to go any further.

It seems from what you say - tell me if I'm wrong - that, in fact, you did get some sort of a run through, even if it was only oral, on how the system operated?-- Yes, but when you are dealing with a number of different mines with different systems, it becomes difficult to recall and remain familiar with each one.

I understand. But you knew from the rundown you got that the acknowledgement procedure necessitated the insertion of some numbers in the machine?-- I didn't get that - didn't get it to that degree.

All right. So, you didn't get to the stage of considering whether, in fact, certain numbers should be inserted and not others?-- No.

Did you at any stage think it was either appropriate or necessary to have some sort of description in the Department records of how the system operated?-- No, not necessarily. If we needed details of how the system operated, we could have called upon Maihak to present the instructions in booklet form.

Or alternatively someone at the mine?-- Yes.

So, from the Department's point of view, it wasn't necessary to maintain an up-to-date record of how that system operated. It was sufficient that you could call on those who knew?-- We'd realised that we could call upon that information at will.

Your Worship, if it assists, I won't finish with Mr McMaster this afternoon. I am about to move to a point which will probably take longer than five minutes.

WARDEN: Is it related? Can you get it out of the way this afternoon? This next point - is it related to what you have been on at the moment?

MR MORRISON: No, it is a different point.

WARDEN: Okay. I anticipated we would have to adjourn until tomorrow. Thank you, witness, you may stand down. You will be required tomorrow morning. 9.15 a.m. tomorrow morning, gentlemen.

THE COURT ADJOURNED AT 4.54 P.M. TILL 9.15 A.M. THE FOLLOWING DAY

WARDEN'S COURT

MR F W WINDRIDGE, Warden and Coroner
MR R J PARKIN, General Manager, Capricorn Coal Pty Ltd
MR P J NEILSON, District Secretary, United Mine Workers' Union
MR C ELLICOTT, Training and Development Officer, Department of
Mineral Resources, New South Wales
PROF F F ROXBOROUGH, Professor of Mining Engineering, School
of Mines, University of New South Wales

IN THE MATTER OF A CORONIAL INQUIRY IN CONJUNCTION WITH
AN INQUIRY (PURSUANT TO SECTION 74 OF THE COAL MINING
ACT 1925) INTO THE NATURE AND CAUSE OF AN ACCIDENT AT
MOURA UNDERGROUND MINE NO 2 ON SUNDAY-MONDAY, 7-8 AUGUST
1994

GLADSTONE

..DATE 14/03/95

..DAY 43

THE COURT RESUMED AT 9.15 A.M.

ALAN EDGAR McMASTER, CONTINUING:

WARDEN: Thank you, witness, you are on the former oath you took yesterday; you understand that?-- Yes.

Thank you.

MR MORRISON: Mr McMaster, yesterday we were discussing a number of aspects of the inspection of the mine, and we last touched on - sorry, is your machine on? It is. We last touched on aspects of the Unor system and the Maihak system and you were mentioning that you, in essence, relied pretty much on the fact that Maihak came up and serviced regularly and recalibrated regularly to take care of that side of the system?-- Yes.

Now, I want to move to a slightly different point, and that was you mentioned in relation to reportable incidents that you had prepared, or about to prepare a draft letter and that in conversation with Mr Schaus he really took the ball further on himself?-- That's correct.

And, in fact, as I understood your comment, he in fact went further in his memo than you intended to go in your letter?-- Yes.

What was that further aspect or aspects?-- The degree of investigation that was to be carried out by the mine personnel.

The response that he gave in the memo, was it something that you discussed with him before he sent it out?-- Yes, I told him what I had intended to write in my letter and he incorporated that, plus a little extra.

And the essence of it was that production would be stopped and the machine quarantined -----?-- Until the investigation was complete.

Now, the reaction of Mr Schaus on that occasion, that is to say, by accepting your suggestions and in fact going a little further, is it reasonable to say that that's a fairly typical response by Mr Schaus?-- Yes.

In your experience, what sort of attitude did he have towards matters you raised and the Inspectorate generally?-- Since Mr Schaus has arrived at the mine cooperation with the Inspectorate was very good, very good.

What about his attitude towards safety matters, so far as you could discern that, and his attitude towards safety programs?-- I had no query with him at all.

Would it be reasonable to say that since his arrival at the mine not only had relations with the Inspectorate improved in the sense that there was greater response but also the safety record improved as well?-- To the best of our perception, yes.

And the response of Mr Schaus to suggestions by the Inspectorate or areas for concern that the Inspectorate might have had, was that reflected also by Mr Mason?-- Yes.

And if I can mention two others briefly: Mr Abrahamse and Mr Barraclough?-- No problem.

And in your estimation, would you regard them as - if I can use some general terms - as people who were responsive to the Inspectorate's requirements and areas of concerns?-- Responsive.

And responsible in their approach?-- Yes.

And safety conscious?-- Yes.

Now, can I turn to one other matter, please, if I may? You mentioned - we talked about yesterday the Unor point that was recording lower gas values than the span test?-- Yes.

I don't want to go back over what we covered yesterday, but you did make a comment, if I recorded it correctly, that as part of your response you directed that it be done as soon as it could be done given manpower availability?-- That's correct.

And you went on to say that if the mining side had - I am paraphrasing here, if you don't mind - if the mining side had seen that it was a priority, the question would have been raised and dealt with?-- Yes, that's virtually what I said.

Now, just on that aspect, did you - you obviously thought that that was an appropriate way to leave the question of determination of priorities, that is to say, the mining side of the operation would speak up and say, "Now I think that really matters to me. Can you put it to the top of the list?"?-- That's correct.

And is that approach, in terms of the system of checks and balances - is that fairly typical of mines throughout Central Queensland?-- Yes.

In your experience, does that sort of system work fairly well?-- In my experience, yes.

I think it's probably reasonable to say that if it hadn't been working well, that's something you would have certainly brought to book in your inspections?-- Yes, it would have been noted in the record book or some other correspondence.

So, is that an example, can I ask, of what might be called practical checks and balances even though they may not be documented in some final form?-- Yes.

And is that approach to systems in mining one which applies to many mines, if not all mines, in Central Queensland?-- Just about all mines.

Is it reasonable to say that there are substantial parts of the systems of control at all mines which are exactly that, that is to say, practically based even though not documented?-- Broadly speaking, yes.

And, in your experience, do those practically based systems operate successfully?-- It's been my experience, yes.

I think you have been an Inspector for quite some considerable period of time; is that right?-- Yes.

Can you tell me approximately how long? I can remember back to '87 but I can't remember earlier than that?-- I started in '64 and had a brief period out of the Inspectorate; working in the mining industry but out of -----

Let's just deal with the period before August '94 - I am not talking back to the 60's or even the 70's - in the couple of years before August '94. In terms of the systems that were operating at Moura - and I am here referring to not only the Unor system in terms of its recording and control but also systems of communication, reporting in terms of deputies' reports and undermanagers' shift reports and things - can you make some comparison between those and the other Central Queensland mines?-- I couldn't make any comparison about deputies' reports and things like that. My field is the electrical field, and I believe there is a somewhat similar reporting system at most mines, on the electrical side at least.

The electrical side of reporting was, to one degree or another, documented but not fully; is that right?-- It's quite well documented. There was shift reports and work sheets, fairly well documented, yeah.

And the standard of reporting that applied in that system of reporting for the electrical side, did you have a comment to make about that?-- It was quite adequate. From time to time comments were made and they were accepted and slight changes could have been made, I think. I can't give an actual instance, but it happens from time to time at all mines.

I was just about to ask you that, in fact. In so far as you can comment about the system of reporting at Moura, is it pretty much on a par with the system of reporting at other mines?-- Much the same, yes.

We have heard a lot in this Inquiry about the need for ultimate documentation at every step effectively - perhaps I am overstating it a little, but I doubt it - documentation of - full documentation of all reporting systems. Now, does that actually happen anywhere in Central Queensland?-- That's a fairly difficult question but -----

Perhaps I can put it more easily. In terms of a comparison, are the reporting systems in Central Queensland mines a mixture of documentary reporting and practical reporting?-- You could say a mixture.

In your view, is that a reasonable system to have in terms of its success of operation?-- It appears to have worked quite well in the past, and when we find difficulties we try and correct those difficulties.

And I think I touched on this yesterday, but it's, I think, a reasonable comment to make, would you agree, that in fact the Inspectorate operates pretty much on the same basis: there is a degree of documentation but not full documentation and the balance is made up of practical experience and practical reporting?-- That's correct.

And is it reasonable to say also that, clearly enough, the Inspectorate, for its own part, considers that to be an appropriate way to conduct its business?-- To date, yes, that's been successful.

That's what - I was about to move to that as well. It has in fact been successful and there is no reason to think it wouldn't continue to be successful?-- From time to time we do make improvements, and there is a move now being made towards auditing and there will be greater documentation in that system.

Is that, in a sense, the change in perception of the role of the Inspectors from - if what can be called, colloquially, policemen to, colloquially, auditors?-- I don't like the term "policemen".

I don't mean it in an offensive way?-- But it's a method of documenting the procedure.

Now, can I turn to another aspect, if I may, a general one, and that is the use of the gas chromatograph? That instrument fell within the province of your inspections from time to time, isn't that right?-- At Moura I took an interest in it, a passing interest.

One of the central people in terms of expertise in the use of the machine was Mr Robertson, I think?-- That's correct.

And you also knew about Mr Selff?-- Yes.

Now, is it an accurate statement to say that you did not perceive the need to ensure its use any more than it was being used?-- I was attempting to ensure that the equipment was ready for use if necessary.

It was in fact tested and recalibrated regularly, wasn't it?-- Yes.

And your experience with it would suggest that it was ready for use almost at any time?-- Well, it was proved to be operative at the time it was needed on 8 August.

That's a comment that probably can't be made of all mines in Central Queensland; is that right?-- I know of one that doesn't.

Doesn't what, doesn't have a chromatograph?-- The chromatograph is not operative at the moment. They have other arrangements in place to take the place of it.

You obviously thought, at Moura No 2 at least, that there was an appropriate level of testing of the machine, an appropriate level of keeping it in readiness for operation?-- Yes.

But is it right to say that you did not consider the need, or there to be a need for it to be used in a different way than it was being used?-- I was only interested in the testing and calibration of the instrument. I wasn't interested in the use of it. That's in the mining province.

Okay. Well, let me ask this question: as I understand it, all Inspectorate reports, be it from Mr Walker or from Mr Bell, are circularised to the other Inspectors such as yourself?-- Yes.

And you sign them off; there is a stamp on the form and you initial off that you have seen and read the report?-- Yes.

And in that fashion, even though it's not your area, you would in fact be kept up to date with what was happening in other areas of inspection?-- When it was mentioned in the report I would read that report, yes.

That's the whole purpose of distributing those reports, to make sure that everybody is keeping up to date with all areas?-- Yes.

Even though you specialise. Now, can you recall seeing any other report that's come across your desk, and you have to initial or otherwise, that did suggest the use of the gas chromatograph in a fashion other than it was being used?-- Not that I can recollect.

Am I right in saying that the use of the chromatograph stemmed out of the 1986 incident, in the reporting to that Inquiry?-- Yes.

And the problem centrally there was that there was no chromatograph on site when that incident occurred?-- Yes.

And that there were considerable delays in transferring a chromatograph from Brisbane to the mine site?-- Yes.

Which included also logistic delays in coordinating services, air services, out of Amberley?-- That's correct.

The result being that not only was there a considerable delay, but when the machine arrived on site it just couldn't be used at all?-- That's correct, yes.

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A long period of time had to be spent recalibrating it entirely; is that right?-- That's correct.

And that was the thrust out of '86, that because of that delay, time and calibration problem because of vibration in movement, it was appropriate to have chromatographs on site?-- That's right.

XXN: MR MORRISON

WIT: McMASTER A E

Can I turn to another topic, and that is the span gas tests that we mentioned briefly yesterday? That was another area which, in a sense, fell in your province in terms of checking the equipment and calibrations and so forth?-- Mainly because at Moura the electricians looked after the system.

Right. So, because they did look after the system, including their stand on the - sorry, I phrased that badly - their role in monitoring the screen while the checks were done, it did fall within your province?-- I felt it did.

Is it right to say that you yourself were aware of the method that was used to conduct the span gas tests?-- Yes.

By which I mean a deputy and miner down the pit putting the gas in in some sequence that's prearranged and the electrician sitting at the screen monitoring?-- Yes.

Is that a system that is used in other mines - well, those other mines that have a tube bundle system at least?-- I know a number of mines that do use that system, not necessarily in tube bundle fashion, but the method of testing the monitoring system.

So, this system was not out of the ordinary at all?-- No.

You, in monitoring that from time to time, is it right to say, clearly saw no need to change that system of doing the tests?-- No, no.

That was a system that, in your experience, operated successfully?-- It appeared to work quite successfully.

And was appropriate?-- To the best of my knowledge, yes.

In terms of the data it generated, is it right to say that you felt able, because of the data generated, to keep up to date with what was happening in that system and its calibration?-- I felt it was sufficient, yes.

That's another system that wasn't documented to the nth degree but relied upon custom and practice, if one can call it that; is that correct?-- You could say yes, yes.

Nonetheless, you considered that to be a successfully operating system?-- At the time, yes.

When you attended the mine for your inspections, I think I understood you correctly yesterday to say that you would write in the record book while you were at the mine and then send later a typed version of that to be stuck into the book?-- Yes, most times I wrote the record directly into the book and, as you said, send the typed copy.

Now, on those occasions did you read back through the record book? Was that your habit?-- Not every time, but, yes, I did look back and - you sort of develop a system of memorising - when you go to a mine, you remember what the problems were last time and sort of zero in on those.

And am I understanding you correctly to mean that you would read back to your previous inspections, or would you read back generally in the record book?-- I would mainly rely on memory, actually.

So, if you needed information, how would you go about getting it? From the record book, from some document or from persons?-- From our own records, too. We keep a copy of all those records in our office and, yes, I could look up those records.

You wouldn't have access to them while you were at the mine site if they were back in the office?-- No, we would go to the mine record book then.

If you needed further information, would you get that by asking whoever the relevant person was to explain something?-- Yes.

And that system of getting information from individuals orally worked perfectly well?-- Didn't have any problem.

No difficulty in extracting information, no difficulty in accepting its reliability?-- No problems.

I just want to ask you about the results of a number of your inspections, just in general terms, firstly, and I wanted to have a look at a couple of documents, but the general question I want to ask you is this: from time to time you would have noted in the record book the entry of documents by district inspectors?-- Yes.

Now, what did you see as their role, or did you understand their role to be in relation to the placing of records in the record book?-- Well, they were virtually doing an inspection of the mine, somewhat similarly to what we did. They have different methods of operating, but the outcome is the same. They write a report indicating any faults that they might find, and hopefully those are attended to.

Now, I assume that there is no liaison between the inspectorate and the district union inspectors in the sense of co-ordinating visits and being answerable to one another. You each perform an independent task?-- There is no co-ordination of visits. The check inspectors do provide us with a copy of their reports since about 12 or 18 months ago.

Did they not provide you with their reports before that time?-- Well, I don't think it was deliberate, but, no, it just didn't happen.

All right. So, in fact, inspections by a union inspector could occur without your knowledge and could relate to matters that are entirely different to your concerns?-- Yes, if - we would see their report in the mine record book and be aware of their problems.

Now, on occasions you did do inspections of Moura No 2, you

would record in your written form that got pasted in the record book comments about what you had done, examples of those are, for instance, auditing the hand held instruments?-- Yes.

Another would be looking at lost time injury frequency rate improvements?-- I made a comment about the good record that the electrical section had. I thought it was appropriate to record the fact that they had a good record.

In fact, by July 1994, they had managed 1,198 days since their last lost time injury?-- That's as far as I know. That's probably right.

I took that figure from your report, so that's a very significant period of time without injury, isn't it?-- Yes.

Now, I might just ask you to look at a number of documents. I just want you to confirm some matters for me that you have recorded from time to time. Have a look at this. These are copies of reports by you that have been put in the book from time to time. If you flick through them, you would probably be able to confirm them in the global way and then I want to take you to some aspects of them. Try and keep them in some sort of order?-- Yes. There are some reports that I have written and some from check inspectors and some from Mr Walker.

I will take you to each of them, but if I can do it in chronological sequence? The first I want to take you to is one on the 31st of October 1990. Should be the top four - it was the top four?-- Yes, it was the top four.

Now, in these documents you record matters of moment, matters that you think require recording in both the record book and the inspectorate's own documents. On that one, if we look at the last paragraph, one of the things you carried out that day is maintenance and testing of cap lamps and self-rescuers were audited?-- Yes.

And the insulation and resistance and earth leakage tests were audited?-- Yes.

The results of your inspection that day were that those systems were being carried out satisfactorily?-- Satisfactorily.

Certainly if there had been any difficulty, you would have noted it and taken some steps to correct it?-- Yes.

Can I ask you to look at the next one in time, which should be 15 January 1991. I don't mean to suggest that I've given you every inspection note. It will be apparent by the dates that I haven't. I've just selected a random number. I'm sorry, that's Mr Allison's report. I beg your pardon, I should have made that clear to you?-- 15 January, that's Mr Allison.

15 January 1991?-- Yes.

Now, that's an example of a report put in by a union check inspector, by which I don't mean a mining officer, a district check inspector, and that would come to your attention, would it not?-- I can't recall seeing that one, but, yes.

Routinely it would?-- Routinely.

I think you might see, in fact, there is a signature by you?-- Yes.

EIOCM, Alan McMaster?-- That's right, I must have seen it.

That's the sort of report that a union inspector puts in and comes to the attention of the inspectors and is circulated to all inspectors as well?-- Yes.

In terms of an inspection system, there is not only your own work, but fully circulated the work of the district union inspectors?-- Yes.

And, of course, their job is taken seriously by them and by you as well?-- Yes.

And, of course, the management; would you agree?-- Yes.

Now, can I ask you to look at another document, which is by yourself, 21 March 1991? Now, on that occasion - have you got that one?-- I've got the 21st of March 1991.

On that occasion you, in fact, involved yourself in three sessions of tool box meetings; is that right?-- Yes.

Involving all the electricians, except those on rostered days off?-- Yes.

Now, that was obviously for the purpose of communicating a particular topic, and the items covered included details of recent near fatalities, highlighting a need for total concentration when doing certain types of electrical work, and so forth?-- Yes.

In your experience, were those tool box meetings a good and practical way of dealing with safety topics and disseminating information to the men?-- The ones that I attended certainly were, but I can't say that they all were.

The ones in that category, so far as your experience is concerned they were effective?-- Yes.

Now, they were meetings that weren't documented, in the sense that there was no agenda or minutes?-- I don't believe those tool box meetings were.

Or even handouts of material, but nonetheless you regard them as an effective and practical way of communicating information?-- Yes.

Did you do that sort of thing often; that is to say, joining in tool box meetings?-- Only when I happened to be at the

mine when there was a tool box meeting programmed. I have done it at a number of mines when there has been specific items that I wish to communicate to all the electricians.

And now, in terms of the use of the tool box meetings, as a way of communicating information, is that something that is also common to many mines?-- Yes.

And in its, what I might call unstructured form - that is to say, tool box meeting on a topic, but not documented, not with curriculum for the meeting, or handouts or anything else?-- In present times they are usually documented with an agenda, and the persons who attend are nominated there on the-----

Yes?-- On the minutes.

We have seen examples of that at Moura at safety meetings where people signify their attendance?-- Yes.

There is some regularity about it. But that doesn't have to be the case in a tool box meeting, does it?-- No.

You don't see that as necessary for the efficacy of such a system?-- I would rather that the minutes were kept so that there is some record of the topic and who received the benefits of the discussion.

That doesn't impinge on the efficacy of communication in the first place, does it?-- No.

Can I ask you to have a look at another one, which is on 22 May - that's yours again. Now, I note at the bottom of that one that there were audits done on that day by yourself on statutory tests, telephone coupler tests, hand held gas monitoring devices and hazard register?-- Yes.

I assume from the absence of any adverse comment that in fact the audit was satisfactory?-- Yes.

Can I ask what the hand-held monitoring devices were?-- The gas monitoring instruments, the hand-held ones that the deputies use.

Were they Dragers at that stage?-- I don't know what they were at that stage, but I was checking the records of the instruments having been calibrated, sent away to be calibrated on the six monthly interval.

As early as that date, by '91, the audit showed a satisfactory level of attention to those things?-- Yes.

That I think is a comment that applies throughout the time that you inspected Moura, say if we take '91 through to the incident in '94?-- Yes.

Your inspections revealed satisfactory - by way of audit, satisfactory standards of testing in the equipment, their use and the calibration of the equipment?-- Yes, the records of the calibration were okay, satisfactory.

Can I ask you to look at another one, that's 30 January '92, next in time by you, and once again you were auditing the records of maintenance on the hand-held monitors, a slightly different thing to the calibration. This is now maintenance of hand-held monitors; is that right?-- It's just a different choice of words.

Same thing though?-- Yes.

Once again satisfactory?-- Yes.

Can I ask you to look at 1 April '92 which is another one by yourself next in time. When I say "next in time" I don't mean it was the next inspection you did, it's the next in time of the bundle that I've given you. On this occasion you addressed another tool box meeting of electricians; is that right?-- Yes.

It says, "While the miners were attending a meeting ..."; can you recall what that meeting was? Was that their own safety meeting and you took the advantage to gather the electricians off for your own tool box meeting? If you can't recall -----?-- I can't recall. They may have been having their own meeting and I just sat in on it.

I want to direct your attention to the next that bears your signature. That's 8 September '92?-- Yes.

Now, this was an inspection conducted by a number of the inspectors, My Lyne, Mr Mackie, yourself, along with the manager and the miners' officer, Mr Byron?-- Yes.

Byron as it's recorded?-- Byron.

If you look at the third last paragraph, that's a comment that

accurately reflects the result of the inspection that day,
"Standards generally throughout the mine were good."?-- Yes.

And it mentions in the last paragraph a lost time injury
frequency rate of 53 and the comment is that's a good
achievement and an indication of a much improved safety
awareness of the workforce?-- Yes.

You agreed with that comment at the time?-- Yes.

That in fact got better, didn't it, as time went on?-- Beg
your pardon?

That approach to the safety awareness and the LTIFR got
better?-- It got better, yes.

Can I ask you now to look at the report - I think it's
Mr Walker's of 19 November 1992. I think that's been copied
to you and you have initialled it on the right-hand side?--
Yes.

In line with what we were discussing before, reports by other
inspectors would be circulated to yourself in order to keep
you abreast of standards generally and matters happening in
other areas that weren't your specialty?-- Yes, my signature
is on there.

This is one such report?-- Yes.

And contains the comments towards the bottom of the page,
"Good standard of housekeeping was evident in all sections.
All operations were found to be satisfactory."?-- Yes.

Now, that accords with your own inspections around that time,
that is to say November '92, operations were satisfactory and
standards were good?-- I presume so, otherwise I would have
noted it.

Correct, good. Now, can I take you then a little closer in
time to 5 May '94, your own report? The second paragraph
notes in relation to 512 section an inspection by you, this is
at a time when 512 was in extraction, "Remote control miner
was being operated safely with the operator standing back past
the tail of the miner."?-- Yes, we had had instances where
the operator of the - with the remote control device was
standing, in our opinion, too far forward of the machine and
not in a safe position, but in that instance he was standing
back in the appropriate position.

You knew this to be part of the system in terms of remote
control of the miner to ensure that people weren't exposed to
greater than three metre rib height?-- Yes.

And you considered that to be an appropriate mining system?--
Yes.

And it appeared to operate satisfactorily?-- It appeared to.

I note on the bottom of that report also that you did some

further auditing that day of earth leakage and other statutory tests?-- Yes.

And again found it to be satisfactory?-- Satisfactory.

Can we just go a few days on from that, Mr Walker's report of 10 May? I think that bears your initials on the right-hand side, or maybe that copy doesn't. Let me show you -----?-- I don't have it on this copy, but, yes, I say I would have seen that one.

I will show you the one that's come out of the record book itself. It's a copy of the same document that bears your initials. That document deals with the participation in the risk assessment for 512 Panel?-- Yes.

You were clearly enough aware of that risk assessment and the fact that it was occurring?-- Yes, I was aware it was occurring. I didn't have any input.

No, I understand you didn't participate in it, but Mr Walker did?-- Yes.

And the results of that would have been disseminated to you by Mr Walker even in brief report form?-- In brief.

Do you agree with the comments in so far as you received a report in the last paragraph of that report, that's a report of 10 May?-- Yes.

They are that management were to be commended for committing to the processes of the risk assessment and in particular for embracing the greater involvement of the workforce?-- Yes.

You thought that was a good step yourself?-- It's a good step in any mining set-up.

And the way in which the persons approached the risk assessment was very professional and objective and there were positive indications that the workforce as a whole was taking a keen interest?-- Yes, it was on the improve.

Your own inspection in contact with people such as Dennis Evans and Max Robertson would have suggested that to you yourself, wouldn't it?-- Yes.

The last document I need you to have a look at is your own of 27 July '94. I think you will see on the bottom paragraph that figure that I mentioned to you before, "Electrical department have shown a steady improvement in their accident statistics and at present" - that is 27 July 1994 - "1,198 working days since the last lost time injury."?-- I believe in giving credit where credit is due.

I accept that, but that is, would you agree, an excellent record to have, that many day lapse since the last lost time injury?-- Quite good.

Is that matched by any other mine in Central Queensland?-- I

couldn't say that for sure.

None springs to mind though, does it?-- No.

Can I ask you some other matters if I may? As an inspector, and receiving copies of other inspector's reports - yes, I suppose I should tender that bundle of the reports to which I've just taken Mr McMaster. If we can have it back I'll put it back in its chronological form and then tender it. I perhaps should indicate they all come from the mine record book. They are already in evidence in a sense.

WARDEN: Copies extracted from the mine record book as referred to by the witness, Exhibit 207.

ADMITTED AND MARKED "EXHIBIT 207"

MR MORRISON: Mr McMaster, I was going to ask you about whether, even though you were specialised in the electrical side of inspections, you took an interest in other areas as well or were aware of other areas as well?-- Naturally.

One of those areas might be spontaneous combustion as a hazard at No 2. You must have been aware of that or had an idea of that?-- I would say I would be less aware of that than other aspects of the mining set-up.

What was your perception as at August '94? What was your perception of spontaneous combustion as a potential hazard at No 2?-- I knew there was a possibility.

No more than that?-- What I could say? It was a possibility.

Did you regard it as the main hazard at No 2 or were there other day-to-day matters that were, in your view, of more importance?-- I felt that there were other hazards that were - methane, methane drainage and my own specialty, the cable flashes, were more of a problem as far as I was concerned as an electrical person.

Did you yourself take any steps to ensure that the people at the mine were aware of the hazard, the possibility of spon com?-- I had no input as far as spon com was concerned.

Is that because it's not within your area as an inspector or is there some other reason?-- No, that's correct, and my lack of knowledge of spon com.

When you say "lack of knowledge of spon com", have you never seen the need to sort of become as fully educated as we have heard mention in this Inquiry about spon com?-- I rely on the experts.

Do you know of any action by way of seeing other inspectors' reports come across your desk in the circulation that we have

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heard about, of any other step taken by any other inspector in order to increase awareness of spontaneous combustion at No 2?-- Not that I can recollect.

Have you seen any other report by any other inspector in that circulation process that suggests any other inspector has in fact taken some action to do that?-- I can't recall any specific occasions. However, there could have been.

It's possible, but you can't - none spring to mind?-- Not at this time.

Did you have any part to play in the review of the Part 60 submission for extraction of 512?-- No.

Is that because there are no electrical aspects to it or -----?-- That's correct.

Most extraction plans for a panel would include positioning of a transformer and monitor points, would it not?-- I don't believe the positioning of the transformer was part of the submission.

Monitor points?-- I'm not certain. I couldn't say specifically.

Do I draw from your answers that in fact routinely you don't involve yourself in Part 60 submissions for extraction?-- Could you repeat that, please?

Am I right in assuming from your answer that as a matter of routine you don't get involved in the Part 60 approvals?-- Not normally, but if there is an item there that Mr Walker thinks that I might have an input about he would ask me, yes.

Did you have any involvement in the refresher training side of improvements at No 2?-- No.

Was there any refresher training that the Inspectorate dictated for electricians, for instance?-- No.

Have you seen any memorandum or report that's come across your desk from other Inspectors that suggest that they were taking steps in relation to refresher training at No 2?-- I believe there were a couple of items where refresher training was mentioned in reports, but I couldn't be specific.

You can't recall the details or the topics?-- Not accurately.

You yourself attended a conference, I think, to establish competency levels in training for engineering stream personnel?-- Yes, that was only a one day conference and there had been quite a deal of work gone on before that particular conference and I wasn't able to attend any later one, so -----

So, do I understand from that that nothing came of that, the attendance at that seminar?-- Not from my perspective.

Were you involved in, or did you know about the 1989 seminar by SIMTARS?-- I knew of it but I wasn't involved in it.

Did you ever receive the material and have a chance to peruse it?-- No.

Did you ever see any of the videos that were done of that seminar?-- No.

Well, we have heard that videos were done of it; if not all, then certainly a lot of the seminar. Do you know what's happened to those videos? Can you help us?-- Not at all.

Have you -----?-- I would say the videos are much more acceptable than the big volumes of words - more acceptable to the workforce.

Absolutely, that's just the point I am getting at. Have you ever seen any memorandum that's come from other Inspectors or any source at all that suggested that someone has taken any step at all to promulgate those videos so that the workforce can see them?-- Not to my knowledge.

You know that that seminar hasn't been repeated?-- Yes.

Do you know if there is any particular reason for that?-- I could hazard a guess, that money wasn't forthcoming for the continuation of that program.

We have heard that in fact there was some discussion at the seminar that it was intended to not only repeat the seminar but to repeat a version of it for persons at lower levels than the first seminar had been pitched?-- I understand that's correct.

Have you ever seen anything that suggested that such an activity was carried out, that it has been repeated or planned

to be repeated?-- Not to my knowledge.

Do I take it that you would consider it would be an appropriate thing to have that seminar either repeated or modified and repeated?-- As events have shown, it would have been ideal.

And it would be appropriate to make use of the videos from the first one in so far as they are applicable?-- I have got to agree there too.

For the very reason that in terms of training a workforce, the video is an obvious and easy and receptive tool compared to reading one or two or three huge volumes?-- Yes.

But as I understand what you say, whilst the existence of those videos was known to you, you have never in fact seen them yourself?-- I didn't know that they existed.

I am sorry, you didn't even know they existed, I beg your pardon. Now, in terms of the monitoring of gases at No 2, you had some involvement in that in terms of your inspections of the equipment that governed the monitoring of the gases?-- Yes.

Did you have any knowledge about CO make yourself as at August '94?-- Very, very basic.

Now, we have heard comments made from time to time that there was some change in the industry in either '87 or '88 from parts to CO make. Have you ever been aware of that change in emphasis?-- Just vaguely. It wasn't a thing that I followed particularly. I concentrated on the electrical problems.

If there had been the change in the terms that we have heard, that is to say, to the new world or the new technology, it's sort of something that you would know a bit more about than just a vague memory?-- I was aware that ventilation and air flow had a part to play in the whole exercise, yes.

In terms of your inspection of mines in Central Queensland, in your estimation or your experience, is that continued reliance on parts per million?-- In general, yes.

And particularly so for those persons who have been educated and trained on parts per million?-- Yes.

So that what we have been hearing about at Moura No 2 in terms of reliance on parts is not something unusual at all for Queensland mines, is it?-- The instrument that's used for the parts per million is an older type instrument and it's been in use for many, many years.

I understand that, but I am really talking about whether you can make the comment - I think you can - that what we have heard about Moura No 2 and persons' reliance on parts as opposed to CO make is in fact not unusual, it goes on at many mines?-- It would go on at some mines, yes.

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Given your state of knowledge about CO make, do I take it correctly that you yourself didn't make any check of the CO make graphs?-- No, not at all.

Or of any other aspect of monitoring beyond the capabilities of the machinery?-- That's correct.

Can I come back to another topic which we touched on before, and that is to say touched on it in terms of your knowledge of or assessment of spontaneous combustion as a hazard at the mine. If we took the last few years at No 2, can you tell the Inquiry what your assessment of the major risks would have been in the day-to-day operation at No 2?-- Well, as far as I was concerned the major risks were methane and cables, hanging of cables. That will do.

They would be the main two?-- The two that spring to mind immediately.

Well, we might add in there perhaps, would you agree, roof and rib problems for their obvious impact, such as Dave Camplin had got injured, and miners, continuous miners, that get buried and cables damaged as a result?-- I was aware of the rib problem and it impinged on my work in the cable hanging sections, and it appears in some of the reports, I think, about cable hanging.

You are talking there about correct and appropriate positions of the anchor points?-- Yes.

In fact, the methane drainage performance had significantly improved over the last few years, hadn't it?-- Yes.

To the stage where, would it be right to say, Moura No 2 had perhaps the most advanced and complete methane drainage program in Queensland?-- In my area, yes. I can't speak for the whole of Queensland.

Quite. I am sorry, I shouldn't have asked you to comment on the whole of Queensland, you are quite right, but certainly in your area that's so, isn't it?-- Yes.

I think that's all I have, Your Worship.

WARDEN: Thank you.

MR HARRISON: I have no questions, Your Worship.

EXAMINATION:

MR PARKIN: Mr McMaster, during cross-examination yesterday by Mr Clair you talked about a thermal cut-out device short circuiting. Could you elaborate a bit more on that, please, regarding a conveyor drive on a continuous miner?-- How detailed would you like me to elaborate on that?

Well, I mean, what actually happened with the instrument, for a start?-- Well, the overtemperature device which is fitted to all of those motors on the machines was actually taken out of service. It was faulty, taken out of service and was rendered inoperative.

And that caused - what did that cause, did you say, a small -----?-- Because of the usage of the machine and possible overloading, the motor did overheat.

What steps did you take to make sure that a similar occurrence didn't occur?-- Well, certainly the persons involved were spoken to rather severely and there was a report made on it.

So, are you happy that that occurrence didn't repeat itself?-- I was quite convinced it wouldn't because the persons involved were shaking in their shoes, at risk of having their tickets revoked.

Well, that would be a fairly serious business anyway, wouldn't it?-- Well, it could mean a person's livelihood.

The reason for the question is: it's not a likely scenario in 5 South?-- No, no, not at all.

Now, I think you have said under cross-examination that you were happy with the cable flash situation, the way that it was being tackled and people were progressing?-- Yes, in '94 it was coming along quite nicely. Everything was happening as it should have.

One final point, Mr McMaster: just as a general comment, how did you rate Moura No 2, how did it compare electrically with the other mines that you are familiar with in your area?-- I had no particular concern. My only concern with Moura was that it was a producer of methane and, therefore, an additional hazard as far as the electrical side was concerned.

And that was mainly - I guess your main concern would be the cable flashes?-- Yes.

Thank you.

EXAMINATION:

MR NEILSON: Just one question, Mr McMaster: when Mr Morrison was asking you about the seminar and whether or not it had been repeated or videoed, do I take it that the seminar was in fact videoed?-- I have no knowledge of it.

I understand that you said you haven't seen it?-- I haven't seen it. I didn't attend the seminar, I haven't seen any videos, I don't know of their existence. They could exist, but I don't know of it.

Did I understand you to say that one of the reasons why it probably wasn't repeated was the lack of money forthcoming?-- Well, that's the one - that's the reason that springs most easily to mind.

Is that a problem within your area, the lack of finance - do I take it lack of money in the budget?-- It's always of concern.

To what degree of concern would it be?-- I believe it's becoming more of a concern in latter years.

Can I ask you this then: in your experience, does a lack of finance or the lack of money in the budget impede on the ability of yourself to do your job effectively? Does it hinder you in any way?-- There are a lot of things that we could do given more resources.

Thank you.

EXAMINATION:

WARDEN: I have a couple. Could you turn to your statement, page 4, the last paragraph? Do you have a copy there? Page 4, last paragraph. That information, have you got that noted anywhere or is it from your personal recall of what existed down there at the time from your own inspections?-- You are referring to if the initial explosion was initiated from electrical sources, is that what you are referring to? That's page 5, sorry. Page 4.

Last paragraph. The first half. All that information, did you know that from your own memory or have you got it noted anywhere, written anywhere?-- All high tension isolators and substations?

Yes?-- Yes, that was part of the investigation. We went into all of the equipment that was down the mine and we have turned up the approval documents for all of them.

So, there is documentary material on those matters?-- There is documents to show that that was explosion-proof design, yeah.

We are not relying on your memory of it?-- No, there is-----

XN: PANEL

WIT: McMASTER A E

Considering you made no notes of it on inspections?-- Not on inspections.

Thank you?-- But I have documentary evidence of that.

Could you just tell me again the mines that are in your particular area, and go a bit slowly because the names may be a bit strange to the typist?-- The number of mines?

Yes, their names?-- Or the names of the mines?

Yes?-- Underground mines?

All of them, yes?-- Well, there was Moura No 2, Cook, Laleham - L-A-L-E-H-A-M - No 1, Crinum and Gordonstone.

Are you the only Electrical Inspector in the central area?-- In the central area, there is another one based in Mackay.

And he covers, what, the northern part of that area?-- Yes, from Oaky Creek north to Collinsville.

I take it the electrical section in the mine maintains records of maintenance and repair jobs and that you inspect that periodically when you go there?-- Yes.

And such other things as tag-out procedures?-- Tag-out procedures is one of the main features.

What's the situation with relief when you are not available or you are away, who covers your duties?-- One of the other inspectors, electrical inspectors.

From where?-- Well, generally Dave Horner from Mackay.

So, he looks after your area if you are away?-- Yes.

Thank you.

EXAMINATION:

PROF ROXBOROUGH: Mr McMaster, with regard to cable flashes, is it reasonable for me to assume that the risk of a cable flash increases with the length of the cable unreeled or reeled - sorry, reeled out?-- Yes.

So, there is more chance of a flash when the shuttle car is nearer the continuous miner?-- Yes.

Now, where, in your experience, do most cable flashes occur?-- It's hard to quantify, but there are flashes that have occurred when the shuttle car is close to the miner and the other possibility is when it's too close to the anchor point, as I explained yesterday.

XN: PANEL

WIT: McMASTER A E

Okay. What, in your estimation, would be the closest point to the working face where a cable flash could occur? I am thinking particularly of 5 South?-- Could occur?

Yes?-- The closest place is at the back of the - on the miner cable at the back of the miner if the shuttle car impacted on it.

And is that a high risk area for cable flashes?-- It's a high risk area if the cable attendant is not on the ball.

In your experience and knowledge of cable flashes, is that an area where several cable flashes have occurred?-- There have been a number of cable flashes occur in that spot, but I must indicate that the cable attendant sometimes has to look to his own safety from rib spall.

Is there any limit to the number of repairs that can be carried out on a cable?-- There is no absolute limit, but it becomes an economical assessment as to when the cable is discarded.

As the number of repairs increase on a given cable, does the risk of subsequent fairly increase, do you think?-- You have got to say that, yes.

Yesterday Mr Morrison raised, or alluded, I think, to the possibility of arcing on a 6.6 Kva transformer in 5 South. I presume that transformer was in the intake or is it - was in the intake airway?-- I'm not clear on that. 5 South?

Was there a transformer in 5 South that Mr Morrison referred to yesterday?-- There was a flameproof substation energised in 5 South, yes.

I see. That's perhaps what he was referring to?-- Yes.

And the question of potential arcing of that substation -----?-- There was no indication that there was any fault at that position.

No, but was it a potential source of arcing?-- Well, all electrical equipment has to have a degree of hazard, but the hazard is controlled to a great degree.

Mr Morrison this morning questioned you on your knowledge of spontaneous combustion?-- Yes.

You are an electrical engineer; is that correct?-- Yes.

You wouldn't be expected to have any particular knowledge of spontaneous combustion, would that be correct?-- Well, I'll certainly be upgrading my knowledge from this point on.

Thank you.

EXAMINATION:

MR ELLICOTT: Can you describe to me your expectations for the maintenance and calibration of gas monitoring equipment at underground mines and, in particular, Moura No 2?-- What I was looking for on the records was the regularity of calibration of the instruments, the repairs that were carried out to the instruments when they were away being serviced, the frequency of the particular repairs that have been done to equipment, and there is another point there - I can't think of it at the moment, but that was the main thrust of it.

Where did these criteria, particularly regarding frequency and regularity, come from?-- I believe it is the Australian Standard.

So, you are aware that there is an Australian Standard?-- Yes.

It is my understanding that the Underground Coal Mine Electrical Rules require apparatus to be constructed and installed in accordance with relevant Australian standards; is that the case?-- Yes.

But, to my understanding, they don't necessarily require maintenance to any relevant standard?-- Not specifically.

But, as a matter of good practice, you would probably expect as a minimum that any relevant standard be applied?-- Yes, any engineer - any good engineer would adopt the Australian Standard as a base.

I think you have given - well, you have given me the impression that you were aware of the existence of that maintenance Standard prior to the explosion?-- The maintenance of electrical equipment?

Well, I think it is part of maintenance of explosion protection equipment?-- Yes.

Or something of that kind?-- Yes.

You were aware of that prior to the explosion?-- Yes.

Would it surprise you to learn that Max Robertson appeared to be unaware of its existence?-- Yes, it would.

I wonder if you can describe to me in your own words your understanding of the function of an inspector?-- That's a very - could be a very broad reply, but basically it is to ensure the safe operation of the coal mine.

For the inspector himself to ensure?-- Would you repeat that?

For the inspector himself to ensure, or herself?-- Not himself; to ensure that the mine was operated by others in a safe manner.

Do you think that that function is spelt out in statute? In other words, does the Act and Rules give a firm indication of the duties and responsibilities of inspectors?-- I have always found it to be satisfactory.

Can you take me to a place in the Act or Rules where those duties and responsibilities are enunciated?-- Not in great detail.

Would you agree that the approach of an inspector and the functions of an inspector may be the subject of administration and probably part of policy matters to a large degree?-- They can be influenced by policy, but I'm sure most of the inspectors would regard that as an infringement on their rights.

So, notwithstanding, though, they - you would think - have a fairly clear definition in their own mind of what their role and function was?-- I believe they do.

And that would largely arise from the legislation?-- Yes.

Okay. Nothing further?-- And interpretation of and usage.

You think there is a universal interpretation amongst the inspectorate of what the legislation says?-- There is probably minor variations, but, in general, interpretations are the same.

Nothing further, thanks.

WARDEN: Anything arising out of that?

MR CLAIR: Just some brief questions, Your Worship.

FURTHER RE-EXAMINATION:

MR CLAIR: Mr McMaster, when you were appointed to your position, was there any step taken to instruct you as to the function that you were expected to fulfil and the obligations that you had?-- There was no formal induction as we know it now, however I did do a number of inspections with other inspectors and I generally picked up what was required.

Was your attention drawn to the relevant parts of the legislation, either by some document in writing or in any other way?-- All inspectors have a copy of the Act.

I mean, that's a starting point, but was your attention drawn to the specific parts of the Act that laid out your duties?-- That was quite some time ago.

I appreciate that. As best you can recall?-- I don't think any one person pointed to a page in the Act and said, "You

FRXN: MR CLAIR

WIT: McMASTER A E

shall do this and that."

Were you given any written document which purported to draw your attention to the relevant parts of Act?-- There is no document such as a duty statement.

Let me ask you this, then: over the years you have been in the job, has there been any attempt, either by way of distribution of documents, circulars to inspectors, or by way of seminars - training seminars - to define the role of the inspector, or to instruct inspectors as to their duties?-- There has been no formal seminars, but - no formal seminars. I'll leave it at that.

You said "but", and then you paused. Are there occasions on which these matters are discussed in some less formal way?-- Yes, when inspectors meet, they talk about problems and interpretations and the various items associated with our job.

Are there regular meetings arranged for the purpose of this kind of exchange of information?-- We do have meetings of inspectors, yes.

Arranged specifically for that purpose - to exchange information about the way in which tasks should be carried out or the way in which they are carried out?-- Not necessarily.

Is there any other form of training - in-service training or refresher training for inspectors?-- We do attend seminars. The latest one that I attended was on auditing and there have been others on accident investigation, various seminars from time to time.

How frequently would you find that you were attending a seminar?-- Probably once or twice a year.

And is that as a result of some regular program which covers topics on a cyclical basis or rolling basis, or is it just from time to time there is a seminar arranged and the inspectors are invited to apply to attend?-- If there is a seminar being staged, that could be of benefit to any of the inspectors, whether it be mechanical, electrical or mining. We make application to attend those seminars, or even it's stated that all inspectors in that particular field shall attend those seminars.

Is there a record kept of which inspectors have attended which seminars so that there is, in fact, some information about who has had their training in certain areas? I mean, is there some sort of formal record kept?-- In latter years there is a record of that. In our monthly reports, we state what seminars we have attended and I assume that is collated and-----

Have there been occasions within your knowledge, either your experience or experience of others, that you are aware of, where there has been difficulty in their attending seminars because of shortage of staff, or anything like that?-- There has to be occasions where that occurs.

Is that an ongoing problem - the number of staff available in the inspectorate - within your knowledge and experience?-- I would say that with the number of mines that are coming on stream, that will become a major problem in the future.

What about library facilities? Do you have adequate library facilities for the carrying out of your job available to you at your Rockhampton office?-- If I become aware of a booklet that could be of benefit, I'm at liberty to apply for it, and if it is in the library in Brisbane, I have access to it. If it is not, I could apply to have it purchased.

Ever any difficulty in securing the books that you need?-- Not in my field, no.

Thank, Your Worship.

WARDEN: Thank you. Did you have anything further, gentlemen? Anything arising out of the last round?

MR MARTIN: No, Your Honour.

MR MORRISON: Nothing, thank you.

MR HARRISON: No, Your Worship.

WARDEN: Thank you, witness. You may stand down.

WITNESS EXCUSED

THE COURT ADJOURNED AT 10.32 A.M.

THE COURT RESUMED AT 10.55 A.M.

MR CLAIR: May it please Your Worship I call Michael Paul Walker.

MR MORRISON: Mr Clair, before you do - sorry, I couldn't quite catch your attention.

MR CLAIR: I apologise if I was being in any way disrespectful by standing up.

MR MORRISON: Not more than he usually is, Your Worship. Not more than he usually is. There is one matter I wish to raise and it has nothing to do with Mr Walker, that's why I wish to do it before he starts. Last Thursday, which was 9 March, we received a letter from Mr MacSporran's instructing solicitor enclosing a copy of a letter from Mr Mackenzie-Wood directed to the Inquiry and dated 21 September last year. It's evident from the fax numbers on the document that the Department or the Inspectorate have had that letter since about 23 September last year. The letter sets out in very brief terms a summary of Mr Mackenzie-Wood's conversation with Mr Kerr about which Mr Kerr has already given evidence, and I checked the transcript, Mr Kerr gave evidence of that on 8 and 9 February this year.

Now, so you understand the points that I wish to raise about this, can I just read the letter omitting the formal parts?

"Please be advised that on 25 July 1994 I received a phone call from Mr David Kerr, Acting State Manager for Rescue in Queensland and superintendent of the Moura Rescue Station concerning carbon monoxide levels in the 512 Panel at Moura No 2 underground mine. Mr Kerr advised me that an increase in carbon monoxide level had been detected in the ventilation circuit and an investigation of the area had revealed no physical evidence of a heating. He then asked me whether a change in the pillar extraction method could alter the normal background of carbon monoxide. I agreed that this could be possible."

That's the end of the letter. It's directed to Mr N Barker, Warden's Court, and signed Mr Paul Mackenzie-Wood. Your Worship, production of the letter before Mr Kerr gave his evidence or to Mr Kerr while he was giving his evidence may well have been of some benefit in the cross-examination of Mr Kerr. There is nothing now that we can do about that beyond noting that the opportunity to make use of that information has been lost, and we would submit for no apparently good reason.

We think it appropriate to call for the production of any statement or report which has been obtained by Mr MacSporran's client or counsel assisting the Inquiry from Mr Mackenzie-Wood or to do with Mr Mackenzie-Wood's involvement in this incident, and we also think it appropriate to ask for clarification of whether it's intended to call

Mr Mackenzie-Wood to give evidence. May I note one last thing which I think should be noted - and I'm pretty sure I've got the dates right - I recall Mr Martin asking at the review in Brisbane, which my memory tells me was about 6 September last year, for the production of any document to do with Mr Mackenzie-Wood's no longer being a panel member. This letter obviously postdates that request. Thank you, Your Worship.

MR CLAIR: Your Worship, can I place something on the record in relation to this first of all before Mr MacSporran gets to his feet? As counsel assisting the Inquiry, and in fact in any capacity, I was unaware of the existence of that letter until shortly before it was distributed on Thursday. In fact it was shown to me by my instructing solicitor, Mr Boiston, who had only just become aware of the existence of the letter himself, and my response was that given that it was produced to Mr Boiston seemingly from the Departmental records, that it was a letter that he - sorry, it was a letter that the Department should make available to all of the parties here, and I understand that Mr Boiston relayed that back and the letter was very shortly after that distributed.

I must say that my conclusion was the same, that the letter at least would have provided some basis for some questioning of Mr Kerr, although as I recalled Mr Kerr's evidence without having gone back to check it, his evidence was much in line with what was contained in the letter. However, the letter wasn't available when Mr Kerr was here. It did cross my mind as to whether it was necessary to recall Mr Kerr. I have formed the view that it wasn't. I did form the view also last week that the document is one which should be formally placed as an exhibit on the record and intended that that should be done after the document had been distributed to the parties and before we close evidence.

As to the calling of Mr Mackenzie-Wood, the position that I have adopted at the moment is that what is contained in the letter seems to provide at least the extent of what Mr Mackenzie-Wood might usefully be able to place before the Inquiry to supplement the evidence we have heard from Mr Kerr. I've taken the view that really the position doesn't warrant the calling of Mr Mackenzie-Wood, but I'm quite happy to hear from any other counsel involved in the matter or any of the parties involved in the matter as to any arguments which they advance to support the calling of Mr Mackenzie-Wood, and if after assessing any arguments put forward I form the view that Mr Mackenzie-Wood should be called, well, then he can be added to the list of witnesses. Thank you, Your Worship.

MR MACSPORRAN: Your Worship, can I just respond briefly in this way: the letter from Feez Ruthning was dated 16 February 1995 to Mr Boiston seeking from the Department any documents relevant to the Inquiry setting out several categories of documents. Searches were then done both in Brisbane and Rockhampton offices of the Department to ascertain all of those documents. That was a very large and onerous task and took some time. Documents were then delivered to Feez Ruthning for their perusal. I don't know the exact date of

that, but I think it was about a week and a half ago or thereabouts, somewhere in that vicinity. It was only after that was completed that further searches were conducted and this particular document was ultimately produced. I don't have the date of that except the letter that accompanied the document to Feez Ruthning was 9 March, I think, 1995, last Thursday. I apologise for the oversight. As I say, a massive bundle of documents had to be obtained. The categories identified by Feez Ruthning were large and non-specific so as soon as this document was recovered it was in fact distributed not only to Feez Ruthning but to the other parties in the Inquiry.

Obviously it's now apparent that document may have had some relevance at the time Mr Kerr was called, although as Mr Clair, in my submission correctly says, Kerr's evidence really just confirms what Mackenzie-Wood has said in the statement. Furthermore there is evidence of a conversation between Mr Lyne, the chief inspector, and Mr Kerr to the same effect around the same time. As time consuming as this would be it is, of course, open to the Inquiry to have Mr Kerr recalled to deal with this point and/or Mr Mackenzie-Wood called to speak to this document.

In my submission, that's not necessary, but it's certainly open to the parties to insist upon that being done at this stage.

MR MARTIN: I don't see any need for Mr Mackenzie-Woods or Mr Kerr to be recalled.

WARDEN: Thank you.

MR MORRISON: Your Worship, two -----

MR CLAIR: Before Mr Morrison continues, perhaps I should say that I did ask Mr Boiston to make inquiries from Mr Barker because, as Mr Morrison has pointed out, the letter was addressed to Mr Barker, and I was somewhat surprised that it hadn't come through to my instructing solicitor and then to myself as material associated with the Inquiry as opposed to it being found in the departmental documents. Mr Boiston did speak with Mr Barker and Mr Barker said that in fact he had no knowledge of the letter. It seems that the letter never reached Mr Barker. I think that should be placed on the record.

MR MORRISON: Your Worship, there are just two or three things I wish to raise. Firstly, as to it not being necessary to call Mr Mackenzie-Wood, one could really only make that decision if one had already found out that this was in fact the extent of his evidence. Now, as I read out the letter and as I look at it now, it, on any view, is a truncated summary of a conversation and nothing on its face suggests to me that it's the extent of this conversation, or indeed nothing on its face suggests to me that it reflects the terms of the conversation.

One matter I would be interested to know is was CO - carbon monoxide level discussed as opposed to carbon monoxide make, and if carbon monoxide make was discussed were figures mentioned, were graphs referred to, things of that nature. On any view it is a truncated version, but it may be that either Mr Clair or Mr MacSporran know from a conference or whatever else that this is in fact the exhausting of the memory; I doubt it.

Secondly, on no view - on no view - does this letter fall within any category that we asked for on 16 February, and we expect a better explanation should be forthcoming about that, an explanation of how it could be that the letter addressed to Mr Barker - albeit it says, "Mr N Barker, Department of Minerals and Energy, Warden's Court", it couldn't be any clearer - how that could possibly end up disappearing into departmental files and no-one discerning that had something to do with this Inquiry.

Thirdly, we have asked for the production of any statement or report that has been obtained by Mr MacSporran's client or counsel assisting in relation to Mr Mackenzie-Wood's conversation or his involvement in this incident. I have heard no response to that and I would ask that some response be given to that; if not now, then soon.

Lastly, might I say it's an unusual but not extraordinary course - I don't mean to suggest that - that you would tender such a letter as an exhibit without calling the author, especially in circumstances where it is not in fact a statement but a truncated version of events. It's not unknown that that happens obviously, but usually it happens because the witness is unavailable or can't come or for some other good reason. I mean, it's not unknown, but it would be unusual in this circumstance, we would submit.

MR MACSPORRAN: Can I respond again very quickly? Firstly, there is no other statement, to my knowledge, in existence from Mr Mackenzie-Wood. I certainly had no conference of any sort with him. The only document I have relating to him specifically is this document that I have handed over to the parties, and if it wasn't required by the letter of 16 February, I apologise to have been so thorough in handing it over. The parties all have the document now and they are fully aware of the circumstances so far as I know, and I don't intend to respond any further.

WARDEN: Thank you. I have got no trouble with recalling Mr Dave Kerr from Mines Rescue if you wish to re-put things to him. I will consider in the next adjournment whether Mackenzie-Wood's desirable to be called, and I am inclined at this stage to call him. Thank you.

MR CLAIR: Your Worship, can I say on that front, as I said earlier, that I am quite happy to hear anything from any party about the desirability of Mr Mackenzie-Wood being called. It's certainly a matter that was discussed between myself and my instructing solicitor early in the piece as to whether Mr Mackenzie-Wood should be called. However, after Mr Kerr gave evidence, and certainly being unaware of the existence of this letter, the position we had reached is that we didn't intend to take it any further with Mr Mackenzie-Wood, but there is no difficulty in pursuing that further.

WARDEN: Thank you.

MR CLAIR: Your Worship, I call Michael Paul Walker.

MICHAEL PAUL WALKER, SWORN AND EXAMINED:

MR CLAIR: Your full name is Michael Paul Walker; is that correct?-- Yes.

Mr Walker, you are a Senior Inspector of Coal Mines based in the Central Division?-- That's correct.

Now, can you give the Court just a very brief history of your experience in the industry, positions that you have held?-- I started in the industry in the early 60's with the National Coal Board in the UK as a student apprentice which was, like, akin to a cadetship in Queensland, not quite the same, a little bit more lowly at the time -----

Could you pull that microphone a little closer to you? I can hear you quite well but it may be other people can't?-- That indentureship took me through the National Coal Board's student apprenticeship scheme which was designed to familiarise me and give me experience in all aspects of coal mining and culminated in my doing the - going through the diploma courses to finally achieve the First Class Certificate of Competency in the UK. During that same period, which, from memory, would have taken me perhaps seven or eight years, so into the early 70's - during that period I, on completing the apprenticeship part of that education program, went through the structured channels operated by the Coal Board of being - of taking also the Deputy's Certificate. That involved, first of all, having got the Deputy's Certificate, being employed as a shotfirer. That was really the first official statutory - step under the statutory ladder. That took me through further experience in shotfiring and use of explosives with a minor - fairly minor amount of supervisory responsibilities. I then progressed on to be a deputy which encompassed more responsibilities and more supervision through to being an overman which took me to a different mine. Through the whole of that course there were periods where I was sent to different mines around the area to enjoy their particular problems. From being an overman for a time I was then appointed as a shift undermanager. From shift undermanager finally in 1974/5 as a statutory undermanager-in-charge. That was a position I held in a very large mine in the UK up until coming to Australia in 1977. In Australia I was - I came as a shift undermanager living in Cessnock and working at Aberdare East Colliery for a limited period of time through to mid '79 when I - at that time I progressed to the day shift undermanager position and a semi-official undermanager-in-charge sort of status with the undermanager-in-charge, if you like, assuming more of a deputy/manager type role, but at that stage I had to leave to take up an appointment with a mine in Wollongong at Avondale and served there from '79 to '83 when the mine closed because of the severe recession of that period and came to Queensland where I joined the Queensland Coal Board in Brisbane for four and a half years or so when I opted to take a change of scenery, if you like, and go back to becoming more directly involved with the industry, more meaningfully involved, as I

XN: MR CLAIR

WIT: WALKER M P

saw it at that time, with the industry and applied for the vacancy created by John Brady, who was my predecessor who left the Inspectorate in the middle of '86 - '87, rather - and I took my position as Inspector in February '88 as an Inspector in Rockhampton.

Now, I want to ask you more about your operation as an Inspector in Rockhampton, but before I do that, one of your functions there is to investigate any accidents and to prepare a report. In fact, you have prepared a report in relation to this matter. That's Exhibit 2 that should be on the table in front of you there; is that so?-- It is.

That report deals with the investigation aspect; is that right?-- It does, yes.

It's divided into two parts: part one, the management of the incident and part two relates to the investigation of the incident at the mine site; is that right?-- There is the report and there are three appendices which relate to the manner in which it was done.

I am talking about the actual report at this stage. Part one, and then at page 8 there is part two, the investigation of the incident; is that right?-- Yes.

Now, you have set out in some considerable detail in that report, first of all, the events that occurred from the time that you were first notified about the incident in the early hours of Monday, 8 August?-- That's correct.

Through to the circumstances surrounding the second explosion on the following Wednesday morning; is that right?-- That would be correct, yes.

Also you have set out in some detail the steps that were taken as part of the investigation of the incident under your control, that was at the mine site area; is that right?-- That's correct.

I don't propose to go through that with you since it's all set out in the report. There is nothing in that report there that you seek to alter or modify at this stage?-- No, I don't believe so.

Now, let me turn back then to the association that you had with Moura No 2 Mine in the course of your duties as the Senior Inspector in the area. You mentioned you commenced at Rockhampton in 1988?-- February.

February. At the time that you commenced in that position were you given instruction of any kind as to the scope of your duties and your responsibilities?-- Shortly after commencing in Rockhampton - I think I came up to Rockhampton for a week and went back to Brisbane, because my family were still living in Brisbane, for two weeks, which was a purposeful exercise, as a form of induction for me to familiarise myself with the office structure in Brisbane and the structure of the Inspectorate generally, and during that two weeks also the

Chief Inspector at the time, Graham Hardie, took me over to SIMTARS and introduced me to the SIMTARS establishment, and we had basically a guided tour of SIMTARS by the people there at the time, and I guess notably at that time the CAMGAS system had just been put together and was about to be launched, if you like, and I had an opportunity at first - an early opportunity to observe that system, or what that system was intended to be, but following on from that I guess in terms of induction training, to use that term - following that I had a couple of weeks out in the field with the Senior Inspector, David Wilson.

Whereabouts was that, in the central area?-- In the central division. David took me on a tour, I think, probably taking a couple of weeks.

What was his position, David Wilson?-- He was the Senior Inspector at that time.

Were you taking over from him?-- No, I was taking over as an Inspector. He was the Senior Inspector at that time. So, the Senior Inspector at that time took me around and introduced me to management at all the mines in his area at the time.

Can you tell me what underground mines the central division covers?-- Are we talking about then or now?

Well, I'm talking about now?-- Underground mines, there are five, discounting Moura No 2, which is Laleham and Cook and the newly developing Crinum and Kenmare Colliery in the Blackwater district and Crinum and Gordonstone in the Emerald district.

Going back to when you were appointed, was there a greater number of mines to be covered, or a fewer number?-- There was Laleham and Cook and Moura - Moura No 2, Cook and Laleham - three - and five open-cut mines.

So, the number of underground mines has increased over the years?-- That was my responsibility - the district comprised a few more - not underground mines. I had all the underground mines in my jurisdiction, but there were a total of seven open-cut mines at the time - sorry, eight. I had five of them.

Okay. Now, you say you went around with the senior inspector to visit the mines?-- Yes.

That happened for a couple of weeks?-- Yes, it was a - basically out on a Monday, back on a Friday, get around as many mines as we could sort of exercise.

I take it that you were given a copy of the Coal Mining Act, or were you not?-- I believe I was. I have got no direct recollection, though, but I imagine I would have been.

What steps were taken to direct your attention to the duties that you had to carry out as an inspector?-- I guess - I have got no direct recollection of any structured instruction along those lines. I have no doubt at the time there would have been discussions, talks, between myself and David Wilson and whoever, but I don't know of any structured efforts that I can recall.

Any steps taken to direct your attention to sections of the Act or the rules or regulations that you had the obligation-----?-- I don't believe so.

Did you understand it to be part of your duties to ensure compliance with certain of the provisions?-- I did.

Did you know what those provisions were?-- I did. I had a - I originally had a First Class ticket from the UK which was converted in New South Wales - for my occupation in New South Wales, and that was subsequently through the oral examination process and endorsed for Queensland also. That process is designed to ensure that people taking on those qualifications do have a working knowledge of the Queensland regulations. That's not to say that it can be in its infinite detail at any given time, but that's the idea of it.

So, when you started in the job as an inspector, you had some familiarity, you say, with the Queensland provisions?-- Yes.

That familiarity derived from your studies for what qualification?-- Well, those - the basic process of gaining a First Class Manager's certificate was the normal education process resulting in that certificate and the mining law of wherever that certificate was to be used at the time. The process to enable me to use that qualification in Queensland necessitated me revising the Queensland regulations prior to taking an oral examination, and I suppose - on reflection, of

course - I would have had some cognisance of those in my position as an engineer with the Queensland Coal Board in Queensland as well - not a working one, but I did inspections of mines with the Queensland Coal Board, and I guess as a mine manager you do tend to have it bent that way - the procedures and the way things are done, what you are up against, your own knowledge and experience and the regulations at the time.

Did you, at the time you took the job on, take any steps to refresh your memory as to which particular requirements assumed importance in terms of carrying out the inspector's job?-- I have got no specific recollection, Mr Clair. I have got little doubt in my mind that I would have gone through some processes of that nature.

What about the actual day-to-day duties of the position? How were they carried out? Was there a regular circuit each month, or every two weeks, or was it a case of your establishing that yourself as time went on?-- The inspectorate generally operates by a rule of thumb schedule referred to by Mr McMaster, I think it was, or of the undergrounds once monthly, open cuts quarterly. I guess for a senior inspector it is pretty difficult - that's an aiming point that we try to strive for, but there has never been any official gratification of that as being something that we could be measured against, if you like.

How many inspectors were there at the Rockhampton base at the time you started? You were an inspector, there was a senior inspector-----?-- I was an inspector, there was a senior inspector - when we talk of the inspector, we talk of a mining and engineering persuasion - there was myself as inspector and David Wilson senior, principal mechanical inspector and Alan McMaster electrical inspector and a testing officer.

Did that establishment change as far as the inspectors of mines were concerned?-- Yes, it did. When I - on David Wilson's retirement, which I think was 1990 - my memory is not real good of it - I became senior inspector in that vacancy and the inspector's position was not filled from that time.

So-----?-- In addition to that, the mechanical inspector's position, until Mr Mackie joined us last month, remained unfilled for 15 months prior to that - from November 1993.

So, from some time in 1990, you think, when Mr Wilson retired, instead of there being a senior inspector and inspector of coal mines, there has only been a senior inspector?-- Just me, that's right.

You say there was a 15 month period during which the position of senior mechanical inspector-----?-- What it was at the time - the principal mechanical inspector's position was filled by Alan Hepburn - I can't remember the circumstances which dictated that, because he was in the position before I was - but it just happened to be in Rockhampton. That position is currently in Brisbane, held by Mel Bell. When Alan Hepburn retired, that position became a mechanical inspector's position. Mel Bell, who was in Brisbane, was

promoted to that position and retained it in Brisbane, so our team in Rockhampton was that of mechanical and electrical inspectors, senior inspector, testing officer and should have been - supposedly an inspector.

Coming back to the question I asked you about whether there was a routine in place when you commenced as an inspector, you did say that there was a - at least a practice whereby you attempted to visit every underground mine once a month and the open cuts once every three months?-- That's correct.

When you took over as senior inspector, were you meeting that sort of schedule?-- Was I meeting it?

Mmm?-- I still-----

I mean, you said it was an ideal, really?-- I guess it is certainly my opinion - probably the consensus of the inspectorate - that was the sort of exposure that we wanted of the coal mines to maintain our contact and our knowledge of what was going on in the work place. As an inspector, I - with three underground mines and five open-cuts, I got reasonably close to achieving that, but I was only in that sort of mode for a few months - a year or so - before being - going to senior inspector's duties, whether it be acting or before I was officially appointed as senior inspector, and subsequently as senior inspector that need obviously was still there, in my mind, and so I attempted to at least pursue the same schedule, but that wasn't possible to achieve.

It wasn't possible to achieve. At some point the number of underground mines increased. You outlined the fact that there are now five underground mines?-- That's correct, yes.

At least when Moura No 2 was operational, is it correct to say that there were six?-- There would have been if Moura No 2 had still been operating, there would be six, yes.

Back prior to 7 August last year, were there six?-- There were five - five. Kenmare was in the early stage of its development.

They increased to five prior to 7 August last year, so at least as far as the underground mines were concerned, which were the ones you wanted to visit more frequently, your workload increased; is that right?-- That's correct, yes.

But, in fact, your establishment remained then with only yourself as senior inspector and no other inspector-----?-- That's correct.

Of coal mines, I mean?-- Yes.

Well, what effect did that have on your attempts to reach this ideal of an inspection of underground mines once a month?-- I guess putting it bluntly you are trying to do what you can when you can. I think I still maintained quite a reasonable schedule of inspection at underground coal mines, perhaps less so at open-cut coal mines. Some things have to give to allow

- you know, it is a case of prioritising, and I still attempted to achieve a good attendance at the underground mines. That was largely at the expense of the open-cut mines, and, to a degree, I also purposely avoided being involved in extra-curricular demands that were in place from time to time in order to stay on that track.

Extra-curricular demands in respect of what areas?-- In the senior inspector's job generally, there were project-style things - demands from time to time, or involvement in other matters, regulation review. For example, I was the chairman on the Underground Regulation Committee, too, for some time after the committees were put together to review the regulations, and I ultimately resigned that position, I think, in early 1993, because I just found that it was impacting far too much on the work in the mines.

Now, I want to go to the period for - from the beginning of 1994 through to the 7th of August. If we can talk about that period and what your practices were during that time? Did you manage to maintain once monthly inspections at Moura No 2 during that time?-- No. I believe I attended - in 1994 I attended Moura underground on seven occasions - seven days, if you like. Two of those occasions were accident investigations and a batch of three days which surrounded the risk assessment session in May. Those three days really comprised of arriving at the mine - I left the office at 1 o'clock and arrived at the mine at 3 in time to take part in a training session that was being conducted under ACIRL's auspices for the deputies of the mine to educate them more thoroughly in basic rock mechanics, if you like - roof bolting techniques and rock mechanics, and understanding the nature of those things in the work place, and the following day was an involvement with the sitting of the risk assessment group on that day, followed by a - an underground inspection of the 512 panel itself only with Bernard Madden in the late afternoon, and then the following morning was a wrap-up of the risk assessment before returning home after lunch, which - so that was counted as three days. So, in essence, it is not - it really doesn't reflect a once-a-month schedule.

Now-----?-- I might add that when - when we do accident investigations, although we are focused on a specific aspect of the mine, obviously there is an opportunity to also observe things at the mine, but it is not like an inspection day.

I will come shortly to the dates of inspections during that period, but apart from - in terms of your normal practice, apart from your routine inspections, obviously there are times when you attended the mine in response to either an accident or in response to some specific event?-- That's correct, yes.

Which required your attendance; is that right?-- Yes, yes.

Were there ever any occasions when you just made a random, unannounced inspection - that is, not on any regular routine schedule and without giving notice that you were coming to the mine?-- Are we talking at Moura?

Yes?-- I don't believe so.

Did you do it at other places?-- I have no specific recollection, but I think - I have got a vague recollection of an incident or an event some years ago on either one or two occasions when I did do that. It is such a vague recollection, but I can only surmise from that vague recollection that it would be as a result of being cheesed off over some particular aspect.

Right. There was some specific-----?-- There would be something that would make me take that action. I do not believe in turning up on the doorstep unannounced as a matter of course. It would have to be a specific reason for wanting to see something if I had some inkling that, otherwise, the particular issue might be covered up. It really isn't practical to do that otherwise, because it is desirable to spend the day with the manager, see the mine with the manager, and managers are very busy people. If you say, "Well, I'm coming on Wednesday.", he'll say, "Good luck, I'm in Brisbane.", so, you have got to discuss with the manager when it is most convenient to get together. Sometimes that can't occur. Perhaps my schedule is intractable and so is his, in which case the manager would organise me to go with whoever the 2IC is, or someone, to show me around on that day.

I take it from what you say that there was never anything that arose in respect of Moura No 2 that made it desirable to do a spot unannounced inspection?-- I don't believe so.

Nothing that you were aware of that prompted you to do that?-- No.

Now, when you did go there for your routine inspection, I gather from what you say that ordinarily you would take up with the manager when you arrived?-- Yes.

And what would you do after that? What things would you look at? What was your normal progress through the inspection?-- I guess a typical routine would be to arrive at the mine at about 8 or thereabouts and to discuss with the manager the current status of the mine, what was happening where, what may have been any issues arising since the last inspection, or any aspects of the mining operation that may have changed since the last inspection.

What sort of things would be discussed in terms of issues that had arisen since the last inspection? What kind of thing would be reported to you then?-- I guess that can range from the actual operations at the mine at the time and the details of those operations, or perhaps what you might call administrative issues. For example, there may be a Part 60 submission in the making, and the formulation of that submission might be discussed, or any correspondence thereto. An episode some time fairly recently at Moura was the 6 South section - they decided to advance the 6 South section into a potential inrush area, which involved speaking with management, and perhaps offering advice as to how that process is done, because that requires a process of exemption from a

chief inspector, so those sorts of things would be processed. In general terms the safety performance of the mine in general is often discussed and what initiatives might be on the go at the time, what improvements. Managers are generally quite anxious to convey and make the inspector understanding of initiatives in the safety area and their current statistical status, their lost time inquiry frequency rates and things like that. What else can I say?

You said you ordinarily discussed these things with the manager?-- Yes.

Did the discussion tend to be about things that were happening, as it were, at the top managerial level at the mine or did you get on to things that were more day-to-day matters, for instance, how the monitoring system was working, what might have been happening in a particular panel?-- I think the discussions would cover a broad range of aspects, whether they be, as you say, managerial or quite very often the nuts and bolts, yes.

After you had that initial discussion would you then make an inspection?-- Yes.

What did the inspection involve? Did you, as a matter of course, first of all look at any documentation there or did you just head off underground with the manager?-- No, at times that might be the case, depending on the subject being discussed at the time.

Was there any particular documentation that you did, as a matter of course, look at?-- I don't believe - there is a large range of things and different things might crop up at different times. Deputies' inspections were - at least a regular habit of mine was to look through and sign deputies' reports that were hanging at the start point at the mine, at Moura and at other mines.

Did you do that every time?-- I used to.

I'm talking about the six months or thereabouts prior to -----?-- Maybe within that, but I did note from a review of inspection reports that the last time I specifically indicated that I had done that was some time in '90 - '93, I can't recall just when, but I was aware of the fact that - not at Moura, but generally I had let that good practice lapse, I hadn't done it for some time.

Shift underground -----?-- Never looked at the shift underground report book, the undermanager's report book as such.

Any other documentation you looked at as a matter of course?-- On occasions there would be things like ventilation records, whether they be - not in Moura's case, but auxiliary fan type documentation. There is a schedule for - requirement of managers to maintain surveys of ventilation, both main ventilation and auxiliary and where those records should be kept and things like that. So they were checked periodically.

At Moura when you went there was there any progressive plan that you would look at to show what was happening with extraction, that is a plan showing just what was taken out in respect of the given panel, the extraction panel?-- Yeah, there was a number of overall mine plan plus section plans always posted in the undermanager's office on the big noticeboard there. They would be referred to prior to an inspection. Obviously when talking about what's happening and where they have progressed those plans would be referred to, and the information gained from there would be part of the information used to decide where you might be going on that particular day when you went on the inspection.

Was that invariably the case, that you would look at those extraction plans?-- Well, almost invariably anyway.

Was there a document you could look at that would show you just what had been extracted up to that time when you were there?-- Yes.

Did you take steps to ensure that that coincided with the approved extraction plan?-- Yes.

When you look for documents that were there, first of all did you check to see whether that coincided with the approved plan?-- Yes.

When you went underground did you take steps to see that in fact what had been taken out was properly reflected on the plans you had seen?-- That would be an objective of examining an extraction panel.

I'm really interested in whether you did that sort of thing, you see?-- Yes, yes.

You did?-- I did.

Any other documentation? Ventilation, for instance, did you take an interest in what was happening with ventilation at the mine?-- Yes.

Did you ask to see or were you shown plans that showed you the current state of ventilation in the mine at any given time, that is showing up-to-date changes?-- That has been the case on occasions, but I've got no specific recollection in the recent past anyway.

No recollection in the recent past?-- No.

I'm asking you to direct your attention to the period beginning of '94 through to 7 August?-- I don't believe so, no.

Was that a matter that you regarded as being of importance in terms of carrying out your duties, to ensure that what was being done in respect of ventilation at the mine was being done properly?-- Yes, it is. The regulations require the keeping of such documents, ventilation surveys to be done and

records to be kept and that would be one of my functions, to ensure that that was being done.

But did you actually -----?-- I say periodically. I don't believe I have done in 1994, but I think it would be true to say that in common with mines generally, underground mines generally, all mines without exception have got an automatic - or most automatic system of compliance with those regulations and it would be quite unusual and rare for any mine, in my experience since I've been in the job, to be found to be lacking in that area. They are a very, very fundamental part of a mine's operating procedure.

When you say "in that area", the area of actually keeping records, up-to-date records, for example ventilation?-- For ventilation in particular, yes.

But did you check to see that those records were there?-- Not in '94, no. Not that I can recall anyway.

How did you assure yourself then that what was being done in terms of ventilation was being done properly during '94?-- I think in terms of practical observation on the job more than any other way.

During your inspection at the mine?-- Yes.

Okay. There is, of course, the mine record book?-- Yes.

Did you look at that on your arrival at the mine or before you carried out your inspection?-- Sometimes I may do that, yes. Again if you are talking about '94, I don't know, I don't know. I didn't make - I never made a habit with the mine record book of systematically thumbing back through other peoples reports in that book.

When you say "other peoples reports"?-- Yes.

For instance, the mine manager's report?-- The district union inspector's reports. There are engineers' reports.

Engineers' reports you said. Was there any reason for that, why you didn't -----?-- No, there wasn't a reason.

----- go back particularly through the mine manager's reports?-- No, there was no reason for that. In reviewing some of the documents for this Inquiry there are certainly some instances that I came across where my signature and the date was on different parts of different reports and different record books, but that's not something I've done systematically.

Of course, the mine manager's reports in the mine record book are there, I take it, for a purpose, that is so there is a record of what has occurred in the mine?-- That's correct.

And they could be - if they have been done properly they could be a useful source of information as to what had occurred at the mine since your last visit?-- As with any statutory

report, yes.

Well, if you didn't read the mine manager's reports in the mine record book did you ask him questions designed to elicit the sort of information that would be shown in the mine record book?-- I believe so in the broadest terms, yes. Our discussions about the mine were quite all embracing, if you like. The mine manager has a great pride in his mine and generally speaking he's not normally shy on wanting to share that experience with you. There are occasions with the mine record - some of those things in the mine record book again are required by regulations to keep, and I flicked through those record books at Moura and other mines to see that those reports had been done, but as I say, no regular scrutiny of the content of those reports, just occasionally perhaps.

There had never been any suggestion, I take it from what you said about your induction into the job, no suggestion in any document or in any training that you might have received that the mine record book was to be perused on each visit?-- No, not at all. I think perhaps I might have an input to some endeavours in that area in the future.

Just on that point, during the time that you were carrying out these duties was there any training of any kind that was available for inspectors?-- Yes, there was. I don't - I think it's true to say not in a structured way, but opportunities do arise and have arisen over the years that I've been in there where we have been able to take part in the ACIRL training seminar in 1989, for example, would be the most notable - one of the most notable events, but there are opportunities that occur that we take advantage of. Some of those - when I say not in a structured way, some of those would be directed to our attention to suggest that they would be worthy of participation.

And has the performance of your duties allowed you the time to get away and attend training sessions that had been offered?-- I think generally speaking the answer to that is yes. Quite a number of seminars that we attend, myself - I'll stick to talking about myself, but the ACIRL technology transfer type workshops and small scale seminars of that style are commonly held in the coal fields in Emerald and Blackwater, places like that. So we are fortunate in some respects that we can incorporate that with our inspection regime when we are out in those places, and very often do.

There is no regular program of refresher training for inspectors, senior inspectors?-- No.

Is there a circulation of material amongst the Inspectorate indicating what changes there might be in mining methods and procedures or safety aspects or anything related to the field?-- Yeah, that's quite considerable. We receive various mining journals and publications, and also commonly we would be forwarded extracts from similar journals to that on specific subjects that have been extracted in Brisbane and forwarded on by mail. Sometimes those things come from two or three different directions, the same material, whether through

the metalliferous side or the coal side or just generally, but we do get quite a deal of that sort of stuff.

Do you have time to attend to that material that comes in?-- Not all of it, no.

What about library facilities? Do you have a library as such at the Rockhampton office?-- We have a modest library at the Rockhampton office, but we have access to the mine library at Brisbane whenever we want it. That involves a little bit of organisation, of course, but we do have a fairly reasonable library at Rockhampton.

Have you had occasion to request more material for that library while you've been there as senior inspector?-- Yes, the odd two or three books here and there, yes.

Ever any difficulties in acquiring what you need?-- Not especially I don't think.

I want to take you to the inspections that you did carry out in 1994. There has been supplied a document that is described as "Moura No 2 Inspections 1994 - M Walker." Have you seen that document?-- I have, yes.

Did you prepare that document?-- I did prepare that, yes.

What exactly is that document?-- Which one was it called again, Mr Clair?

It's called "Moura No 2 Inspections 1994." It was supplied to me with a sheet on the front that looks like that and then behind it is a document headed like that?-- Righto. That's a couple of different things.

I understand it's been supplied to members of the panel too, Your Worship?-- That's that one?

Yes, that's right. The one I was supplied with has a sheet on the front which is apparently a -----?-- I've got that as part of a separate document. It's part of a training record of mine.

Can we look at that document that I mentioned, "Moura No 2 Inspections 1994", and if you can just say what that is exactly, where is that information from?-- This information essentially is from record book entry records.

That's the mine record book?-- Well, copies of the entries that I put into the mine record book which are kept on file at Rockhampton office. It's put together as a result of a search of my diary and possibly from our monthly reports, and there are references there to inspections or visits to Moura mine generally rather than the underground itself for a complete picture, if you like, of my total interaction with the Moura mine.

I want to touch on some of those inspections, but just before I move forward to do that, before you said that your practice

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was then, after you had initial contact with the manager and you did inspect documentation, different documentation it seems, from time to time, you then had your underground inspection?-- Yes.

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This is on your routine visit?-- Yes.

And then you would return to the surface?-- Yes.

And what would you do after that?-- I guess, by and large, post underground visit, putting aside sharing Mr Mason's lunch, would be discussions of a similar nature that I have outlined previously that took place before going underground. Those sort of discussions about all aspects of the mine, you know, go backwards and forwards all the time. Obviously the results of the inspection would be a source of discussion, which, in turn, would give the manager a clear indication of what I intended to put in the record book, particularly if, for whatever reason, I chose not to write into the record book on that day but, rather, to leave and to post to him an already typed up version of what I had put in the book.

Let me ask you about that. Sometimes you did write into the record book itself, did you?-- Yes. That's might be called a normal procedure, yes.

There is a section of the record book that's devoted to reports by the Inspector; is that right?-- That's correct, yes.

But you didn't necessarily go to any other sections and look at those other sections?-- Not necessarily, no.

Sometimes you would write into the record book yourself, sometimes you wouldn't?-- That's correct.

Was there some particular feature that made a difference about whether you would write in and whether you wouldn't?-- A number of features. I have developed a practice in the last couple of years where going away and writing the record book entry has been a more recurrent practice. That's been influenced by a number of things. One, for example, if the record book entry is complex, for example, an accident investigation, to take the easiest one, which is quite lengthy and complex, or if there was any controversy surrounding it whereby I feel that instead of sitting down there and then, and perhaps bear in mine timetables and wanting to get away or whatever, that I needed more time to write a better record for the manager, that would be one thing - that would be the main thing, I guess, but I guess in general I formed the opinion recently that the quality of the record book entry can be improved by not dashing it off the top of your head at the time. There is some obvious shortfalls or dangers in what I have done, including keeping track of the record book itself. The other side to a personal record book entry is that having typed it up, it's a much more legible document anyway. I instigated a practice some time back, which we all tended to follow in the Rockhampton office, of when we get back to the office, assuming that it's a handwritten entry into the record book, we would photocopy that on site and take a copy back and get it typed up and then send back to the mine manager two typed copies, one to be glued into the record book into the position that would normally be occupied by the Inspector's report and the other one to put on the mine noticeboard, and

that was my initiative because I believe that you couldn't really expect mine workers to take the trouble to read my writing, and in most instances those entries are designed largely to communicate with the workforce.

I see?-- And we tried to do that.

You would keep a copy at the office yourself?-- Yes, of those we would put a copy on file, a copy would go down to Brisbane for the Chief Inspector's file and then two copies would go to the mine for that reason.

Can we just touch on some of these matters here? Perhaps just to finish that, after you had come up from underground you sometimes put your entry into the record book, sometimes you did it later and posted it out; you would have the further discussions with the mine manager. As a matter of course, what would happen after that? Were there any other areas up top that you inspected?-- Oh, on occasions. There may be some surface facilities; the main fan notably, I suppose; just generally the mine facilities, but not on a really regular basis. One of our - one of the requirements of the regulations is the mine bath house and the aspects associated with the mine bath house, but they don't take a high priority. I guess with those record book entries something that comes to my mind, Mr Clair, too: as far as possible I would evolve that system of the postal record book entries whereby I would take away a copy of the record book entry, or I would leave the mine and write my record book entry when in the motel room at night and then fax it back to the office the following day from whichever mine I was at on the following day with a view to having it typed up ready for me when I got back to the office to expedite the time to get that report to the mine manager as soon as possible.

Now, looking at your document there, you mention an inspection on Tuesday, 18 January which was a routine inspection; is that right?-- Yes.

Then on 31 January there was an incident investigation?-- That's correct.

Which resulted from an accident in 4 South B Panel where a miner driver was trapped for a period beneath a roof fall; is that right?-- Yes, that was an occasion when - that happened the day before Australia Day when a young fellow by the name of Bruce West was trapped for a period by a roof fall in the miner cab.

And then there was a visit on 9 February, but that was in relation to the open-cut; is that right?-- That's correct.

Then on 10 February you visited Moura No 2; is that right?-- Yes.

On that occasion that was again a response to an incident; is that right?-- That's right. On that occasion the incident occurred that has been referred to at the Inquiry when David Camplin suffered a broken leg when he was hit by a large piece

of - large lump of coal from the rib and I was informed by Mr Schaus of that event and went to the mine to look into it.

You have noted there on the document your principal conclusions as a result of that investigation; is that right?-- Yes.

And you communicated those conclusions to Mr Schaus and the others at the mine?-- That's correct. The record book entry associated with that event was fairly lengthy and in this document I have only summarised the three principal issues, which have been related to in evidence here on previous occasions, with the principal conclusions being - I've termed it, "When planning to mine in abnormal or difficult circumstances there is a need for more formal communication with the whole crew.", giving everyone in the crew a chance to contribute to the - to really - really what that's pertaining to is one of our constant pursuits for quite some time is to get people, particularly groups of people, work crews - that when they get abnormal conditions or any condition, any particular activity, for them to just spend the time to get together and recognise the hazards and understand and implement the controls that are necessary. That's a basic approach to all operations anywhere; that, you know, when we get people doing that, we have a much safer workplace. Secondly, "Second working not to proceed unless ribs have been secured to at least the current standard as depicted in the Manager's Support Rules." In older areas this requires the support areas to be upgraded in terms of second workings.

Just pause a moment there. Had there been some breach of the Manager's Support Rules on this occasion?-- Well, if you look at it in sort of a very nitty-gritty, very picky way, you could say that in so far as what had happened was that in the Part 60 submission for the panel it indicated a method of support which is really designed for the method of support from when the panel started, and there was nothing wrong with that, but right at the start - it is old workings that it started from and that little bit of old workings had been done on a different system, so, strictly speaking, it didn't comply. That's not to say it was necessarily inadequate, but on top of that, with it being old workings, there were some areas which required some repair work to address the situation.

And the third conclusion?-- "Only 'short' or 'in the punch' raming to be practised to a written procedure. This was to eliminate exposure to ribs over three metres in height." Looking at the full context of the record book entry, particularly with respect to the raming, it's not so much me saying this needs to be done so much in cooperation with management and others at the time coming to some - what we could see at the time as being some pretty obvious conclusions of where to do things safely in the future.

Okay. On 28 February there was again an accident investigation at the open-cut mine mentioned there?-- Yes.

Then on the 3rd and 4th - you have got "February" there but it

seems to be 3 and 4 March?-- Yes, it is supposed to be the third month, I think.

That was further time spent on the open-cut accident investigation. Then we come to 22 March?-- Through - those references, most of them the open-cut - the double fatality that occurred on New Year's Eve - through this whole period we were fairly heavily involved with preparation work for the inquiry into that incident.

Now, 22 March you did a routine inspection; is that right?-- Yes.

The last routine inspection being 18 January?-- Sorry?

The last routine inspection being the 18 January inspection; is that right, the first entry?-- You have lost me there somewhere.

Back at the beginning, 18 January '94, the first -----?-- Okay, I'm with you, yes.

The first inspection?-- Yes, I term a routine inspection where the idea is to go to the mine and have a good look around with no firm ulterior motive such as an accident investigation which - or a conference, which is different.

So, your routine inspection then was on 22 March. You had been there on 10 February in relation to the accident but that was specifically by way of the accident investigation; is that so?-- That's correct, yes.

Now, on 22 March you inspected, amongst others, 512 Panel?-- Yes.

And you made the inspection with Mr Schaus; is that right?-- I did.

At one point, according to what you have there, you met up with Professor Galvin, Mr Abrahamse and Mr Quintiero; is that right?-- That's correct. I don't have a particularly clear recollection of where we met up, but I believe it was in 512. We did travel differently on entering the mine. I think they were underground before I went underground. I'm not sure about that, but I think we met up in 512 Panel.

Now, you mention in the summary that there were discussions concerning strata and rib control in 512?-- Yes, that's correct. As Mr Schaus indicated, Jim Galvin's expertise is in rock mechanics, pillar and roadway stability, and he was pursuing a project of his own and really had come to Moura to pick up some background data for his project.

What was the core of the discussions there in 512 that afternoon about the strata and rib control? What was being said?-- I can't remember specifically, but obviously a lot of interest in the method of extraction and the nature of the roof and sides, but I can't recall specifically what was said.

There were some further discussions continued that evening?--
Over dinner, yes.

Who was party to those discussions?-- I think there was the
two - Quintiero and Galvin and Albert Schaus and I, I think.

Do you remember what was discussed on that occasion about
strata and rib control?-- No, I don't specifically but I
think the whole - just general conversations around that
subject of rib support. Design of rib support was a
particular - from what I do recall, was a particular sort of
interest that Galvin was pursuing.

Now, you subsequently received a copy of a letter from
Professor Galvin; is that right?-- That's correct.

Could the witness see Exhibits 162 and 163, please, Your
Worship? Exhibit 162, first of all. Did somebody from the
mine forward a copy of that letter to you?-- Yes, Mr Schaus
sent this to me.

And that was a letter from Professor Galvin to Mr Schaus; is
that so?-- That's correct, yes.

Did it raise certain aspects of concern that Mr Galvin was
expressing in relation - or Professor Galvin was expressing in
relation to the design of 512 Panel?-- Well, to some aspects
of it, yes.

And, amongst other things, he asked in that letter whether
consideration had been given to undertaking a formalised risk
assessment to address the various issues that he had raised in
the letter?-- That's correct.

And other issues associated with the underground environment
at Moura Colliery; is that so?-- Yes, that's correct.

Now, did you consider that letter -----?-- Yes -----

----- and make some response to it in the context of - I'm
sorry, you were about to say?-- Yes, Mr Schaus sent me this
by fax and, as I recall, he also phoned me to discuss the
thing, which we did, and as a result of those discussions and
from the information that Mr Schaus conveyed to me, that he
was intending to implement such a risk assessment, I wrote
that correspondence back to him.

And in your correspondence to him, which is Exhibit 163
-----?-- Yes.

----- you say, "I have no objection to second workings in 512
Panel commencing as scheduled under the conditions you
described.", and you go on to say, "Essentially those
conditions are" - one - "the pre-extraction training of
personnel will stress the need for caution and explain the
reasons why - that the system is a little different than
previously undertaken."?-- Correct.

Two: "Strict supervisory control will be exercised,

particularly by undermanagers."?-- That's correct.

And three: "A formal risk assessment of the system will be undertaken. You have explained that this is to be facilitated by ACIRL and will take about one week to complete commencing 29 April."?-- That's correct.

And you went on to say you would endeavour to attend a day of the risk assessment if your schedule permits?-- That's correct.

Did you take any steps subsequently yourself to ensure that that pre-extraction training of personnel was carried out on those terms?-- I think before I got - I would have had an opportunity to do - only in conversations with Albert relating to that.

But you did have such conversations?-- I believe I did, yes. I believe so. I've got no absolute recollection of it, but Albert very purposefully took it upon himself, particularly with the training aspect for pillar extraction, to actually undertake the training himself and says so in his Part 60 submissions. I would disagree with him putting himself in that position, but -----

What about this aspect of strict supervisory control, the second of those conditions there, "Strict supervisory control will be exercised, particularly by undermanagers."? Did you take any steps subsequently to ensure that that kind of control was being exercised over the extraction in 512?-- I can't recall specifically doing that, no.

Now, as far as the third condition is concerned, the formal risk assessment, was there any discussion between yourself and Mr Schaus about who was going to be carrying out that risk assessment?-- Yes, there was. Well, obviously the fact that I have put it in here that it's going to be facilitated by ACIRL, I did become aware that Terry O'Beirne was going to be the facilitator at some stage, I don't know when, but on that basis of 29 April - as I recall, for some reason or other that didn't take place, it was actually put back a week or so. I would not have been able to attend that risk assessment on the basis of the first planned time for that risk assessment, but when it was - to the best - as I recall I think happened, as it was put back and delayed, I did get an opportunity to go down.

You took part in that risk assessment?-- Yes.

I think you mention that in your summary of events and you also mentioned it earlier in your evidence. Mr O'Beirne was associated with Minerisk; is that right?-- That's correct, yes.

Which was, in turn, associated with ACIRL; is that right?-- It is. I'm not clear as to just what that association is, but it has an association with ACIRL, and Minerisk is a particularly well known body doing such exercises as this, and they have done quite a bit of it around the place. They are

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quite knowledgeable in the coal mining industry.

ACIRL had played a part in the design of the panel?-- Yes,
they did.

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WIT: WALKER M P

Did you form any view as to whether the risk assessment that was planned was a sufficient step to take, both by way of it being sufficiently independent and by way of it being a sufficiently thorough assessment?-- I don't know that I ever assessed it fully in order to say that it was - that is to say, it was fully comprehensive. I was probably more inclined to be supportive of the fact that management had taken this particular step. Risk assessments in their proper term and done properly - or a quantum leap forward for management to take, in so far as the process will put your commitment to safety well and truly on the line - because what the process does is open up the doors for all aspects of the mine workforce to use their collective experience and skills to identify the hazards, and to - not wishing to denigrate the process, but dream up controls, and from all those possible controls, the practicable and affordable controls - decisions have to be made on which ones to implement, and that can leave - as I say, their commitment well and truly on the line, because having taken into account this process and those control measures being identified, management then are really going to shoot themselves in the foot if they refuse to act on the control measures. It is a very onerous process and one that is fundamental - in my view, fundamental to success of safety management in any enterprise.

Now, I want to go back to the program - your contact with No 2. It seems what you have listed on Thursday, 23 March - you and the Chief Inspector, Mr Lyne, went to a meeting at No 2?-- Yes, that's correct.

Moura No 2. That was in relation to Mines Rescue services and strategies?-- Yes, it was.

Then on 10 May you visited Moura to attend a mine deputies' training course on strata control?-- Yes, this is the start of the three day period.

That was the first of your three day period. And you mentioned before what you did. So that was 10, 11 and 12 May you were there; is that so?-- That's correct, yes.

Then you were back there again on the 9th of June on the routine inspection; is that right?-- That's correct. It was routine - I guess it was routine in so far as for myself and for the basic circumstances pertaining at the time, but perhaps not so routine in so far as Mr Bell accompanying me on that occasion.

Well, had you carried out any of the duties that you normally did on your routine inspection on the occasion that you were there in May - that three day period?-- Sorry?

The occasion you were there in May for the three day period, had you carried out any of your routine inspection duties?-- Not - in essence, no. As I say, after the - I think the risk assessment - we did the risk assessment on the Wednesday - from around about 7.30 to 3.30 - and then I think we went down the mine at about 4.30 with Bernard Madden and had a quick look at 512, but, again, looking at what we could observe of

strata stability and those aspects, essentially.

So, really, between 22 March 1994 and 9 June 1994 you really didn't carry out what you might regard as a full routine inspection; is that right?-- If you put it that way, yes.

Now, on the 9th of June, you did inspect 512. You noted localised falls in goaf areas, but that the area was reasonably stable. You audited the system for upgrading rib and roof support ahead of second working. You noted it was satisfactory; is that right?-- Yes, that was taking an interest in the system that Mr Schaus had put in place for - I'm trying to think of the term we used to describe the system - hazard identification system. That was the system that you referred to of - where people would assess, if you like, the next row of pillars to be worked and identify a mark - all the work that was necessary to bring them up to scratch, as far as roof and rib support was concerned, and then for that - for those activities to have been identified as completed before the plan was issued, which allowed mining to proceed, which was a commendable system.

You make a note in your summary, again of a general kind, saying that you were critical of the non-compliance with their own shuttle car cable procedure and you urged consistent commitment?-- Again, on the previous visit, I'm not quite sure which one, Mr Schaus had explained to me the system that he had devised for the installation of shuttle car cables - sort of a mini-risk analysis type of approach - in which the standard operating system was devised, which had a great deal of merit, and I was making note with that record book entry that having instigated that system on the previous visit - month, or whenever it was prior - that there was evidence that people weren't doing as they should, and that it is always dangerous if you don't - if you allow a system to back-peddle, your integrity sort of is in question, so it is important, once you instigated a good procedure, to make sure that you get people to comply.

Okay. Well, that aspect also related to difficulties with cable flash; is that right?-- Yeah, well, the whole - that was one aspect of the control measures that - and the improvements to operating systems that was instigated to address the incidents of electrical flashes, yes.

And did you think that there was a sufficient response on the part of the mine to minimise the risk of cable flash during this period?-- Yes - it was a period of concern with the incidents that occurred, and I think on the - early in July, or thereabouts, I asked Mr McMaster to put together a report on the incidents at Moura, that report to comprise the history of the incidents that had occurred, to document the measures that had already been instigated at Moura, which I had knowledge of, which is the motion detectors on the spooler and those sorts of things that Mr McMaster has already described, and also I basically said, "What do we do now?", because we just had this other cable flash - that was really in the form of a question. Having done this and recognised all the things that had taken place, what do we do now as an inspectorate?

That's basically the question I put. That was asked of him at that time because - for another reason also, because the chief inspector had instigated a meeting with the new regional - Southern Regional Manager for BHP, Mr Tim Hedley at Gregory Mine, I think, on 14 July. That meeting was principally, as I recall it - it was principally designed to go through our intended initial audit, which - for which we had picked Gregory Mine. Gregory Mine was already Quality Assured and had been, I think, for the longest period of time of the mines around the area, and this was to be an inaugural audit; so, as we inspectors would be pretty green in that regard, and we saw that Gregory, having already been Quality Assured, might be, apart from being a fairly small mine - open-cut mine, I'm talking about - reasonably attuned to the audit process to give us a bit of an easy time with our first audit, and - however, obviously with Mr Hedley taking on those responsibilities with respect to the southern region, we also wanted to convey to him where we stood as an inspectorate and how we saw the world - the mining side - and particular aspects within his field of operation, and I indicated to Mr McMaster that I wanted to raise with him our concerns about the electrical flashes at Moura, and that having done that, I wanted that background information in which to quantify our concerns. That meeting did take place with quite a number of other people in attendance. The other thing that I wanted to put to Mr Hedley was concerns about the incidents of explosive misfires at the open-cut. Those issues were raised with Mr Hedley, albeit that the forum we had anticipated on the day wasn't quite conducive to accomplishing everything, but we did get time to talk to him and express where we stood and where we saw the principal concerns.

When was that that you met with him?-- I think it was 14 July. It was-----

14 July. After you came back from your leave; is that so?-- It would have-----

It is noted here you were on leave from 20 June to 3 July?-- Yes, something like that.

After that, on 27 July, you and Mr McMaster visited Moura No 2 again; is that right?-- Yes.

And you had some specific objectives in mind on that occasion?-- Yes, I did.

One of those related to the incidents of cable flashes; is that right?-- I guess that was the principal thing. Again, I decided that what I wanted - this question of, "Where do we go from now as an inspectorate?", having sort of gone - witnessed all these improvements and yet basically still an electrical flash occurred without - almost in sequence, so I was a little - more than a little aware of that, and what I wanted to do in conjunction with the work that Mr McMaster had already done was to ask the electrical management at the mine - the manager of the mine - to provide documentation on similar lines to, firstly, document the occurrences that - those events that had occurred, to document all the control measures that had been

initiated and also to indicate the ongoing strategy for improvement in that area.

In any event, on that occasion, the 27th of July, the kind of inspection you carried out, was that more like your routine inspection? You went there with specific objectives in mind?-- Yes.

Did you take up with the manager and have discussions with him about what had happened at the mine?-- We did speak-----

The acting manager, I should say?-- Yes, we spoke at length with Mr Barraclough and other people, including Mr Evans, the electrical engineer at the mine - the mine electrician.

Yes?-- Yes, but in addition to that, yes, it was by way of a routine inspection.

Did you inspect documentation on that occasion?-- No, what I was really looking for there was for them to generate that documentation, so that we could look at history, implementation of initiatives and an ongoing strategy.

That was in relation to the cable flashes?-- Cable flashes, yes.

Apart from this aspect of the cable flashes, did you, as part of your inspection, look at documentation at the mine?-- I don't believe so.

So, you were really that day more focused on the cable flashes aspect?-- Fair enough to say that, yes.

During the discussions that you had with Mr Barraclough on that day, was there anything mentioned to you that - about what had been happening in the mine - that raised any concern on your part?-- No.

Do you recall whether there was any discussion about this incident on the 22nd of July?-- I can't recall.

You have heard mentioned in evidence?-- No, can't recall.

When there was a higher reading of CO or even a higher CO make calculated?-- No, I don't have any recollection of that at all.

Do you recall speaking with the deputy in 512 panel when you were down there that day?-- Yes, I do.

Reece Robertson?-- Yes.

Do you remember whether there was anything of significance discussed during that conversation?-- Yes, significance is subjective, but we did speak about a number of things. We spoke about the electrical flashes, the things that were being done, and I guess just to continue to raise awareness was the essence of the conversation. I do recall Mr Robertson saying - or making a throw-away remark that he believed other mines

didn't bother reporting as well as Moura did. That may or may not be the case.

That is, reporting the electrical flashes?-- Yes. Moura has, I believe, undertaken those reports very consistently and diligently. I also spoke with Mr Robertson about rehabilitation of mine workers.

Did you notice anything unusual in the 512 panel when you were there that day?-- No, I did not. Perhaps by way of a - something of a distraction, only an hour or so before we went into the panel, they had a large fall in the area, and I can't specifically recall, but I have a recollection that we attempted to view the area of that fall. I can't really recall, having said that, what I actually saw, but subsequently, whether on the job there or whether subsequently on the surface - I suspect the latter - I looked at the geological plan for the panel, and I made the observation that three rows or so prior to where a fall had occurred and jammed the continuous miner was in the pillar on the lower rib side of the panel. The fall - the large fall that had just recently occurred just inbye of the mining position on that day was also in a very similar position, and the pillar next to the rib - the lower rib, and looking at the next row to be mined, the geological features were repeated.

Each of those two areas had geological features associated quite evidently with the fact that they had fallen heavily and the pillar in the next row to be mined, those geological features were repeated again, and I made the observation that - brought it to peoples attention that that needed to be looked at carefully when they come to mine that area, be mindful of that fact.

I see. Now, when you made your inspection on that occasion, how far into the panel did you go?-- I really can't remember. As I say, I have some recollection of trying to observe that fall area, but I can't recall.

Ordinarily when you went and inspected the panel what did you do, just go to the crib room and go to the edge of the goaf where the workings were taking place or did you travel down the top return?-- Probably on most occasions that would be the case. On some occasions -----

Sorry, on most occasions what would be the case?-- To inspect the working areas. It would not - I would not make a habit of going down and doing a waste inspection, if you like, although looking through the record book entries I have on a number of occasions made specific reference to that fact, that that's been done.

In 512?-- No, no.

In 512 did you ever go down the top return and across 13 cross-cut?-- I honestly can't recall.

Do you think you would remember it if you had?-- I think I would, but I couldn't be confident of that.

Okay. Now, just a few more things I want to ask you about - before I do, perhaps since I've canvassed that document by way of referring to the notes in that document I should tender that, Your Worship. I understand copies were provided to all the parties when a copy was provided to me and to members of the panel.

WARDEN: Is this the one headed up "Moura No 2 Inspections"?

MR CLAIR: Yes, Your Worship, "Moura No 2 Inspections 1994 - M Walker."

WARDEN: What about the front page that's on the other one?

MR CLAIR: I think Mr Walker said that was a separate document. I'll leave that off, Your Worship. It looks as though it should be a separate exhibit, in fact.

WARDEN: Thank you. "Moura No 2 Inspections", Exhibit 208.

ADMITTED AND MARKED "EXHIBIT 208"

MR CLAIR: Now, Mr Walker, I want to ask you about some specific areas that have arisen as areas of interest here. I've touched on some of them. First of all, in relation to ventilation, you say that you did regard that as a matter that you should take an interest in as an inspector?-- Yes.

As the inspector of mines. Did you take steps to ascertain the extent of knowledge that the manager or others at the mine had about first of all the keeping of the records of ventilation, any ventilation changes?-- I don't believe I did.

Was there ever any time when you were concerned about, for instance, quantities of air in a panel or about what might be occurring with regulators without there being proper records kept or any aspects like that?-- Yes, I think without - I can't refer to any specific instances, but there have been occasions when, if you like, localised variations in ventilation have been noticed where the ventilation may not have been as brisk as normal.

Do you mean on visual inspection?-- Yes, within the panel, but I don't know that there has been an occasion - I can't recall an occasion where, for want of a better term, there has been a significant deficiency in ventilation in any respect.

When you've noticed on visual inspection that there have been perhaps local deficiencies, have you taken any steps to -----?-- Yeah, that's normally -----

----- investigate that and -----?-- That would normally be discussed with the deputy at the time. It may be a case of simply, yes, there is less air there that day. That's not to say it was inadequate. As I say, I can't recall any specific situation where there was a significant deficiency noted.

Were you ever informed about a series of apparent difficulties in 512 Panel with layering or - and/or re-circulation in the No 2 road?-- No.

When you looked at the deputies' reports - I think in you fact you said you didn't look at deputies' reports in 1994 as far as you can recall?-- I think that would probably be the case.

When you did look at deputies' reports in the past on your visits, is that the sort of thing you would look for?-- Precisely, yes, it is.

Would you ask questions about that?-- Yes.

When you saw a notation about ventilation difficulties -----?-- Deputies' reports would indicate problems with gas generally, whether it be the face or in layering or whatever, and give some insight into that area. They might indicate problems with conveyor systems. Those two specific things come to mind that in the past have in fact taken me down the road to check something out.

If you had been looking at deputies' reports last year and you saw instances of re-circulation of air up the No 2 road or methane migrating outbye when it should have been carried inbye, would they have been the sorts of things that would have sparked your interest and caused you to inquire about it and perhaps investigate it a bit further?-- Yes, they would. I look at that occurrence in the No 2 heading and find it quite amazing.

You didn't read the deputies' reports, it seems, and you didn't notice it in that way. Were they things you would expect would be brought to your attention during discussions with the manager or are they things that occurred more at a day-to-day working level and -----?-- No, I would have a very reasonable expectation that if the manager or the undermanager had such things happen and had perceived them as being significant for whatever reason, just those sorts of things that they would normally raise with me, yes.

Do you agree that the haphazard inspection of deputies' reports by an inspector on a visit to the mine is really not a satisfactory method to rely on to ensure that things such as that are brought to his notice?-- Haphazard inspection of them?

I think you said earlier in the piece you used to inspect some deputies' reports and you would pick up notations about these sorts of things, but that you can't recall inspecting deputies' reports during 1994. That's what I refer to as a haphazard inspection, and my proposition was whether you - my question was whether you agreed that that system whereby there is just a haphazard report - I should say a haphazard inspection of reports by an inspector, whether that sort of system is sufficient to ensure that matters such as ventilation difficulties come to the inspector's attention?-- No, I don't believe that at all. I think that's just a good habit that can -----

That can lapse?-- Well, for one thing, you know, the standard of deputies' reports is an issue in itself and it's good practice to look at the nature of the reports and the material that's been reported in them by itself, but it would be true to say that to find out deficiencies in ventilation or any other aspect of the mine you couldn't just rely on that occasional thumb through the deputies' reports, no, nor would I expect that to be the case. I mean -----

We've heard in evidence here a mention of a smell, I think it was described as a benzene smell or a tarry smell, being reported on 24 June in a deputy's report. Do you recall the evidence about that?-- I do, yes.

Reece Robertson's report?-- Certainly do, yes.

I won't get it out and show it to you now, but again is that the sort of matter that as an inspector you would be interested to know about?-- Very much so, yes.

Well, again this system whereby there is a haphazard

inspection of deputies' reports from time to time obviously isn't good enough to bring that to the inspector's notice?-- A haphazard inspection of deputies' reports within the mine system itself would not be adequate so it would certainly not be adequate for an inspector.

Again do you agree there needs to be some system whereby incidents like that or incidents of ventilation difficulties are recorded so that they can be readily available?-- Yes, indeed.

For inspectors to become aware of them?-- Yes.

Can I move to the question of spontaneous combustion? First of all your own training in relation to spontaneous combustion. Did you receive training first of all in the UK -----?-- Yes, I did, yes.

----- in respect of spontaneous combustion. Further training in Australia?-- Only with respect to the ACIRL '89 training course.

Which year?-- '89, I believe it was.

'89?-- I'll correct that. There have been other seminars that I've attended, but in the ensuing years there have been a couple of other occasions which I can't bring to mind at the moment, but that was the principal one.

After you took up the job in Rockhampton -----?-- Yes.

----- did you receive any training in respect of spontaneous combustion?-- Yes, the ACIRL course in '89.

Apart from the ACIRL course?-- I believe there have been a couple of other instances, yes.

Has there been material disseminated to you as an inspector dealing with spontaneous combustion?-- I believe so, yes.

What sort of material was that?-- I think we had a report on the Ulan incident, fire. That's the most recent thing I can recall, but I can't recall anything other than that just off-hand.

You've seen the exhibit tendered here being the notes from the SIMTARS seminar that Mr Reed attended?-- Yes.

Was that a document that was disseminated to members of the Inspectorate?-- Are we talking about the training course in '89, the week's training course?

Yes?-- Yes, I was at that course.

I think you mentioned ACIRL -----?-- Sorry, SIMTARS.

You were at that course, so did you have a copy of all that information?-- Yes.

Did you bring it back to Rockhampton with you?-- Yes.

Was that material that was available to your staff?-- Yes, in essence.

Did you instruct your staff about what was contained in that material?-- I did not.

Instruct them to read it?-- No.

Did you ever take steps to determine whether people in positions of deputies, undermanagers and even manager at Moura No 2 had been made aware of that material?-- I don't think I can answer that question conclusively. Around that time I was on the course with Phil Reed. In essence I knew what Phil Reed knew because we did the course together. The issues surrounding the course at that time were very much topical and were discussed at some length with Phil Reed and others. John Brady I discussed those issues with, but I've got no specific recollection of involving other people within the management structure.

Did you see part of the inspector's function to ensure that there was training of mine personnel?-- Yes, to a degree.

Well, there is, of course, the requirement under the legislation for refresher training. That's one aspect no doubt?-- Yes.

Did you take steps to ensure that those requirements were being met at Moura?-- Yes.

What sort of steps did you take?-- There are references within the record book entries in past times where we did indicate that we have spoken with the training coordinator at the mine. I've spoken with Bruce Danvers personally in the past, and I've spoken at length with Joe Barraclough, and on occasions we viewed documentation with respect to that and notations were made in the record book to show that in fact they were progressing with refresher training.

They were progressing; were they meeting the requirements?-- Yes, I believe so. I think some of the earlier record book entries may have indicated that they were a little slow off the mark, but nonetheless that they were progressing through. Certainly in recent times it had become, from my observations through this 1994 in particular, perhaps a little before, it had been very commonplace for me to observe training sessions whether it be at the start point or at the training area or in on-job tool box talks on topics at the mine. That sort of activity in more recent times, the last year or so perhaps, was very, very evident.

That might be an appropriate point, Your Worship.

THE COURT ADJOURNED AT 12.57 P.M. UNTIL 2.15 P.M.

THE COURT RESUMED AT 2.18 P.M.

MICHAEL PAUL WALKER, CONTINUING:

MR CLAIR: Thank you, Your Worship. Mr Walker, before the luncheon adjournment I did embark on a line of questioning to ascertain what knowledge you had acquired of spontaneous combustion and I asked you in the course of that where you had received some training in spontaneous combustion, and we moved from there onto your involvement with the administration of training within the mine not specifically related to spontaneous combustion. Now, can I come back to where we started, that is, your knowledge of spontaneous combustion, and I would like to direct your attention to the period being the first half of last year through to the time of the explosion. Having regard to the various sources of your knowledge, what state of knowledge had you reached in respect of spontaneous combustion? I don't want a long dissertation, but can you say what items you regarded as important as indicators of the existence of spontaneous combustion, first of all?-- Yes, my basic training in the UK centred around background CO and Graham's Ratio for monitoring of early signs of spontaneous combustion, which is fairly typical for people trained in the UK, and as a result - largely as a result of the SIMTARS training course in '89 that knowledge was extended to the concept of CO make and the parameters associated with CO make. A review of literature since this Inquiry started would indicate to me that some of the details, for example, fleeting whiffs or smells that don't persist, are contained in literature and I would not have - I was not of that opinion. That would have been something that I had either overlooked or forgotten in that literature.

I'm sorry, just before you go on, I want to be clear about this. Your state of knowledge prior to 7 August in relation to whiffs or smells, what was that? Did you attach any significance to smells?-- Oh, yes, very definitely, but I would have been more inclined to at least be wondering under what circumstances you would just get a fleeting smell and then not for that - for that smell not to persist. I would have to wonder about that, had the occasion arisen, and I would not have been mindful of the fact that it was certainly part of the educational literature that we went through in that SIMTARS course. It is contained in the words of that course.

What you are saying is that the SIMTARS material mentions that there may be occasions when a smell which emanates from a heating might appear and then disappear; is that what you are saying?-- That's correct, yes.

But are you saying as to your state of knowledge prior to 7 August, that's something that you weren't conscious about at that time?-- It wasn't something I would have had a conscious memory of having learned, or if I had, I would have

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forgotten it, and I would have been more inclined to have been at least expecting a persisting smell.

When you speak of a smell, in your experience how has the smell been described?-- Which one do you want me to pick, all of them?

Various ones?-- Again, through the course of these proceedings I can't say that I have ever - I don't believe I have ever smelled benzene, although I am familiar that the term "benzeney smell" is attributed to indicator signs, and it's a term that I do use, or tarry smell or bitumen smell or fire stink, gob stink. They are all terms which I use, not in a definitive way but in a - more a - just a suit the moment way, I guess. I never really looked upon them as having - perhaps having been indicative of perhaps different phases of heating.

Now, go back to the other signs that you have mentioned. The background CO, did you have any parameters in mind as part of your training and ultimate state of knowledge as to levels of background CO that might give you an indication of early signs of a heating, or after '89 did you look more to the CO make?-- Well, the first question first. The background CO is the same as the make. The background CO is a parameter which needs to be established for every mining district. It's really just the norm, what is the normal atmospheric condition in relation to that panel, and based on that norm you then look for deviations. So, that's all I mean by the background CO. That background CO traditionally, and even today, largely might be referred to in parts per million, 2, 3, 4, 5 ppm, whatever it may be for that particular district or panel, and the CO make - simply convert the parts per million to CO make based on the ventilating quantity of the panel, and you could refer to a litres per minute quantity as being the background level.

Now, did you have any parameters in mind as to levels of CO make at which you would at least regard the CO make as giving some early indication of a heating?-- I was aware of the 10 to 20 litre parameter in the Mackenzie-Wood book, and I guess, being aware of that, I would be concerned at CO make entering that range.

What, anything over 10?-- I would have to say yes. I recognise some confusing aspects of the data that's come out of this situation which may lead one to wonder whether or not in some circumstances 10 litres is the proper base level. I guess, in the absence of any other information, you could only go by what the textbook says and by not having established any practical parameters to say otherwise. Why I say "confusing aspects", it occurred to me that in the Mackenzie-Wood book where it refers to the 10 to 20 lpm it specifically refers to a longwall district. Again, going back to my very early days as an apprentice in the Coal Board, part of that time was spent with the ventilation engineer at the mine doing ventilation surveys. A normal part of that routine would be to take the necessary measurements to establish the background CO and monitor accordingly. The thing that confuses me - and this, I suppose, is somewhat hindsight, so I guess I am

digressing a little bit, but with a longwall district, because the extracted area behind the face has been totally collapsed, caved, the actual working area remains constant. Although it may change in position from day to day, week to week, really it is an intake airway and a face line, a return airway. The amount of coal exposed to oxidisation remains practically constant. As a result - and my recollections, as I say, going back to those early times - the expectation for a longwall panel is that the background CO remains constant, 1 ppm, 2 ppm, 3 ppm, whatever the figure may be. It occurred to me that in a situation like 512 Panel whereby the voided area is constantly increasing in size and the exposed coal available for oxidisation is increasing day by day, albeit with the chemists - albeit that the chemists say that after a certain time coal will skin over with its oxidisation process and slow down or prohibit further oxidisation so that the process is not totally perpetual, nonetheless compared with the parameters set out of 10 to 20 litres for a longwall district and the conditions that that represents, the 512 Panel with an ever increasing availability of coal for oxidisation must be different, and I guess I really can't say any more than that. It's got to be different, it's got - I can't say different. I would think it's got to be greater and increasing. I'm probably just digressing a little bit from the point of the thing, but that sort of led me to some confusion about - I guess, under those circumstances, whether 10 litres, the lower range, would in fact cause you concern or whether you could perhaps be looking for something a little higher.

Can I ask you this: did you, first of all, take any interest in what levels of CO make were being achieved in the 512 Panel at Moura No 2 last year?-- I did not.

Did you have any discussions at all with the manager or anybody else at the mine about the levels of CO make in the panel?-- Other than in the early - what I think was the very early part of the panel, I did hear the expressed opinions from someone, I don't know who, about the fact that the 512 Panel, because of all the extra coal being left around and the larger voids, leading to higher levels of CO than had normally been experienced, and I can't really recall whether it was said in the mode of an expectancy or a fact. I just had the recollection of that being the case. In addition to that, there was talk, I think, associated with - at the time of the risk assessment and maybe before that about a concern that the additional broken coal being left behind in the workings added to the spontaneous combustion risk.

Did you ever see any graphs of CO make produced as part of that weekly vent survey?-- For 512?

Yes?-- No.

Was there any reason why you didn't make inquiries about those things?-- No, there wasn't.

Did you regard spontaneous combustion as being a matter of some significant risk in a mine like Moura No 2?-- Spontaneous combustion at a mine like Moura or any other mine

that had a propensity for it or a known occurrence, we would, at the very least, like, or endeavour to stay on top of the monitoring disciplines to avoid getting into a spontaneous combustion situation. In my view, those monitoring disciplines were and certainly appeared to be very much in place at Moura.

What do you mean when you say that?-- I'm talking about the fact that the mine was equipped with a continuous monitoring system.

That's the Unor system you are talking about?-- Yes, the Unor tube bundle system. It was as good a system as was available to any mine in Queensland, and certainly in my district and I had no reason to believe that it was working other than well.

Did you know that there was a weekly CO make calculated and graphed?-- I knew that the CO make was being monitored and calculated weekly. I am suffering a little bit like other people now, what I knew before and what I knew after about whether or not there was a graph being produced weekly. I think I did know that.

Did you ever ask to see it?-- No, I did not.

I think you were answering my question about whether you regarded spontaneous combustion as a significant risk?-- Yes, I would regard it at Moura as being a significant risk which had to be - as I say, the appropriate monitoring disciplines, it would be important and vital that they be maintained in a proper manner.

But it didn't occur to you that you should check on that, check to see that the monitoring system was being maintained in a proper manner?-- I haven't -----

Be it the Unor or the weekly calculation of CO make?-- I was aware that those things were being done. I have looked and observed the Unor screen at the start point on many occasions. It's almost impossible not to see it. In fact, it's practically impossible not to see it unless you are otherwise distracted. I guess the problem with this - I guess the problem with this situation is that on the frequency that I would go to the mine, the Unor screen would look the same from one month to the next month to the next year, and while not wishing to say that those systems - there isn't a need to audit those systems, I would certainly expect that my normal routine in future would be to instigate on my own part - for my own part a more formalised, at least, annual audit that will assure me that a mine's systems are working appropriately and that the people associated with those systems are sufficiently knowledgeable. I have a clear view for my own part that that will be very much a prime concern of mine in the way I perform my duties from now on. However, I guess almost being too familiar with those systems and passing them by on repeated visits and seeing them in operation, perhaps I made too many assumptions as to the - exactly how efficient they were. However, again, it would occur to me that if I had

have done a thorough audit of that system towards the end of 1993 and that system had been in operation, I'm not sure whether that would have affected to a great degree the outcome, or what appears to be the outcome.

Just on that front, one of the things that seems to appear from the evidence is that members of management and senior management at the mine didn't appreciate the significance either of CO make or of particular levels of CO make. Now, can we just address that apparent problem for a moment and say, well, what kind of activity from the side of the Inspectorate would be required to ensure that people in those positions keep up to date with new developments of any kind?-- I will start off by saying that I will correct my previous assertion that - with the exception of that aspect of it, and that is making sure that people were knowledgeable in the equipment being used. That would have obviously proven to be useful.

Well, you see, before you attempt to answer that last question I put to you, I will go on further with the answer to the last question. One of the duties of an Inspector of coal mines is to carry out the examination and report upon the proficiency of candidates for various mining qualifications. I am looking at a document that's been provided to me which is headed "Duty Statement". Did you understand that to be part of your duty?-- Yes.

Now, that obviously looks at the aspect of ensuring proficiency of candidates as they take on formal qualifications, but do you agree that really there needs to be some action taken to ensure the proficiency of people on an ongoing basis in areas associated - areas of expertise associated with their responsibilities at the mine, first of all?-- Yes, I do agree with that.

Now, that appears to be, at least for the moment, intended to be covered by this requirement for refresher training to which there was some reference just before lunch; do you remember that?-- Yes.

And I understood you to say that as far as you could gather, the efforts that were being made to comply with refresher training were adequate?-- They appeared to me to be so, yes.

Well, this is an area, this area of CO make and the knowledge even of those people at higher levels of management about CO make, appears to have been less than adequate, far less than adequate?-- Yes, I agree.

So that it's one area where, quite obviously, the refresher training wasn't achieving what should be achieved. Now, what comment can you make on that?-- Perhaps I will approach that from two directions. I am of the view - I'm not sure whether I'm perhaps thinking correctly in saying that refresher training is not the point, but I'm of the view at the moment that the controls or the way in which we - the most effective way in which the industry might ensure that their managerial people, as well as everyone else on site, when they take up

appointment in the mine would be more in the realms of induction training. I think it's a fact that the industry has in the past, up till now, and probably is still doing so, assuming that the manager and management staff, to a large degree, know everything and that when they take up a job we assume that they know everything, and as a result there is no real effective induction processes for those people.

Probably in similar terms, that therefore there would be no effective refresher training, but it is my view that that is an area that the industry must adopt to have a very appropriately constructed and detailed induction training program at every mine into which undermanagers, for example, and managers will receive assessment and training to the point of being competent to address the hazards that they have to control at that mine.

What about the stricter enforcement of the current requirements for refresher training?-- That's a relative thing. I'm not quite sure - yeah, in any aspect of any game, you can always up the game, but I'm not in a position really to fully understand what the present situation is with respect to refresher training to be overly critical of it.

Didn't you, from time to time, check on what refresher training was being given at the mine?-- Yes, yes.

But you are saying you didn't fully understand what was required by-----?-- No, no, you seem to be talking more globally, and I was really sort of addressing it from that point of view - that perhaps refresher training for the industry, as I thought you were talking, might be - or our attempts to enforce it might have been deficient on an industry base, that's what I was trying to say. I'm not sure that - just how well we are doing that to be able to comment.

I see. Another aspect of the system that you mentioned - at least the monitoring system that you mentioned - was the Unor system. Did you involve yourself much with that when you visited the mine?-- No, I didn't.

Did you make any inquiries as to whether people at the mine were properly trained in its use, or was that something that you left more for Mr McMaster?-- No, I believe that discussions in the past did centre around what people were trained on that apparatus. There has been no formal audit done. When I first went to the mine - or maybe not quite the first time - but I was given an introductory or an induction on that machine by Phil Reed. At that stage it was the original touch screen, and Mr Reed showed me the rudimentaries of the machine and what it could do, including doing the graphs, throwing up the graphs at the flick of a switch, so to speak. On subsequent occasions, probably at least two, I've been through the same process when I've actually taken visitors to Moura, and Moura personnel - and I've been present when they have also been given a run down on the machine, but that training - well, it would hardly be training, because I had no expectancy to continue to have to use that machine, but an introduction to it was quite rudimentary and not involving the full details of the machine.

Beyond that, you didn't take any steps to find out whether there was a formal protocol in place for the use of the system and acceptance of alarms or anything like that?-- I was aware that the machine was managed, for want of a better term, by a limited number of authorised people, and that the system was controlled in that manner. I was aware that the electrical

department basically were responsible for the upkeep of the machine, and I was aware that Mr Selff - Ken Selff - of his function at the mine with respect to the equipment.

I've touched on a number of areas in which you, as an inspector, have differing degrees of involvement. It seems in some cases you had what might turn out to be a false understanding as to the extent of knowledge that people at the mine had; for instance, in respect of the significance of CO and levels of CO make. Do you think - or what is your view on whether or not the Department involves itself sufficiently in the training of personnel at the mines? I know we have heard reference to SIMTARS seminars and dissemination of some material from there, but that doesn't seem to be something that happens on an organised, ongoing basis?-- We don't - other than personal interchanges between inspectorate and people on site, there isn't an organised system. We have in the past taken initiatives to enter into the education field in some specific ways, notably in the area of noise mitigation, and with the knowledge that we acquired on noise suppression and those sorts of areas, we have organised and run seminars for the industry on industry premises, training-----

That's just on the noise aspect - noise suppression aspect?-- Yes, I think diesel particulates was another one that we have run.

Without running through the few that have taken place, do you think there is scope for a more organised system of training to be administered from the Department's side?-- From the Department or the Inspectorate?

From the Department's side?-- I think there is a role for the Department to play in co-ordinating that approach. It would appear difficult for that to occur unless the Department takes an active role.

At least a more active role than it appears to have taken in the past?-- Certainly.

Finally, you have made reference to relying on your talk with the mine manager during your visits to the mine in order to ascertain whether there has been anything of significance occurring at the mine?-- Yes.

And it seems to appear from the evidence here that sometimes the mine manager has been aware of significant items and sometimes he hasn't been and sometimes he has mentioned them to you and perhaps on other occasions he hasn't. From the point of view of the inspector, who, at least for the period of time, had the duty of visiting mines, what sort of comment would you make about the need to establish a system, whether it be a computerised system or otherwise, which registers significant incidents as they occur? When I say "incidents", report of a smell, report of a high CO make reading in a panel, a report of difficulties with ventilation, such as recirculation or layering of air in a roadway - a register that records those significant events which, first of all,

pursuant to the system, would have to be acknowledged by somebody at a particular level of management, but also provides as a system for that log to be available for inspection by a - an inspector when he comes to visit; would that be a matter that you would see of some benefit to an inspector, or a system you would see of some benefit to an inspector?-- It could just as easily be argued that it could be of assistance to a manager too.

I am asking for you to comment as an inspector?-- I couldn't disagree to that collation of those sorts of occurrences. It could be a useful tool.

Is an inspector going to look at it when he comes to the mine to do his inspection?-- I think he might. You know, it is a new idea, and I suppose, you know, there would have to be a fair bit of thought to be given to exactly what that beast would be, but, yes, I take your point; it could be such a tool which would be more readily discernible to everyone involved to put all those factors together, and perhaps not depend on individuals, but that the system was available to a number of people.

Just one more question: on your inspections, did you tend to speak to quite a number of other personnel at the mine apart from the manager, or did you tend to speak with the manager and expect to get all the information from him?-- No, I think generally speaking - I think I could probably speak for other inspectors at Rockhampton office too - but I speak mainly for myself - an inspection at a coal mine is not an unpleasant affair. It is the root of our up-bringing and of our profession, and I regard visits to every coal mine as being refreshing and interesting and, likewise, the people who are there, and it is not uncommon for me to make the effort to speak to as many people as possible.

With a view to getting information from them?-- With a view to getting information. A lot of that information is purely by being familiar. I think quite a number of people at Moura would know me well enough to want to stop and discuss things if there were things to discuss. Perhaps more formally we make efforts to discuss things with the miners' officers on site whenever we can. I think the miners' officer on site, particularly at the underground mines, we have got a sufficiently good relationship that I think when they get an opportunity, they purposely seek us out, too.

Thank you, Mr Walker.

CROSS-EXAMINATION:

MR MacSPORRAN: Mr Walker, can I take you back to when you joined the Inspectorate in 1988? You have told us that you had some considerable experience in the UK; is that so?-- It seemed to be overwhelmingly considerable, which is why I came to Australia.

And you had further experience in New South Wales before coming to Queensland?-- Yes.

And I believe you told us that you actually replaced John Brady as the Central Division Inspector in early 1988?-- That's correct, John vacated the position in about June 1987 and I came in in February 1988.

And did you know John Brady at the time you took up the position in early '88?-- I didn't know John well. I had met him when I was engineer for the Coal Board at that time and I had met John - but I did get to know him quite well very quickly as he was manager of Cook Colliery at the time - one of the mines that I inspected.

So, you would see him at least on the occasions when you inspected Cook Colliery?-- Probably in 1988 I would have seen John Brady once a month.

Now, at that time, that's early '88 when you joined the Inspectorate, who was the manager at No 2 at Moura?-- Phil Reed.

And did you know him before joining the Inspectorate?-- No, I didn't.

Did you establish with him a satisfactory working relationship as you perceived it?-- Yes.

You have told us something about your procedures in terms of - that's generally - in terms of your inspections, but can I ask you this: before you went to inspect on each occasion, would you plan some items that had to be addressed - that is, before going to the mine?-- I think - yeah, before going to the mine you would be mindful of any administrative issues that might be outstanding, perhaps of any perceived under-performance as a review of reports from previous inspections, perhaps any - in some cases, any projects that might be going on that there was a need to get up to date on.

Would those matters all be ascertained before you actually arrived at the mine, would they?-- Yes, they are the sort of things that you give some thought to with a view to having an objective for the inspection.

Now, I think you told us that, by and large, your visits to all mines, including Moura, were not without notice - that is, you would arrange to arrive on a certain day?-- That's

correct, yes.

And did I understand you to say that that was the only practical way you could carry out your inspections - things that needed to be addressed?-- I believed that to be the case, and, as I said before, it is important to spend as much time with the manager as is possible, and unless you consult as to his availability compared with your schedule, you are just going to take pot luck, and that's to be avoided.

Well, given the position currently, assuming you had the resources and time, do you see a role at all for random, unannounced inspections at the mines?-- Yes, I think I tried to allude to the fact that if I was in the position where, through whatever method of communication I was aware of a situation at a mine that was not satisfactory and which it would occur to me that it was an important thing and that that would be likely to be covered up should I make arrangements or give prior notice, I would go unannounced.

Now, taking you back to the period of your inspections during 1994 leading up to the final one on 27 July, did you ever have any belief that there was a need for you to turn up at Moura No 2 unannounced over any issues at all?-- If I had felt that, I would have done it.

Well, once you arrived by arrangement, I think you told us you had some sort of meeting with the manager before going underground?-- Yes.

And it was at that meeting that you would expect matters of concern, if there were any, to be raised with you and dealt with before your inspection?-- Yes.

Did you raise topics yourself at those meetings before going underground?-- Yes.

That is, matters that needed to be addressed?-- Yes. An issue that I didn't refer to before, which I think is an important aspect of an inspector's role, is the dissemination of information about incidents and occurrences that have happened at other mines - current things. We have a safety alert system which works very well whereby any significant incident that occurs in our mines from which we can learn, we put on paper in the form of a safety alert depicting the nature of that accident or incident and the factors which were involved and recommendations as to how to prevent a recurrence. Whenever those occurred, they are circulated to all the mines. I'll add that the other officers of the inspectorate operate in a similar way, and when they generate those alerts, we would get those and we send ours to them, and they subsequently disseminate those alerts to their mines, so there is a fairly wide network. In addition to that, we also receive similar alerts from all other states in Australia and the Territory, and from Papua New Guinea to a degree, also on the metalliferous side and not just coal mining, and all those that are appropriate or clearly pertinent, we also send out to the mines on a mail distribution list, and when I go to a mine, those that are current at the time, I like to assure

myself that the relevant people are getting the information and also to go through those incidents and talk about it.

When you say those alerts are distributed to the mines, how is that done? Are they sent to the manager, or is there any follow-up as to their distribution at each mine, or how does it work?-- We have a distribution list - a tick-off list which can nominate whether it be the manager, the mechanical engineer or the electrical engineer, or, in fact, the manager of the coal preparation plant - coal preparation plants. Some of them in the industry are a separate statutory managership - statutorily independent of the mine that they serve, so we treat those managers in their own statutory right, and they get those things too. It would depend on the nature of the alert to whom those alerts are addressed.

Was there any average frequency of the issuing of those alerts, or were they simply done as they arrived?-- Yeah, they are done as they occur, but with them coming from such a diverse number of locations or generation points, we are sending them out quite regularly.

After you had these meetings at the mine itself, you would go underground and who would accompany you?-- Are we talking generally?

Talking generally, yes?-- Wherever possible it is the mine manager, who is often accompanied by the undermanager-in-charge.

And-----?-- But on occasions also includes - can include a miners' officer, and again, depending on circumstances more than anything else, might include the mine electrician or the mechanical engineer.

Depending on what issues were to be addressed?-- Yes.

Would it also more often than not include the people you had been speaking to above-ground about any concerns that might have arisen - that is, if you had a group meeting, you discussed things, would the group go underground?-- A little bit hard to zero-in on a particular instance of that, but that's not without its possibility. There is certainly occasions where, as an inspectorate team, we've approached an inspection from that point of view - that is, all the mechanical and electrical and mining persuasions have done a joint safety review type inspection of the mine to go over a number of issues outstanding or to review progress.

On average, again generally how long would you spend carrying out the underground inspection?-- That would vary very much on how much you tackle underground, but I suppose typically four hours, longer depending on the complications that might be -----

Again, I suppose, the extent of that in terms of the whole mine would depend upon what areas on that particular day might assume significance?-- Yeah, that's correct. For example, if the conveyor system is to be inspected that might involve a walk from the surface to the far end of the mine along the conveyor route inspecting the conveyors and then the various panels and then a return to the surface and that can be quite an extensive exercise. That mode of operation from my own point of view in the earlier years at Moura was quite regular - very regular. Moura's conveyor system when I first went there was somewhat humble, and through discussions with Phil Reed and George Mason focusing on those issues the conveyor system was very significantly upgraded and management took a very positive pride in the standard of the installations in current times and I guess the need for such regular traverses of the conveyor system diminished as a result.

After the inspection underground you would have a further discussion on the surface like a debriefing, I suppose, of what had gone on underground?-- That's right. I mean the discussions with management from arriving at the mine through the inspection, during the inspection, after the inspection all centred around those same subject areas largely, I guess, but afterwards it would be very much - one of the aspects would be debriefing.

You've explained to us the procedure you adopted in terms of making your record book entry and you've been through that?-- Yes.

Now, you told us something about your knowledge of spontaneous combustion and the source of that knowledge. If I could direct you to the period between 1988 when you joined the Inspectorate and before you attended the SIMTARS seminar in 1989, what was the state of your knowledge of spontaneous combustion?-- My knowledge in spontaneous combustion then would revolve around Graham's Ratio being the main indicator or the main monitoring regime to detect early signs of spontaneous combustion, and associated with that would be parts per million background and monitoring of CO in a panel on the basis of parts per million.

What about smell?-- In addition to that, yes, the normal physical - the normal physical signs that have been spoken about so much here, sweating and smells and a feeling of heat on the rib or wherever and -----

Were you personally aware of any change in emphasis from parts per million to litres per minute at the time you joined the Inspectorate in '88?-- Not at that time, no.

Did you have any discussions with Mr Reed, for instance, in that period '88 to '89, in terms of monitoring for spontaneous

combustion?-- In CO make?

Yes?-- I really - perhaps I can't really be too sure about that because on the lead up to the SIMTARS course - there was a lead up period to that in which CO make and what the course was all about would have been part of discussion amongst the Inspectorate. I can't recall it specifically, but I may have - I may have been - in fact through my association with Phil Reed and John Brady during that period I feel sure that we would have talked about CO make generally prior to the SIMTARS course, but I don't have a specific recollection of it.

Do you have any particular reason for nominating John Brady in those discussions?-- Yes, I do, because John Brady was the inspector who was - at the time of the No 4 explosion and also in the 1986 sealing of 5 North, and through those experiences John in particular had formed very strong views as to how carbon monoxide - or the monitoring of a panel should take place.

In any event, you've told us you did attend the SIMTARS seminar in - was it about September or so 1989?-- Something like that.

You told us the knowledge you gained there, including the parameters for CO make and litres per minute?-- Yes.

You brought back from the seminar with you the literature being the volumes that set out details of the training course conducted by SIMTARS?-- That's correct.

Mr Reed attended that course as well?-- Yes, he did.

Did you continue to inspect No 2 after the seminar conducted by SIMTARS?-- Yes.

Was that at a time when Mr Reed was still the manager at No 2?-- Yes.

Can I take you then quickly to some details of those inspections? In addition to the document Mr Clair referred you to have you also prepared a summary of record book entries for the period 1988 up to 1994?-- Yes, I did.

Would you just have reference to that, if you would, please? Your Worship, I understand this has been distributed to the parties including the panel members. I don't want to spend much time on this, but is it a document compiled by you which has gathered together for the years nominated, that is '88 to '94, entries you have made upon your inspections at No 2 in the mine record book?-- That's correct. It's a compilation for each date of an inspection or for each record book entry, a dot point of -----

Of what it concerned?-- Of what might have been there, yes.

I don't want to take you to all of them, but at the bottom of that first page which is dealing with the inspections of April and May of 1990?-- Yes.

There is reference there apparently by you in the record book to "Improvements to the defect reporting system required and coverage and training program."?-- Yes.

Can you tell us very quickly what that signifies?-- The defect reporting systems basically cover equipment, mobile equipment and it's a system whereby operators of that equipment can log in any defects that they find during its operation and put it into a system for action via the mechanical or electrical departments essentially to ensure that those defects are corrected in an appropriate manner, a speedy manner. That - I think I'm probably - just looking at the year, I think that's - it's probably true to say that - I'm trying to think of a fatality that occurred at Oaky Creek mine, but I think it was a little bit before that whereby defect reporting was a particular aspect of that inquiry's recommendations, defect reporting systems.

So you are saying that once that became apparent you flagged it in the mine record book for Moura No 2?-- Yes, except I think the one I'm thinking of was in the end of 1988 or early 1988, so it was a little bit before that.

I don't particularly want to go into all the details of these things, just to get your explanation for what they basically relate to. There is another entry on the same page for the following month which again deals with the same topic; is that so, May 1990, defect reporting?-- Yes, yes.

Over the page for the same month, apparently part of the same record book entry, you have, "Progress of training scheme, particularly refresher training."?-- Yes.

Is that the kind of entry you mentioned earlier when you were answering questions from Mr Clair about record book entries dealing with refresher training?-- That would be something that I would be trying to recall whereby at that time obviously I would have been looking into the state of the training, particularly refresher training.

We are talking about a period May 1990; do you know who the training officer was at Moura No 2 at that stage? Do you recall?-- I'd be guessing at Bruce Danvers, but I'd be guessing.

If you look down the same page which refers to October 1990, there is a reference at the end of that record book notation which says this: "Training - more required. Critical of part-time safety training coordinator position which is secondary to other production functions." Does that refresh your memory about what the concerns were at that stage, that is 1990?-- That was a comment which would confirm the fact that I would be talking about Bruce Danvers. A lot of that - the information that I gained to make that sort of comment would have come from Bruce Danvers who at that time did express to me in our discussions that as an undermanager come training officer it was apparent that as far as being the training officer was concerned he was only spending about 30

per cent of his available time in that area, so that's where that would have originated.

We know, of course, from the evidence here that - I think it was around late '92 or early '93 Mr Barraclough took over the role that had been occupied by Mr Danvers, but in a full-time capacity as safety and training undermanager?-- That's true, I think with less secondments with other roles anyway, much less.

In any event, the issue was flagged by you in the record book back in 1990; is that so?-- Yes.

That period apparently coincides with what is said to be, again from the entry, an overall safety performance review by the whole Inspectorate team, particularly of some areas where performance was considered to be lacking?-- Yes.

And that training aspect was part of that review, was it?-- That was one of eight dot points that I've got listed there.

We move into '91, quickly. Over the page we have the tail end of the April '91 notation which speaks of a need to develop and document a safety and accident prevention plan?-- Yes.

Again is this an example of your flagging issues with the management that did require attention and that were in fact attended to ultimately?-- That particular reference is made more as a result of discussions with management and my impressing my view on management at the mine that there was a need for such a document to be generated, that is a document which would identify clearly the commitment to safety by the mine, and its mechanism for implementation which we could then audit.

There were ongoing discussions about that obviously, were there?-- Very much so, yes.

That's reflected again, I think, in the entry of June '91, "Further discussions management team and Inspectorate team"?-- Sorry?

I'm sorry, June '91, the last entry for June '91?-- Yes.

Progress on safety and accident prevention strategies?-- Yes.

Discussed between management team and Inspectorate team?-- Yes.

It was a co-operative exercise discussed between Inspectorate and the management?-- It was, I think perhaps more our view that that approach needed to be taken to document activities in that area at that time. I am aware that - I think in - perhaps 1992 when Mr John Grubb came on the scene that he had a view that an accident management plan or a safety and management plan was required, and I understand that he - one of the initiatives that he took on taking up his position was to require each of the mines to put one in place.

Mr Grubb, so we know this, was a BHP official?-- Yes, he was the headman in coal operations for BHP Australia Coal in Queensland.

The same matter again is referred to next month, July '91, "discussions with a miners' officer, Steve Bryon"; do you see that?-- Yes.

Then we come to later in '91, September, with the sealing of 5 North. We have heard some evidence about that?-- Yes.

You were informed of that, were you?-- Yes, I was, yes.

Who informed you that that was taking place?-- I was informed by telephone by Phil Reed.

He was still the manager at that stage?-- Yes, he was.

Can you tell us what you were told about the circumstances of the sealing in 5 North?-- I'll have a look at some -----

You have some notes, do you, of that event?-- Yes.

I just want generally what you were informed, but by all means if you need to look at your notes do so. Perhaps I should ask you this firstly before you refer to that: after you returned from the SIMTARS seminar in 1989 did you become aware that Mr Reed had introduced a system of monitoring CO make at No 2?-- Yes.

Do you know when you became aware of that?-- I don't specifically, no. It was a - as I say, in around that time it was very much topical and, you know, we discussed it quite frequently, but that was then.

Tell us what Mr Reed told you about the circumstances of requiring sealing of 5 North in 1991?-- I made some notes to the effect that he informed me that the 5 North panel was experiencing very heavy conditions and had been for the past week and that some intersection had fallen and that there was significant bumping and banging high up in the strata. He informed me that he planned to leave a row of pillars untouched between 9 and 10 cut-through and restart production again at 8 to 9 cut-through. That's just to leave a row of pillars intact to try and stabilise the area, but then he further informed me that he was no longer able to inspect the waste and that he thought that some stoppings had probably been destroyed and therefore full and proper ventilation of the area was probably not occurring. That information surrounded the information he gave me on the carbon monoxide level which he said had risen in the top return to 6 lpm and the bottom return three to 4 lpm. I note there that, I think, the fact that it rose from three - I think I've put 3.3 to 6.6 over the last four weeks in the top return and from one to 2 lpm to the 3 to 4 lpm over the past four weeks in the bottom return and on that basis he decided to withdraw and seal the panel.

Were you at the mine at all during the course of the

sealing?-- No, no, I was - well, Monday the sixth, probably at the office.

Ordinarily were you informed about sealing of panels at No 2?-- I don't believe so.

Can I take you back then to the mine record book entries? If you move on past September 1991 to the next page there is a further reference to a lack of a full-time training coordinator. That's the same point mentioned before; is that so, December '91?-- Yes.

January '92 a reference to a safety management program still to be drawn up?-- Yes.

A similar entry in March 1992?-- Yes.

Again these are aspects of the operation of the mine that you flagged in the mine record book?-- Yes.

You indicated on the following page, September 1992, "Improved safety awareness", and you quote the lost time through injury figure; is that so?-- Yes, yes.

Then in January 1993 you note in the record book that Mr Schaus was the manager; is that so?-- Yes, I've put that there specifically because that's the first record book entry that I could identify of which Mr Schaus and I would have done an inspection at Moura.

The evidence seems to indicate Mr Schaus took over on 9 December 1992. Would that January '93 be the first inspection of the mine where you actually met Mr Schaus?-- Most likely.

Was there any period either before or after Mr Reed's departure where there was a formal meeting between the three of you, Mr Reed, Mr Schaus and yourself?-- No - well, I don't believe so.

Would you have expected there to be such a meeting or such a handover of -----?-- No.

Why would that be? Why wouldn't you expect that?-- I just don't think that sort of occurrence - that sort of thing has ever occurred. One mine manager would - it's normally the case that one mine manager would leave and another mine manager would carry on. So the opportunity for a third party to - particularly an external one to intervene would be quite remote, I would think.

Then your inspections at No 2 as noted in the record book continued when Mr Schaus was manager?-- I'm sorry?

Your inspections at No 2 continued as the record book indicates for a period when Mr Schaus was manager?-- Yes.

You note there in August 1993 that an intended inspection of No 2 was not done apparently because of an investigation into

a spontaneous combustion situation at No 4 Acky portals?--
That's correct.

What was that about?-- I only indicated that I went to Moura mine with the intention of going to the Moura No 2 underground, but the incidents relating to the No 4 mine changed my plans and I ended up spending quite a lot of time on this issue in relation to No 4 mine whereby carbon monoxide had been detected by the mine monitoring system in No 4 mine, and that was coming from a spontaneous combustion situation in the open-cut itself outside what's known as the Acky portals and the carbon monoxide was actually being entrained into the mine. There had been an attempt some time shortly prior to dig out that heating with a drag line which had obviously proven to be unsuccessful and we ended up trampling all over the area to actually locate the nature and the extent of the heating and then subsequently organise the introduction of bulldozers to dig the whole thing out. It was only - the actual spon com was only a few metres outside the portals and if it had encroached into the coal seam itself within the high wall it could have been a serious ongoing problem.

The final notation on this document, page 6, relates to October 1993. You say "Conference only, B Madden ACIRL, regarding future design options for partial extraction to maximise recovery and productivity."?-- Yes.

Did that involve anything to do with 512 or proposed development of 512 to your knowledge?-- Looking at that date I would think so.

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So, that's the body of that document. Your Worship, I should tender that. It's described as "Moura No 2 Incident Summary of Record Book Entries 1988 to 1994".

WARDEN: Thank you, as described, Exhibit 209.

ADMITTED AND MARKED "EXHIBIT 209"

MR MACSPORRAN: Mr Walker, could I take you then quickly back to the previous Exhibit, 208, which is your summary for the inspections of 1994? Do you have that with you?-- I do somewhere.

Can I take you quickly to page 3 of that document where you speak of, amongst other things, attending the mine on three days in May: 10, 11 and 12 May 1994?-- Yes.

And you have indicated as part of your record book entry the part you played in the risk assessment in respect of 512; is that so?-- Yes.

Can you recall, as part of that exercise, being present when there were any discussions about spontaneous combustion being a risk? Was it identified?-- I cannot recall during the course of the day that day and part of the day that I was there that spontaneous combustion was an issue that was discussed. The process took a number of days for the panel that were actually doing the risk assessment. Bear in mind to a large degree myself, and perhaps even senior management, can be regarded as something of an observer to this process, a prompter perhaps, not a direct participant.

I take it -----?-- I can't recall - I could be wrong, I could be wrong, but I don't recall during the time that I was there that that was raised in the nature of business.

I take it, though, you became aware that it had been discussed at some stage; if not then, shortly after?-- Yes. As I said earlier, I think it might have been at that time that the business of extra broken coal being left behind in the waste area may have been discussed as an added potential for spontaneous combustion.

Did you actually see, after that time, the formal document that had been drawn up in respect of the risk assessment?-- Yes, I did.

Did you notice in there that spontaneous combustion had been identified as a risk?-- Yes.

And controls were identified for the risk?-- Yes.

Did you have any further discussions with anyone at the mine about that risk of spontaneous combustion?-- Yes, I did. In one of my visits to the mine subsequent to that risk

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assessment I did speak to some degree with Mr Schaus about the outcomes from the risk assessment process.

Did any of those discussions centre around the identification of spontaneous combustion as a risk, can you recall?-- I don't - I can't recall that they did.

The next inspection you carried out, which was the routine inspection which was 9 June, refers to auditing the system for upgrading rib and roof support ahead of second working and noting it was satisfactory; do you see that?-- Yes.

Was it the case that that was the main thrust of the risk assessment done for 512, that is, rib and roof support and problems associated with that?-- Yes, to put it in a simple term that would be correct. Not this system for upgrading the rib and roof support but for strata - roof and rib control and awareness generally during the extraction processes and the very sequences was the main thrust, I would say, yes.

Would that be one of the reasons there was an audit by you on 9 June for this upgrading of rib and roof support?-- Sorry, Mr MacSporran, what was that?

You say rib and roof support was one of the main risks identified for 512?-- Yes.

On 9 June you have noted auditing the system for upgrading rib and roof support ahead of second workings?-- Yes.

Was that just another step in the control of the problem?-- Well, that's correct. It was an initiative that I was fully aware of its involvement and which I was interested in, and it's always an important part of the safety aspects of that system, and I was interested to see that it was working properly.

I want to take you then to your last inspection which was 27 July. You have told us something about that. It's noted in the Exhibit 208. I think you may have been present here when Mr Mason gave evidence about a conversation that occurred, he says, with you on that day, 27 July?-- Yes.

Firstly, do you recall Mr Mason being at the mine on that day?-- Yes, I do.

Do you recall having discussions generally at some stage with Mr Mason on that day?-- I have fleeting recollections of Mr Mason busying himself around the place on that day. I don't have - I don't have a recollection of Mr Mason speaking to me about events of 22 July. I was going to say what it was I did remember, but -----

In any event, can I take you to this: just to refer you to the evidence Mr Mason gave very quickly - page 3722 - he said this: "I believe I told him" - referring to you - "that we had had a high make reading on 22 July which was the result of the - I told him that we used a Drager tube reading as against a normal Unor reading; that we had proven that to be a false

reading, and that everything was okay." Now, do you have any recollection of that conversation, firstly?-- No, I don't, no.

Do you dispute that conversation occurred?-- Sorry?

Do you dispute it? Do you take issue with it?-- No, no. Well, I can't remember, so -----

But you have no recollection of the conversation itself?-- No, none at all. I have a recollection with respect to Mr Mason on that day. One of the reasons - one of the three reasons that I went to Moura that day, which we started to embark upon earlier, was, firstly, to address the business of electrical flashes and, secondly, was to - that I wanted to go through with Mr Schaus the Part 60 submission for the next panel. I had just completely forgotten he was going to be on holiday, so I wasn't able to do that, and I - the only recollection I've got of Mr Mason that day was to say to him, you know, I wanted to go through and clarify some issues with respect to the Part 60 for 4 South level and Mr Mason said, "I'm not sufficiently up" - basically to the effect that he wasn't sufficiently up to do that, so I wasn't able to do that. The third aspect was to - I had a meeting organised at 2 p.m. at the open-cut to address the issue of misfires with management there.

Apparently on that day, the 27th, just to complete this topic, Mr Barraclough was the Acting Manager; is that so?-- Yes.

Did you discuss with him on that day anything about training that you recall?-- I had - I can't recall anything specific. I had a fairly extensive discussion with Mr Barraclough that day which, as I recall, was, to a fairly large degree, philosophical about training and safety. On both our parts we were, I suppose, each of us espousing our philosophies in that area and bouncing off each other different aspects of safety management and training.

Is that a convenient time, Your Worship?

WARDEN: Thank you, yes. We will have a short break, gentlemen, of 10 minutes, and resume at 5 to 4, and I propose to go through till about 5 o'clock today.

THE COURT ADJOURNED AT 3.42 P.M.

THE COURT RESUMED AT 3.55 P.M.

MICHAEL PAUL WALKER, CONTINUING:

MR MacSPORRAN: Mr Walker, just a couple of other matters: in terms of the training the Inspectorate itself receives, is it the case that the Inspectorate generally has access to training seminars and conferences conducted by the SIMTARS organisation?-- Yes, that would be true.

And was one such training occasion in early 1991 involving CAMGAS and SEGAS systems; do you recall that?-- I believe it would have been. I'm not sure I can recall it specifically.

I think you've compiled a document, haven't you, of your training between 1988 and 1995?-- That's correct.

Is one of those items covered, February 1991, a SIMTARS training day relating to CAMGAS and SEGAS?-- Yes.

Was that CAMGAS and SEGAS system such that was operating at Moura No 2 at the time we are talking about, or available for use, I should say?-- Yes.

In addition to any training seminars or conferences run by SIMTARS, were you also given access to SIMTARS's literature?-- Yes.

Did they form part of the library of the district office in Rockhampton?-- Yes.

Could I take you then quickly to another topic: as part of your role as senior inspector, were you involved in the oral examination of applicants for deputies' certificates?-- Yes.

Can you tell us briefly, if you would, was there a format that you adhered to in conducting those oral examinations?-- There wasn't a formal format. There was a format in so far as a number of subject areas were covered, and with respect to any particular candidate - not necessarily all the subject areas were covered with every candidate. It would be a selection of subjects relative to practical aspects of coal mining and mining legislation we'd cover.

Can you indicate for us the range of topics that would be available to you to test these applicants, again without going into any detail - just the topics that you would flag as available to be used?-- Mine gases, ventilation, inspections, hazard identification, pillar extraction, spontaneous combustion, conveyers, fires and fire fighting systems, stone dusting/trickle dusting, explosion barriers, dust suppression, underground cutting and welding, frictional ignition, training, cable care, accident statistics, panel sealing, standard section management, statutory responsibilities of workmen, alcohol testing, noise, shotfiring. They were - I

whipped through a little document that I put together hastily from having reviewed back through a notebook associated with those oral examinations and picked out basically the subject matters that were there. In addition, I typed up some question-type notes that we used that were put together some years ago, which were still in that book that I used for all examinations.

Do I understand you to be saying that of those 22 topics you flagged, not all of them were covered on all occasions?-- That's correct, yes.

It would depend, would it, on the specific risk that might have been associated with a particular mine where the applicant came from, or proposed to work?-- Not strictly speaking. Probably what I think you are referring to with that is that a particular style that I adopt is almost invariably to ask a candidate to describe the hazards that exist in the mine that he is currently working at. Often, as an introductory process, after discussing his experience and where he has been and that sort of thing, I would normally make a habit of that.

One of the topics-----?-- But then any of the other topics could be included.

One of the topics you indicated as available was spontaneous combustion?-- Yes.

Did you have a set format of what would be addressed as part of that topic?-- I don't know whether you could describe it as a "set format".

In terms of monitoring?-- I have summarised it under dot points, what happens and how it occurs, CO make and it's significance compared to parts per million, and I'll take you through the exercise - one that I put together myself and I used for some time which is designed to cover a number of practical aspects and involves the use of Drager, checking an alarm, possible sources of CO and a logical approach to the investigation of it, communication with and use of the face crew, the physical signs of spontaneous combustion and the most likely locations. That basically would encompass the area that would - that we would address, or that I would address. I keep saying "we" because - for the deputies' orals - what's normal is it is conducted by myself and a practising mine manager at the time - one of the practising mine managers in my region and, as far as is practicable, it is a manager that's not a manager of the deputy candidate who is being examined, and that's involved 10 managers during the past five years, and the examination would normally take about an hour and a half.

Can I take you to something different, quickly? As part of the investigation of the incident of 7 August, you collected a lot of documents; is that so?-- Yes.

Can you tell us very briefly, if you would, how that was carried out?-- When we went into the investigation mode -

that's following the incident control mode at the mine - immediately following the incident, there is a period of incident control mode where the important issue is to control that incident and not look at investigative matters. Following that, in going into the investigation mode, I got together an action sheet log sheet and we - inspector's involved started to put down - basically list down everything that we could think of that could be appropriate for this Inquiry. Some of those documents in the first instance were very obvious, like the current mine deputy's statutory reports and things like that, and plans, and all sorts of things. That log became a control document, so that once we had logged it on as being required, we could then log the fact that we had asked Mr Schaus for it, and then we could also log the fact that Mr Schaus had returned that information. A copy of that was also given to Mr Schaus, so that in exactly the same way he knew what had been asked for. That wasn't done initially, but we did, through the course of this process, do it that way, so that he had that same control document, and as the process went on, of course, various other items were identified as being necessary and added to that list and the list grew, and in a formal - somewhat formal manner, Mr Schaus was asked to provide those documents, and following on from his - from Mr Schaus' evidence, indeed there were some - there was some documentation which was provided and offered which was logged on to that same sheet which we did not - in the course of his own investigative process he had come across those and included them in the documents that he thought we might need.

Well, at any stage was there a search by anyone from the inspectorate - any seizure in that sense?-- The only semblance of that sort of mode of operation was, I guess, when we cleared the deck following the second explosion and in the incident control room that we were using, we gathered up all the documents we could lay our hands on and took them with us, because we were evacuating the area, but other than that, no.

On that occasion was it to preserve the documents that had been with you in the incident control room?-- That's right, just so they didn't get blown away or-----

Finally, can I ask you about the next step in the investigation, which was the process of taking witness statements?-- Yes.

That was carried out, by and large, by yourself with assistance from others at times?-- That's correct.

As part of that process, did you liaise with the legal representatives of various parties and of witnesses?-- That's correct.

There seems to be a practice whereby statements were taken in the presence of - most often, that is, the presence of the witness' legal representatives?-- That's correct.

Tell us how that came about?-- When the process of interviewing witnesses was initiated, and, generally speaking,

the first people that we interviewed were deputies - and we had the district union inspectors on site and helping us with that process, in any case, but - and subsequently as we approached a timetable for interviewing members of staff, they made it - made us aware of the fact that they wanted legal representation during those interviews.

You had no objection to that?-- I had no objection to that. I really couldn't see the point in objecting. If I had have objected, we wouldn't have got a statement - well, I suppose we wouldn't.

In any event, the statements were then taken in that form, is that so, with parties other than the potential witness being present?-- Sorry, can you repeat that?

Witness statements were then taken in the presence of parties, other than the witness themselves - that is, you conducted the interview with others present?-- With whoever they wanted present.

Were witnesses ultimately given copies of their statements?-- Yes, they were. We went to a deal of trouble to provide copies in draft form as quickly as possible. We took a secretary from Rockhampton, put her on site with word processing equipment, and that expedited the matter quite considerably, and then endeavoured to - the people who made the statements were able to look at what they put and come back and ask for any corrections they wanted, which we then incorporated and made those corrections, and when they were satisfied, they signed them.

And was it the case that only after those statements were signed were they, in effect, released to the parties?-- That's correct, we didn't release those until they were actually signed.

Thank you. Thank you, Your Worship.

CROSS-EXAMINATION:

MR MARTIN: Mr Walker, did you examine Mr Schaus for his Queensland Manager's Certificate?-- No, I did not.

Do you know who did?-- I think the Chief Inspector did, but I'm not sure of that.

Do you still have Exhibit 209, which is your summary of the record book entries before you?-- No, I don't.

If I can just take you back to the entry, April 1991, just at the top of page 3?-- Yes.

By April 1991 you had perceived the need for the development and documentation of the safety and accident prevention plan, hadn't you?-- Yes.

And you had discussed that with No 2 Mine management?-- Yes.

And by 7 August 1994 it still had not been implemented; is that the case?-- That would be the case.

Can you explain why?-- I can't, no.

That was a matter which was being attended to by the management of No 2?-- Yes, it was being formulated. Some documentation towards that sort of outcome had been generated in that ensuing period -----

But not finalised?-- But an all embracing plan for the mine, as I understood it, had not been finalised.

Could I just take you forward to an entry which you've talked about already in August 1993, that is you went to Moura to inspect No 2 but couldn't because of the incident involving a spontaneous combustion at No 4?-- Not so much that I couldn't, it was just that with the time I had available I was distracted to the other problem.

Well, what was happening when you got on site at the mine? Was an investigation going on at that time into spontaneous combustion?-- I can't remember the details, but management were in possession of information concerning the output from the mine monitoring system.

Is that in the No 2 -----?-- No, no, in No 4. It only affects No 4 mine which is not an operating mine.

I understand that, but where was it being monitored?-- No 4. No 4 mine has a similar system set-up.

Who in management was involved in doing what in relation to the spontaneous combustion that you recall? Was Mr Mason involved?-- I wouldn't be able to put my hand on my heart and -----

I'm not asking you to do that, I just want your recollection?-- I honestly don't know. It would be normal for Mr Schaus and Mr Mason to be there, but to say can I specifically recall whether they actually were there, I don't know.

What about any of the undermanagers?-- I don't know that either.

Do you remember a Probeye being used by Mr Mason?-- A Probeye, from my recollection of that day, was not used.

Can you not advance the matter any further from your

recollection than you have?-- As I say, I can't - I'm pretty sure that we went down to the cut -----

Who is "we"?-- With Mr Schaus, I'm pretty sure, and I think it might have been Lex Henderson also.

You said the cut, what cut?-- 3C pit, I think it is.

That's within the portal of No 4 Acky panel portals -----?-- That's the open-cut into which the Acky portals -----

Go?-- Yeah, or from which the Acky portals are driven and it's an intake - an additional intake airway to the No 4 workings. The spontaneous combustion was in the floor coal that had been left in the open-cut pit. As I say, it was only - I don't know, 10 or 12 metres from the portals from the entrance at the time, and as I say, they had tried to dig it out on a previous occasion and dump it up on to the spoil heap, but it became evident that that wasn't successful and we identified the area as being significantly heated, and it was quite apparent that the carbon monoxide being given off was entraining into the intaking air into the Acky portals. Clearly there was no danger to the No 2 operation under those circumstances, but had the spontaneous combustion progressed and got out of control within the seam itself -under the high wall into the No 4 mine, it could have been an ongoing and much more difficult problem to tackle.

Well, you said that there had been a previous attempt to dig it out, I think?-- With a drag line.

But how long, to your understanding, had this problem been ongoing by the time you got there?-- I can't really recall, but from memory I think the thing had been dug out some days previous. I'm not really sure.

You think you remember Mr Schaus?-- I think I do.

What about Mr Mason?-- Look, I'm just guessing. I can't recall.

Were you guessing about Mr Schaus?-- Possibly, possibly. If they turn around and say he was on holiday that day -----

Your best recollection is that Mr Schaus was there?-- Just to be straight, look, I can't recall. I have no reason to think that he wasn't there, but if I'm really put to the point I really wouldn't know, wouldn't have a clear recollection at all.

Well, he was the mine superintendent and the likelihood is, I suggest to you, that if he was at the mine at all he would have been with you?-- I can't argue with that.

Thank you. I have nothing further.

CROSS-EXAMINATION:

MR MORRISON: Just in relation to that point, Mr Walker, you were asked whether a Probeye was used and I think you answered that question. What did you understand to be the purpose of a Probeye? Is it to locate a potential heating?-- Yes, that's correct.

If you knew where the heating was and you tried to dig it out with a drag line, do you think you would know where the heating was?-- An on the ground inspection quickly showed where the problem was.

This was outside the portals of the mine in an open-cut
-----?-- Sorry?

This was outside the portals of the underground mine?-- It was outside - 10 or 12 metres from the entrance, yes.

And in the open-cut?-- Yes.

And revealed after the overburden had been removed from the last trip in the open-cut?-- That's correct.

And then it was dug out by the drag line and then the portal was sealed with overburden again?-- Under the normal course of operations that's the case, to restrict or to try and prevent air into the No 4 mine from that location.

And having been dug out, the heating having been dug out by the drag line, and the portals sealed with the overburden it was after that that it was apparent that the area that was dug out was heating again?-- That would be correct, yes.

That's when steps were taken to ascertain whether that was going to impact in some way upon the No 4 mine?-- Yes.

Which was at that stage a non-operational mine?-- Yes.

Can I just ask you a question about Exhibit 209? Do you still have that with you?-- Yes.

This is really a point summary; was that prepared by you?-- It was prepared by me, yes.

And if we want to see the full context of the entries they will, of course, be in the record book?-- They will be in the record book, and I believe that all the parties have had copies of all the record book entries that I made as well. So they should be there in your filing systems also.

This might give us a handy point summary, but for the true entries themselves and their exact wording, they appear in the record book and we can look at those for -----?-- That's correct. This was a fairly hurried attempt by me to just provide a summary.

When one looks at that it spans - in fact it doesn't span 1994 at all, it's 1988 through to the end of '93; isn't that right?-- That's correct, because I did the 1994 ones as a separate document and whereby obviously understanding the significance of 1994 I attempted to present it with more detail.

The 1994 ones, have they been done in the same point form from the record book or is that really, as I understood it, a compilation of a number of sources, record book, your diary and monthly reports?-- And possibly monthly reports. I don't recall the monthly reports as such, but certainly diary - going back through my diary and using the record book entries I've tried to be as complete through 1994 as I could be.

The documents then have two different bases; Exhibit 208 which is the 1994 period is not just solely from the record book, is it, for 1994?-- No, that's correct, and in fact as you can see it includes references to visits to the open-cut operation too.

And it also includes in its form some commentary by you as to whether you believed considerable discussion would have occurred regarding such and such. Can I ask you to look at it?-- Yes, sure.

Do you still have it with you?-- Yes, I've got it in my file.

It's Exhibit 208. I think you'll see the example of what I'm talking about on the first page for 18 January 1994, the third last paragraph?-- That's - yes, that's an attempt at my trying to fill in the gaps, and I suppose it goes into the realms of speculation, but -----

I'm not being critical of it, I'm just pointing out that there is a difference between the two documents?-- That's correct.

They are not from the same source?-- Not at all, no.

We can see a similar thing in page 3, the entry for 11 May where you've got a bracketed line as the last line indicating the limits of a particular inspection?-- Yes, yes, that's as I referred to earlier on after the day in the risk assessment situation, just popping down the mine for an hour and looking at those aspects of 512.

Can I ask a couple of other things about those? In terms of what Exhibit 209 shows in frequency of visits and record book entries, would I be right in thinking that in that respect most of the mines you deal with would end up generating a document like this containing Exhibit 209, the record book entries?-- Yes - the summary?

Yes, the point summary record book entries?-- No, that wouldn't be the case. That was done specifically to assist with this Inquiry.

I'm sorry, I'm not making myself clear. What I'm saying is if you went to the record books for those mines and did this same

exercise you would end up with a pretty similar sort of document, point form summaries -----?-- Very much so.

----- of various entries. There would be some good comments, some comments urging people to get on with various things. There would also be some bad comments perhaps?-- Very much so, yes.

In that sense what we see reflected in 209, would I be right in thinking that Moura No 2 was pretty much on a standard with others? This document wouldn't show that it was excessively wonderful nor would it show it was excessively bad, pretty much a routine set of reports?-- I think there are - there are some perhaps notable exceptions. In the case of new, large, modern mines that are starting from scratch - and I'm thinking of mines like Gordonstone - there might be - there are not the same problems that an old mine generates and so there would be differences in that respect. That's not to say that with those mines there haven't been mistakes made.

I suppose in that situation we are not really comparing like with like?-- That's right, but on similar mines to Moura it would be fair to say that they are not that dissimilar.

That's the point I'm getting at, nothing special arises out of this in terms of the comparison between Moura and other mines of perhaps not the brand new variety, if I can put it that way?-- Yes.

I gather from your evidence that from when Mr Schaus arrived, in your dealings with him you never had any difficulty dealing with him in terms of his reception to your ideas and his willingness to adopt them?-- I found Mr Schaus to be more than receptive. I found him to be a person who had a passion for what he did, a person who had a great vitality. I enjoyed his company for that reason.

It was refreshing in the mining industry to find a manager like him?-- I'm not going to comment on that.

For fear of -----?-- I've got the other blokes to go back to.

For fear of the other blokes next week on the next inspection?-- Yes, he was a stimulating sort of a fellow.

I have to tell you, Mr Walker, I didn't mean to jeopardise your future operation with the other managers. It never occurred to me. Likewise in terms of the management team at No 2 similar comments could be applied to, say, Mr Mason?-- Yes.

And Mr Barraclough?-- Yes, I've known Mr Barraclough for quite some time.

And also Mr Abrahamse, the mining engineer?-- Yes.

Now, your assessment, particularly of Mr Schaus and Mr Mason, would I be right in thinking that they co-operated with you on the occasions when you required things of them?-- I never had

any reason to suspect that they weren't.

And co-operated fully and frankly with you?-- Yes.

You would have had no call to consider them to have been less than honest with you in their dealings, would you?-- I wouldn't, no.

That view you had in relation to them would have continued right through until this incident and after; is that right?-- That's correct.

Did you instruct anyone to make an attack on their credit by way of their honesty?-- In these proceedings?

Yes?-- No.

Can I ask you a couple of questions about documents that one routinely looks at on an inspector's inspection? You mentioned, I think, that you didn't always, but sometimes did, look at the mine record book on an inspection occasion?-- That's correct.

Would you, on those occasions when you did, do so because of some specific reason or would it be a general perusal?-- It would be - I can't recall a specific reason unless I was looking to see whether the fire officer's reports were being filled in or whether the manager's reports were being filled in as per the regulations.

So it would be, as it were, a topic driven -----?-- Mostly it would be a perusal and I opened the book and flipped back and look at by and large the inspection reports that had been put in in the immediate past.

And this was by no means a regular habit?-- No.

And would it be reasonable to say, so far as you are aware, it's not a regular habit of any Inspector?-- I wouldn't be able to comment on that.

You didn't obviously consider that it was a necessary part of your inspection that such a review take place?-- I guess the answer to that would be no, I didn't consider it necessary at that time, otherwise I would have done it.

Correct. And it follows from that point that in terms of your ability to carry out your work, you didn't consider that that impaired your ability to carry out your work?-- No.

Now, as I understand it from how you described the occasions of inspection, a considerable degree of reliance is placed upon the receipt of oral information by you?-- That would be the case, yes.

And the obvious sources for that information are those persons with whom you have contact at the mine, principally, say, the manager, undermanager-in-charge and designated persons who might be involved in specific areas of interest?-- Yes.

And that may well include, as it often did, I think, from noting the entries, the miners' officer, Mr Bryon?-- Yes.

And do I understand correctly that you didn't really need to interrogate those people, much as we do here in these proceedings, when you are at the mine? You would broach the subject in a fairly simple way, "What's been happening?", and then you would expect a verbal report?-- I think if I attempted to interrogate them the same as in these proceedings I would be most unwelcome, but, no, there is nothing like the formality. There is no need for that sort of formality. The particular persons, Steve Bryon I know quite well, and along with quite a number of people at Moura I look forward to meeting up with on the occasions that I go there and take the opportunity to speak with them, and if there is anything - usually if there is anything of any import that they wish to speak about, they would do so.

In your experience, has that interchange of information worked quite successfully; is that so?-- I have no reason to think otherwise.

And it has done over the period of your experience as an inspector?-- Yes.

And it would be initiated by an exchange as simple as, "What's been happening recently?", and then an oral report?-- Yeah, "How are things?", yeah.

In terms of other documents that you would routinely inspect - and if I can confine ourselves to No 2 at the moment - you mentioned that you did not, or you don't have any recollection of looking at the CO make graphs?-- That's correct.

Although you were aware such a graph was being produced?--
Yes.

Did you have occasion to go to the deputies' cabin from time to time on these inspections perhaps to speak to Mr Bryon?--
Yes. Not so much having an occasion, but occasionally I do pass the deputies' cabin and poke my head in to say giddyay to someone in there.

And were you aware that the CO make graph was posted in that cabin as well on the noticeboard?-- No, I wasn't.

Do you ever recall seeing it in the undermanager's office?--
No.

Can I assume from your responses that not only did you not look at it yourself but there was no occasion when someone said to you, "Look at this graph, this is what it's doing.", or, "What do you think of that?"?-- No, that's correct.

And no time when, for instance, Mr Schaus or Mr Mason, apart from the 27th, for instance, that he has talked about, indicated to you a concern about high CO levels?-- I'm sorry?

I will start again. No occasion you can recall where, say, Mr Schaus raised with you a concern about high CO levels or high CO make levels?-- No.

And, likewise, Mr Mason, with the exception of 27 July about which he spoke in his evidence?-- Well, that would be correct, yes, as far as I can recall.

And similarly, Mr Abrahamse and Mr Barraclough, to your recollection?-- Yes.

Now, while on the topic of documents, you did in fact, on occasion, read back through some deputies' reports?-- Yes, I did.

Again, is that a topic driven occasion in the sense that you wished to look at some specific feature or it was just a browse back through a number to see what was going on?-- It was only a browse. It was intended to look at the - basically at the standard of the deputies' reports and at the same time you can pick up some information which may lead you on to other things.

Touching on then the standard of the reports and two aspects of that, one is format and the other is content, can you make some comparison of the reports at this mine with other mines in Central Queensland in terms of the deputies' reports?-- They are not dissimilar to the statutory deputies' reports that are used elsewhere.

And I suspect - I don't know but you can tell me - similar to New South Wales?-- Yes.

Does that comment apply also to the undermanagers' reports, or

are you unable to say because you haven't looked at those?-- Well, I have seen the undermanagers' reports since this Inquiry started, of course.

In which case -----?-- But I wouldn't have known at the time.

Accepting you didn't know at the time, can you, nonetheless, make that comparison now?-- Well, I don't know what anybody else's looks like either, so I can't.

I'm sorry, all right. In terms of content of the mine record book entries inserted there, comparison of this mine with other mines in Central Queensland?-- In what respect, Mr Morrison?

In terms of the content of the mine record book, and I don't mean matching specific item with specific item, but the sort of things that are recorded and the general format of that recording?-- Yeah, very similar.

In terms of the way in which reports were generated at this mine, is it reasonable to say that the way in which they were generated and their content is, in your experience, not a departure of an industry standard?-- Essentially, no. There may be some mines who might have an idea that they use what may be regarded as being a little better in some areas, but, generally speaking, I think everybody can sort of improve their game, but not dissimilar.

Are all mines in Queensland required to post their deputies' reports prominently; for instance, at the start point?-- Yes, that's a requirement of the regulations.

That seems not to be the case in New South Wales, or at least wasn't once?-- No, it's not, or wasn't. I'm not quite sure what the situation is now, but it wasn't.

And the purpose of doing so, am I right in thinking, is obviously to allow the men to read the reports?-- Yes. The two mechanisms, the record book entry and the deputy's report, and the regulations surrounding them are designed to give access to the workforce of that information to the best possible degree.

In your experience from having contact with the workforce, do they appreciate that that's the reason the reports are up there, so they can read them, or do they wander around looking up and saying, "Goodness gracious, what are they doing there?"?-- I don't know I can answer that in the strict context in which you put it in that I don't know if I have ever asked people if they realised that's why they are there. I would be of the opinion that they would be fully aware of the fact that they are there and I would think that they would understand why they are there.

I think you yourself have on occasions read the deputies' reports at the point where they are pinned up at the start point?-- I'm sorry?

On some occasions when you have flicked back through deputies' reports it's been those ones posted at the start point?-- Invariably.

You don't go -----?-- When waiting to get into the transport I would browse through them, yes.

Now, in terms of the interchange of information at this mine, we have heard a deal of evidence about the fact that at shift changeover, particularly on hot seat changes, there is an exchange of information deputy to deputy, undermanager to undermanager and various combinations of that. Is that something that occurs at other mines as well, or are you not in a position to say?-- I believe it does but I'm not absolutely sure.

Your experience would suggest, though, that other mines in Central Queensland, at least in the district you deal with, have a combination of information systems which are partly written, namely, reports, and partly oral, the exchange of information from person to person?-- Yes.

And the system as we have heard it described here at Moura is not out of the ordinary at all in terms of Queensland mines?-- I wouldn't say so.

You wouldn't say that it's out of the ordinary?-- I wouldn't say that it's out of the ordinary, no.

Can I accept from your evidence that in terms of your dealings with that system, that is to say, the reporting system of the mine, you did not at any stage see the need to alter that system?-- No.

Nor did anyone else, to your knowledge, in the Inspectorate see such a need?-- No, not to my knowledge. I've got a vague recollection that the system in fact may have been upgraded during my time there, but I'm not absolutely sure, from the time when I first came there.

There is some evidence that the system at Moura 2, the report system, was upgraded, the format of reports?-- Yes.

Is that what you are referring to?-- Yes.

But you can't recall - tell me if I am wrong - can you recall any directive or memorandum from any other inspector, be it ordinary Inspector through to Chief Inspector, suggesting that that system needed to be altered or modified?-- No.

Or any such memorandum suggesting that the system was not working efficiently?-- No.

In your opinion, was it working efficiently?-- To the best that I could ascertain and from my observations at the mine, and bearing in mind that it's a relatively small mine with a close-knit workforce, I've got no reason to believe that it was other than quite reasonable.

Now, you mentioned that at the end of what might be called a routine inspection you would sometimes write in the record book and then later send a typed version of that entry?-- Yes.

To be stuck, what, over the handwritten entry?-- No, no. If I had done a handwritten entry, that would be it as far as the record book was concerned, but I would then send the typed up copy, two copies of that: one, the reason why I did it, was designed to be put into the manager's filing system and the other to go on the noticeboard. There are some limitations to the record book and the way it's expected to be used by Statute, and I could see that in some cases we have had problems at mines with their filing system and that I could see that it would be better for a separate file of record book entries to be maintained in addition to the record book. Now, whether or not the managers have actually kept up that file, I'm not sure, but the other significant part of that is to have a typed one to go on the noticeboard for the benefit of the workforce.

Now, you were asked a question by Mr Clair about whether you would see it as either appropriate or desirable to have what might be called a significant incidents log where anything significant in the mine goes into that book as opposed to routine matters?-- Yes.

Now, were such a system to be put in place, do you see that as disposing of the need for a mine record book?-- Well, basically it would be a different tool. Bear in mind within the mine record book as it stands at the moment there is a section in which reportable incidents are recorded. To some degree it could be an enhancement of that, but, no, I can't see it replacing the record book. I could speculate over perhaps some options that might be better than a mine record book - they might include that - but -----

Or a different format that compels in a separate section the recording of events of note or something like that for each entry?-- Yeah. I'm just sort of being hit out of the blue with it. I need time to think about the concept - to analyse the concept really.

And the difficulty with such a system, in any event, is that, as with all good record systems, it depends upon people who make the entries to do the right thing, doesn't it?-- Absolutely.

And then it also depends, as we have heard, upon those people who should be reading it to actually read it?-- Yes, it does.

To include not only managers but inspectors as well?-- Very much so.

And there would have to be, no doubt, defined some sort of system whereby one could determine just what was a significant incident and what was what?-- Yes, that would be the case, and I did make the point earlier about I'm not questioning what we've heard about the problems with ventilation in the No 2 heading in 512, but similar incidents in a mine you would be faced with somebody's opinion as to whether - how significant they were. So, you know, there would be a need to get over those hurdles.

And a classic example might be a variant on what you have been discussing, namely a ventilation incident occurs, is dealt with within a shift by remedial action which works, and in all minds the problem has been solved, and that is no longer significant?-- Yes.

And yet, later on, upon some examination, it may assume significance it never had in the first place?-- Perhaps in conjunction with other similar small occurrences, yes.

Touching on the question of ventilation, you have heard some evidence in these proceedings of the reversal of ventilation in No 2 and layering that was discovered on one or more occasions; do you recall that?-- Yes.

And I think you are aware, from the entries in the mine record book, that that problem has been experienced in other places in the mine as well?-- Yes.

At 5 South and, I think, if my memory is correct, 401 and 402?-- Yes.

So, the occurrence of that event is not in that sense unusual, is it? It is not something that has never happened before, has it?-- It would appear that it has happened in a couple of panels.

You have described the record of the No 2, or the incident of the No 2 ventilation question as: you found it "amazing". It couldn't have been the occurrence of the event that you found amazing because you know it has happened before in other panels. What was the comment directed to?-- I guess - I guess the phenomena has been described in reasonable detail, but I guess the occurrence of the - of layering, in whatever form really backing up against a main intake airway with so much air available.

It is an unusual event?-- Well, on the face of it it would be. Having said that, in the No 2 heading, if we are talking about the location then being where bottoms had been taken and the whole cross-sectional area expanded, and the fact it was the middle of winter so there could be very significant thermal differences, okay, but, nonetheless, there is-----

I - I should let you finish. I was going to add another equation. It would also depend on where the miner was operating and where the brattice has been erected to direct the miner?-- It occurred to me that the basic problem was continuing to control the distribution of air along -

effectively - along with movement of the miner, and perhaps some lapses in that control being predominantly the problem.

In light of what you have just said, perhaps "amazing" was an inappropriate adjective to describe your reaction to it?-- Yes.

Perhaps "curious event" might be closer to it, or "unusual", but not "amazing", would you agree?-- Yes, I would.

Now, could I turn to another topic, which has been dealt with in some detail, but perhaps not as much as I wish to ask about, and that is your knowledge of spontaneous combustion. You have been asked for it in a variety of ways, categorised by years, which I suspect is hard for you to remember?-- You're not wrong.

But let me understand one thing from your answers: I understood you to say that in terms of physical signs, before this Inquiry, and reading the literature that's been exposed to this Inquiry, you were certainly of the view that the smells would be smells that would persist?-- I say that from the context of having revisited the literature, coming across the paragraphs that describe fleeting smells, and then really applying my mind to that situation and thinking, "Oh, you know, I wasn't really of the mind that you would get such things.", or, put it this way, at the very least struggling to appreciate under what circumstances you might get those.

As I noted what you said, it was in terms of whiffs or fleeting smells - you were not of that opinion until you read this material which causes you to wonder-----?-- That wouldn't have been at the - certainly wouldn't have been at the forefront of my mind, no.

And would the same comment apply to the other physical signs, say, sweating and haze; your perception prior to reading literature here would be that those signs, if generated by a spontaneous combustion event, would persist?-- I have got no reason to believe that the concept of sweating would not persist, certainly for as long as heating persists, or the physical heat of a - an area of coal. The other ones you referred to?

The haze, if the haze was truly-----?-- Yes, in the same context I would have thought that a haze would have persisted.

Nothing in your training prior to this Inquiry - if we can include this Inquiry as a training circumstance - nothing in your training would have led you to the view that is reflected in some of the documents, namely that these things can waft in and waft out?-- I went through the training in which that documentation was part of the training material, and as I said, either at that time that's either been overlooked or not sufficiently emphasised or explained, but for whatever reason, it didn't stay with me.

All right. Now, in relation to spontaneous combustion generally speaking at No 2, we've heard that the seam is

liable to it and it was seen as a risk-----?-- Yes.

-----when one works the seam. You would agree with both of those things?-- Yes.

Did you take any steps, and if so what were those steps, to ensure that people at the mine were aware of those risks - that fact and that risk. When I say "you", I'm talking about you as an inspector?-- Other than what I may have conveyed to other people in personal communications at the mine, I can't think of any.

Can you recall if there was any directive, memorandum or document coming from any other inspector in the hierarchy saying that such steps should be implemented or nominating any such steps?-- No.

In your view, were steps being taken to deal with the spontaneous combustion risk at No 2? Was that your assessment during your period of inspecting it as an inspector?-- I was of the view that, yes, that essentially the ongoing disciplines associated with preventing spon com were in place.

Now, can you tell me what those disciplines were in your view?-- I have no reason to believe that, in general terms, the underground stockpiling of coal, broken coal, was not avoided, and that the location of stoppings and seals wasn't normally - those locations weren't normally with regard to the spon com risk, or that extraction processes weren't generally with regard to the spon com potential.

You seem generally there to be referring to the question of ventilation of the working panel?-- Well, I suppose spontaneous combustion is all about ventilation.

Now, did you take into account and have in mind that length of the panels might be a relevant factor in controlling the risk of spontaneous combustion - by "length", I mean duration and extraction time?-- Yes, to a degree.

And 512 you would have known was to be one of the shortest panels in the mine's history?-- I guess from my perspective, 512 had no sooner started and it had gone.

Very fast, very efficient; is that so?-- Very much so.

And, in your assessment in the time up to August 1994, as an inspector, it was appropriate to have regard to the duration of extraction time as a matter you could utilise to control spontaneous combustion risk?-- I believe so.

I don't mean the sole matter by any means?-- Sorry?

I don't mean the only matter by any means. I'm not suggesting-----?-- No, not the only matter, but there is comfort to be gained by completing extraction processes quickly.

What are some of the other factors you thought were in place

to take control or account of the spontaneous combustion risk? You mentioned ventilation, but in a number of factors, and we have agreed now on duration of panel extraction?-- I suppose in simple terms the quantity of air available for the process.

Can you just tell me what you mean by that?-- Well, there was a large amount of air made available, which I believe would adequately ventilate the waste area.

In fact, in this mine, even if we take some mid-range figures, we had about 40 cubic metres of air going through on most occasions. Are you able to make some comparison between that and other bord and pillar mines or underground mines in the Central District?-- I don't know whether there is a need to do that because, you know, other mines may not have had the same method of works, or the same gas problems, but, yes, I mean, there was more air available generally to operate a panel at Moura, considerably more than most - other systems elsewhere at other mines.

Your Worship, I haven't finished this point, but having deference to the witness, I don't really wish to drive him past 5 o'clock.

WARDEN: If you prefer to finish the point-----

MR MORRISON: No, it is a convenient point to stop.

WARDEN: Okay. Thank you, gentlemen. We will terminate proceedings today and recommence at 9.15 tomorrow morning.

THE COURT ADJOURNED AT 4.57 P.M. TILL 9.15 A.M. THE FOLLOWING DAY

WARDEN'S COURT

MR F W WINDRIDGE, Warden and Coroner
MR R J PARKIN, General Manager, Capricorn Coal Pty Ltd
MR P J NEILSON, District Secretary, United Mine Workers' Union
MR C ELLICOTT, Training and Development Officer, Department of
Mineral Resources, New South Wales
PROF F F ROXBOROUGH, Professor of Mining Engineering, School
of Mines, University of New South Wales

IN THE MATTER OF A CORONIAL INQUIRY IN CONJUNCTION WITH
AN INQUIRY (PURSUANT TO SECTION 74 OF THE COAL MINING
ACT 1925) INTO THE NATURE AND CAUSE OF AN ACCIDENT AT
MOURA UNDERGROUND MINE NO 2 ON SUNDAY-MONDAY, 7-8 AUGUST
1994

GLADSTONE

..DATE 15/03/95

..DAY 44

THE COURT RESUMED AT 9.17 A.M.

MICHAEL PAUL WALKER, CONTINUING:

WARDEN: Witness, you are under the former oath you took yesterday, do you understand that?-- Yes.

MR MORRISON: Mr Walker, yesterday when we finished for the day we were discussing spontaneous combustion and exploring some aspects of your knowledge of it and background in it and also some aspects of whether it was a hazard or a risk at this mine and what steps were taken to overcome it. Can you recall that general area of questioning that we were talking about?-- In general, yes.

If I might just continue with that for a moment? We were discussing some of the methods or the means used to control spontaneous combustion and we discussed ventilation being one, panel design being another - in terms of its extraction duration - and a third was the monitoring of the gases. Do you recall those three aspects that we discussed?-- I guess monitoring of the gases is an after-the-fact sort of an element, but nonetheless, yes.

Well, when you were asked about spontaneous combustion, I think by Mr Clair, as to whether it was a significant risk, you responded pretty much in terms of - or pretty much in terms by referring to the monitoring system at the mine and how it monitored frequently and pretty well?-- I don't recall that, but-----

If you just accept my word for the moment? The responses were predicated in terms of the monitoring system. Does that, in fact, reflect the view that you had at the time that the monitoring system was a primary tool in coping with spontaneous combustion as a risk?-- I think, yes, in the context that when all the design features are put into the system to reduce the potential for spontaneous combustion, as far as can be done, then quite obviously the element that remains is to have an effective monitoring system, such that if you then do suffer such an event, you are able to identify it.

Certainly it seems from your answers both yesterday and that one just now that your view, as at 7 August, was that this mine had an effective monitoring system?-- Yes.

And we discussed yesterday the fact that it was, to your knowledge, regularly calibrated by Maihak?-- Yes.

In fact, I think Mr McMaster made reference to that as well?-- Yes, he did.

The fact that it was regularly calibrated by Maihak and serviced by Maihak is something which you, as an inspector,

took into account in terms of what you would look at?--
That's correct.

One of the other factors mentioned that perhaps has something to do with extraction duration is the concept of incubation periods for coal. Were you aware of the fact that people had in their minds that there was an incubation period for this coal?-- Yes.

And did you have your own view about that as at 7 August?-- I didn't - can't say from a position of authority that I had a particular view of my own, but I was aware that there was a general understanding of the six month to 12 month incubation period for Moura, yes.

There was nothing that you saw to lead you to think that that view was wrong?-- No.

But equally, to be fair, I gather you didn't embark on any particular research to test whether it was right?-- No, that's correct.

That sort of research might be quite complex, I suppose, to establish incubation periods for a particular seam or, indeed, individual parts of a particular seam?-- I think it would.

Now, in terms of spontaneous combustion, when you reviewed the Part 60 submission for extraction, did you have an eye to spon com as a risk when you assessed that Part 60 submission?-- I believe that, in general terms, I would, yes, reflected in the fact that the monitor point alarm settings and things and ventilation quantities are part of that submission.

It is the sort of thing - when I say "it", I mean spontaneous combustion as a risk in this mine - it would be the sort of thing always in your mind, even if not consciously in the forefront?-- Yes.

So, when you looked at this Part 60 submission and the method of mining which it disclosed, one of the elements that would have been playing in your mind would have been, "How does impact on spon com?"?-- Yes.

And you approved the Part 60 submission pretty much in the form in which it was proposed to you?-- Yes.

And can we accept from that, then, that you took the view, at the time, that the method proposed did not create an undue spon com risk - or, indeed, any risk?-- I would accept in the line of the conversations I recall in the early part of the panel about additional loose coal being left behind the argument that that might equate to an added potential - I would accept that. It is a matter of degree and perception as to whether - to what significance that you would regard that; however, at the end of the day I was under the opinion that the monitoring system was - should - should, in fact, a problem occur, the monitoring system was adequate to cope with the situation.

And the monitoring system you refer to there is primarily the Unor system, which samples, as we have found out, every 13 minutes in this panel?-- Well, you might say primarily, but also with deputies' inspections.

Primarily that, but not just that?-- Not just that.

There are, indeed, daily inspections by deputies and the daily taking of readings by deputies?-- Yes.

And that's not all, either, because you would also include in that system the weekly inspection by the mine manager and all the visits that are made by inspectors and district union inspectors?-- Yes, there is a very - in mines generally there is a very comprehensive inspection regime.

And that comment - that is to say a comprehensive inspection regime - is certainly applicable to No 2, as they are to other coal mines in that district?-- Yes.

No doubt to other coal mines, but I am confining it at the moment to those with which you have immediate contact?-- Yes.

Now, you mentioned - if I can just pick up on one point you just referred to there, you mentioned yesterday that early in the panel life you had heard about this proposition of there being higher CO levels because of the extra coal and, I think you said, the voids created. I'm not sure about that aspect of it. I haven't double checked that, but certainly the extra coal?-- Yes.

Now, that was a reference to higher CO. Can you recall if it was in reference to parts or make? You probably can't?-- In the ultimate analysis it would refer to make, I guess, but it would manifest itself in either way.

Now, can you recall from whom you heard this proposition? Was it Morieson - Allan Morieson, perhaps Jacques Abrahamse?-- I can't recall. I have just a flash-back recollection of having a discussion on one occasion with Phil Shorten, which may have been along those lines, not discounting the fact that it might have been Allan Morieson. It may have even been both. I can't really recall.

This was - was this also a comment that was discussing, as it were, the background CO of the panel?-- It would relate to that, yes.

You referred yesterday to the background CO of the panel in terms of it being one needing a norm for a panel?-- Yes.

I think that is the case. You wouldn't expect the norm for 512 to necessarily be the norm that applied, for instance, to 401, 402?-- No, quite the contrary. In fact, textbooks recommend - and the system basically is geared to establishing that for each individual panel.

When we are saying "the norm", we are talking about background CO, whether one expresses it in parts or make?-- Yes.

And equally, each panel will vary depending upon the way in which it is extracted, in terms of its method, in terms of its duration, in terms of its ventilation?-- I'm not sure that I'm clear at this time on exactly why it varies, particularly in relation to the method of operation, but based on the comparison that I made yesterday of a basic or standard long wall layout, compared with a layout of partial extraction like 512, I would expect a difference.

That comparison you made yesterday was the obvious one between long walls and bord and pillar?-- Yes.

But even comparing one bord and pillar panel to another, there would be differences in the way the CO would be produced, depending upon a number of factors, no doubt - we can't enumerate them all - but panel size would be one, more coal to be exposed, duration might be another?-- All sorts of things, yes.

So, if I can come back to that point for a moment? Not only is there reason to think background CO would vary panel to panel, and you couldn't just apply one panel's background CO to another panel - you would agree so far with that proposition?-- Yes.

But also in looking at the CO produced during the extraction of a panel, you can't apply one to the other; you have to take into account why it was that CO was produced that way?-- Yes.

So, if one came to the stage of comparing, for instance, the CO make of various panels, you would need to have some analysis of how those panels were mined and progressed in order to make a valid comparison; you wouldn't just compare the empirical values, one to the other, would you?-- I think that's a fair comment.

Now, you've mentioned yesterday in relation to that business of background CO that even today that is expressed in parts per million by people?-- Commonly.

I just want to pause and explore that for a moment, if I may. We have heard some evidence about there being a change in emphasis either in '87 or '88, around that era, from parts to CO make; do you recall that evidence?-- Yes.

Perhaps not evidence, but propositions put forward. Now, about that time, as we understand, was when CO make gained some prominence largely through SIMTARS seminars - or a SIMTARS seminar. That's about the era?-- About that time, yes.

Now, you said yesterday to Mr MacSporran - page 4,090 of the transcript - you were asked whether you were personally aware of any change in emphasis from parts per million to litres per minute at the time you joined the Inspectorate in 1988, and you answered, "Not at that time, no." That's correct? You didn't have any perception of a big change in emphasis?-- I think later on I revisited that, and in that short period from my going to SIMTARS, - I think I did indicate from a personal point of view at least through association with John Brady and Phil Reed, I believe my awareness of that concept would have already been raised to some extent prior to that SIMTARS - but the SIMTARS course was the primary vessel for that.

Let me just pause and explore a couple of points about that. The SIMTARS course was for managers and inspectors - I'm not -----?-- Mines Rescue people.

And district union inspectors may have been there as well?-- Yes.

It wasn't for the lower echelon of the mine staff?-- No, it wasn't.

And to your knowledge that course hasn't been repeated, has it?-- No.

There was some discussion at that course about the appropriateness or need to not only repeat the course itself but to modify the course and have it repeated - and have it done for the lower echelon; is that right?-- That's correct. My understanding of that course was the course was put together with a great deal of care specifically as a training - complete training package in that area, and the people who were invited to participate obviously were the management level throughout the industry, the idea being for those people to not only take part in and learn from that course but to assess its value for future training in the industry, and at the conclusion of the course my recollection is that it was the consensus of those people that that course should be continued in various forms to suit other people throughout the industry.

Now, that was five - perhaps nearly six years ago and the fact is that it hasn't been repeated in any form, has it?-- It

hasn't, no.

Were you aware that it had been videoed?-- I have - I've got a bit of a recollection that I was aware of it being videoed because I think my testing officer at the time got a guernsey to go to that to do the videoing. I think that's the case, but I could only be - I could only conclude therefore - or surmise that it would have been a fairly amateur sort of video. I'm not aware that there is a professional video of the whole proceedings that might be fit for use for training.

Absolutely, but professional video or not are you aware if the videos have ever been put to use in dissemination for training purposes?-- I've never seen them.

Do you know if there is a particular reason why the seminar wasn't repeated in any form?-- Again -----

I doesn't wish you to speculate. If it's pure speculation I don't wish you to do that?-- I can't really speculate on that. I have my view why I think it might be, and I am aware that the SIMTARS organisation have attempted to, on a number of occasions, pursue that course being presented.

But they have not been able to obviously?-- No, no.

Do you know of any particular reason why the videos weren't put to use?-- Well, I don't know because I had forgotten that - I had really forgotten all about the thing being videoed in the first place. I hadn't considered that.

Do you think those videos are in the Department's possession since -----?-- I can only assume -----

Since your technical officer did it?-- They would either be there or at SIMTARS. I really don't know.

Can we come back to the question that I was asking you about? As a result of that seminar you had some contact with Phil Reed and John Brady in particular, and you mentioned how that association with them gave you some awareness of CO make?-- As I say, I don't have any direct recollection of that, but, yeah, I believe that was the case.

But what's been put forward here by way of propositions is that in the whole industry there was a change of emphasis. Now, I take it you don't agree with that or at least you weren't - you didn't witness that?-- I'm probably not in a position to be able to say that the whole industry undertook that change of emphasis. It was my perception that that was the intention.

Was it equally your perception that that was the reality or did in fact people continue to rely upon parts?-- I think a mixture of both. I think there was - generally speaking in my area there was a move on to being more aware and using the CO make. Perhaps the confusion is coming from the fact that as far as parts per million are concerned that's the working tool of a deputy and he is not normally in a position where he can,

even if he was able, to convert to CO make every time he takes a Drager reading and, of course, the Unor systems themselves all read out in parts per million. So the everyday monitoring, I believe, still does tend to place a lot of emphasis on parts per million.

Not just the Unor systems, even the telemetric systems read in parts, don't they?-- Yes.

So it would be right to say, wouldn't it, that notwithstanding the views about CO make, in reality the industry still continues to operate on - I don't mean solely, but still continues to operate on and take into account parts?-- Yes.

And that is something that would be, in your view, an experience endemic from miners through to management?-- Probably.

Can I come back to that topic of the Part 60 submission for 512 if I may, for a moment? At the stage of dealing with that Part 60 submission obviously panel design was one of the things that you had to look at?-- Yes.

And that is the central feature of a Part 60 submission, design, intended work method and ventilation?-- Yes.

Now, at the time you looked at it you would have noticed that there were two rows of what have been termed compartment pillars?-- Yes.

Did you have the view that they created a ventilation problem at the time you approached the Part 60 plan?-- I didn't. I took the view that they wouldn't present a significant ventilation problem.

Was it your view, based on your experience, that the ventilation in this panel was just as likely to be similar to any bord and pillar panel because bord and pillar panels are multi-heading multi-cross-cut panels?-- I took the view that because of the size of the 512 Panel, and certainly in comparison with some of the larger panels that have been successfully extracted at Moura, that the expectations of successfully ventilating that waste area would be a reality.

Now, did you form the view at the time you approved the Part 60 submission that those pillars would create dead spots behind them?-- I did not consider that aspect at that time. I don't agree with the concept.

You mention you don't agree with the concept; you are referring there to the concept of dead spots behind the pillars, aren't you?-- I'm of the view if you are to examine the normal layout of a bord and pillar operation where the roadways are straight, all the pillars are in line so the air has a straight flow down the headings, between any two adjacent headings there is an extremely low pressure differential, and therefore in every cross-cut there is going to be negligible if any flow of air. That can be demonstrated on any occasions where we put transformers, and often we have

to put up brattice wings or whatever to force air in to keep the transformers cool. On the other hand if, for whatever design parameter, you stagger the pillars the air has to flow in the cut-throughs which it didn't have to do before. So

So -----?-- But overall it will increase the total resistance of the system. Whether or not that's significant is a matter of judgment.

It certainly wasn't your judgment that it was significant in this case?-- No.

Can I ask you this: do you recall if anyone ever raised with you the fact, if it be the fact, that dead spots were occurring behind the pillars?-- I'm not aware of that, no.

Now, can I just ask one last question about this general area? You were involved in the risk assessment procedure to some extent, you attended on a number of days, but not all of them?-- I attended for one full day on the Wednesday plus the Thursday morning.

Now, I think part of the time you were involved, in your attendances, was a period when control measures were being discussed, that is appropriate control measures for the risks identified?-- I think so.

You no doubt had some contribution to that discussion?-- Yes, it's a sort of a back seat position for me. That's the way I look at it. I was there really as a supernumerary to be supportive and to show that an interest was being taken in the system, and it would be my style, I believe, to - not one to hog the floor, but certainly to find any way that I could to prompt in any area that I thought might have been overlooked.

There is no question that notwithstanding your back seat role, if I can call it that, that had you felt the need to speak up you would have done so to offer your two bob's worth?-- Well, that's correct, but I guess the success of a system like this is that you are really, sort of, involving the people who actually do the job.

Correct?-- And in most cases they will have the answers.

Now, the two control measures mentioned in relation to spontaneous combustion as a risk were the short panel duration and monitoring of the gases?-- Would you just -----

Do you recall that?-- Could you say that again, please?

The two control measures, the two primary control measures identified in relation to spontaneous combustion as a risk were short panel duration and monitoring of the gases. You would have seen those as two appropriate control measures?-- I'm not quite sure whether I put the monitoring system as a control measure. I mean -----

Identification measure perhaps?-- Yes, yes.

And then as another alternative, or one to be considered but not necessarily implemented, was flooding?-- Yes.

Now, in any event you did not consider at the time that that discussion was going on that what was being proposed in relation to spon com was inappropriate or lacking in some detail. Had you felt so you would obviously have spoken about it?-- Yes, that's correct.

Now, can I just ask you one last thing about that risk

analysis procedure? You were asked yesterday by Mr Clair whether you thought ACIRL was sufficiently independent - I will make sure I get the two aspects of it. There were two questions: whether they were sufficiently independent and sufficiently thorough to carry out that task. Now, as I made a note of it, you certainly answered the second part, about the thoroughness, but I don't know that you answered the first part. In your view, was ACIRL sufficiently independent to carry out that Minerisk analysis?-- I don't recall that first part actually, but ----

Well, I think it got lost a little bit, but you were certainly asked whether you thought they were sufficiently independent to be involved in the Minerisk analysis?-- I've got no reason to suspect that they wouldn't have been.

Mr Schaus expressed the view, I think, that they were, at that stage, at the forefront of the Minerisk, or the risk analysis procedures. Is that your view?-- That would be my understanding.

Now, can I turn to another topic, if I may, and that's the topic of refresher training? Do - I am sorry, I will start again. As at August 1994 had the Inspectorate been conducting reviews of refresher training in mines, and you can here confine yourself to your district, I don't need the whole of Queensland?-- No, not as an organised initiative at that time, no. I suppose in the '94 year people were in the knowledge that the refresher training systems were generally underway at mines, an overview - a constant overview of that situation, but not specific in my case anyway.

So, in terms of checking on training, your contact in relation to that would largely be, in terms of No 2 at least, discussions with Mr Barraclough who was the training officer?-- As well as whatever may have been said in discussions with Mr Schaus or Mr Mason, other people.

It's an area where you are dependent upon the flow of information rather than some systematic documentary tracking in order to provide you with information?-- Yes.

There seems to have been no, as it were, auditing of whether refresher training was being complied with or done; is that right?-- Not in recent times, no.

Has it ever been done?-- I understand - auditing is a bit of a term - in the past the documentation associated with the progress of the system has been viewed. The sorts of sheets that Mr Barraclough keeps, or his predecessor, on how many people have gone through what subject areas has been viewed and assessments made on that basis, as to whether the system was progressing satisfactorily or otherwise.

Now, you have mentioned the documents that Mr Barraclough kept. You were aware of the sort of documents that he kept, perhaps not the detail but the nature of them?-- The nature, yes.

Which is to say a sheet tracking who had done what courses and updating dates and so forth?-- Yes.

And the topics being those that, by their description, complied with the Chief Inspector's approved scheme of retraining?-- Yes.

Do I understand then that your view was as at August 1994 that refresher training was being adequately coped with at No 2?-- I think I would repeat myself a little bit there, that specifically through 1994 and through that era I would not be specifically aware of the state of the game with respect to refresher training to say that yes, it was right on the ball or to have seen statistical records to show that it was right on the ball. However, I think I did say before that it was very apparent at the mine whenever I went there and through discussions with those people I mentioned that there was a great deal of training taking place, far more than in the past, which I found was encouraging.

Does it stand in comparison with other mines in your district in terms of the level of training?-- I think there are mines in my district that do better.

Are there mines that do worse as well?-- I think probably on a par.

Now, there was an audit of some mines carried out in 1990 in relation to refresher training; do you recall that?-- Say again, please.

There was an audit of some mines carried out in 1990 in respect of refresher training. Do you have any memory of it? Perhaps not?-- Could you give me some more detail?

No, because I haven't got all the documents from the other mines. I'm not sure that they want to produce them. Can you recall such an audit?-- About that time there was an audit done on a sample of mines in conjunction with Workplace Health and Safety, and the objective of that was to assess the mining industry's state of training, standard of training, with a view to establishing or otherwise reciprocity with outside industry.

Now, that may have even involved Mr Pearce, the senior examinations officer from the accident prevention department?-- Yeah, I think that might have.

And mines visited might have included Blackwater, South Blackwater, Curragh, Oaky and Gregory?-- I can't remember the mines. I can't remember which mines they were, but -----

That exercise doesn't seem to have been repeated after that date, would that be right?-- My recollection of that was, as I say, it was designed - it was really all about equipment operation, machinery operation, and as a result of it Workplace Health and Safety were assured that the standard of training being given to workers in the coal mining industry

was equal, if not better, than was being offered to outside industry and, therefore, reciprocity was established.

Very much with an emphasis to reciprocity in the use of a ticket?-- Yes.

Now, can I turn to another topic and that is one that you have been asked about before; that is to say, CO make? You have been asked a number of questions about that, which I don't wish to rehearse, but what I want to know about is this: did you take any steps to gauge the level of understanding of people at any of your mines in relation to CO make?-- No.

Do you recall if there was any directive, memorandum or letter from any other Inspector at any level of the hierarchy suggesting that that should be done?-- I'm not aware of any, no.

Now, can I turn to an aspect of the mine method that was used for 512, which is to say the use of the ramping. You were obviously aware of that method as proposed in the Part 60 submission?-- Yes.

And you had witnessed that method being used, or a modification of that method being used before in 4 South B?-- Yes.

As proposed to you in the Part 60 submission, the method was for short ramping essentially in the punch?-- Yes.

Now, do I take it that you had no view at the time that that created any particular difficulty?-- That's correct.

Either from the point of view of safety of the men or the point of view of increasing the risk of spontaneous combustion?-- No, not for either of those points of view. I could see that it would possibly make mining a little bit more difficult.

A little more difficult in what sense?-- Compared with simply one ramp down into the area and then to progress along on the bottom of the seam.

And that difficulty was really generated by the desire to increase the safety of the operators?-- Yes.

You have inspected the panel yourself on a number of days in May, June and July; is that right?-- Yes.

And had occasion on some of those inspections, if not all of them, to actually see the effect of the ramping?-- Yes, I did.

Did anyone raise with you at any stage any concerns they had about the ramping or the product of it?-- I don't believe so. As I say, there is some awareness of the fact that comments have been made about extra coal being left around and whether that might equate to an increased spontaneous combustion risk.

I think you mentioned those comments in relation to the early life of the panel?-- Yes.

Not subsequently?-- Well, subsequently if that was repeated around the era of the risk assessment in May, but essentially in the early part of the panel, yes.

Extraction commenced on 29 April; the risk assessment, I think, was in the first fortnight of May?-- Yes.

But not after that time?-- I don't believe so.

Now -----?-- I have a recollection, which I didn't convey to anyone else at that time, that on - to be quite frank, and bear in mind that I'm not there day by day and I wouldn't have the same - I don't think my opinion would be as valuable as an operator, for example, but I did reflect on a personal opinion that it appeared to me that compared with the normal rib strip operation, that there really didn't appear to me to be that much coal being left around. Now, whether that's a valid thought or opinion, I don't go out often enough to really perhaps be the best judge of that.

You may not be the best judge, but certainly you had considerable experience in the industry underground?-- Yeah.

Considerable experience as an inspector of mines in Central Queensland?-- Yes.

And based on that experience, is it right to say your opinion was, based on your inspections and your experience, that the loose coal in this panel didn't seem much dissimilar to normal bord and pillar operations?-- Well, on the limited chance that I had to see it that did cross my mind, yes.

Now, can I just turn to the last inspection you made which was 27 July which you discussed in some detail? You in fact went down to the No 5 heading, I think, in 512; is that right?-- I went down - the miner was - this is on 27 July?

Yes?-- Yeah, the miner was working over in that solid rib area, yes.

And you tried to look down that heading, I think, to see if you could identify a fall that had been reported to you?-- In the previous cross-cut. We made some attempts to view that. I can't recall to what extent that was successful.

Now, as you finished that inspection and started to move out of the panel, you had contact with Reece Robertson?-- Yes.

Now, was that down near the miner or back near the crib room?-- That was at the crib room.

So, on the way back to the crib room did you have occasion to look into the goaf? Did you peer into the goaf?-- I can't recall.

You may well have done so?-- May well have done.

It would be normal, wouldn't it, for someone in your position, given your background and knowledge of mines, just to have a general poke around?-- Yes, I'm aware of Mr Barraclough's evidence where he did exactly that, and I would normally be on his shirt tail, yes.

It's entirely possible you did?-- Yes.

But no memory that you have of that day, or your memory of that day is certainly that there was nothing unusual or abnormal in the panel?-- Nothing at all.

When you spoke to Reece Robertson, I know you mentioned that you were talking to him about a couple of aspects, that is, cables and rehabilitation of miners?-- Yes.

Did he say anything to you to indicate that he had found anything unusual in the panel?-- No, he didn't.

I assume that you would have opened the conversation with him much in the way you did with managers and so forth when you arrived at the mine, "What's happening? How's it going?"-- Yes, I always try to - at some stage generally that sort of situation arises with the deputy of a panel.

In other words, you solicit some information from him about what he might want to tell you about the panel and how it's going?-- Yes, Reece is a character I know particularly well.

But he certainly didn't mention to you either smell?-- No.

Or ventilation problems?-- No.

Can I turn to another topic now, if I may, and that is the seals that were used, Tecrete seals, in No 2? You obviously knew that Tecrete was being used for seals in No 2?-- Again, I don't think - I know that's probably not a true statement to say I knew that. I was quite possibly aware of that. However, if you had asked me on the day I perhaps wouldn't have remembered, but maybe I would, maybe I wouldn't, I'm not sure.

We know they were used. They are used elsewhere in Queensland as well, aren't they?-- I understand they are, but I've no direct knowledge of it myself, this particular type of Tecrete seal.

And used in New South Wales as well?-- I understand so.

What you know of them now, do you see them as having some advantage over brick and mortar stoppings?-- When I was - when I became fully aware of what a Tecrete stopping was from the documentation that we gathered - and that's not to say that it may have been explained to me before - but when I became aware of the design of those seals, it appeared to me that they would be a better seal than a brick seal.

And what aspect led you to that view?-- I think the monolithic structure and the heavy reinforcement that went into them.

The reinforcement you are referring to is the roof bolts into all parts of the rib and roof?-- Yes.

Did you ever form the view that the seals being used at No 2 would not be explosion-proof in the sense that the regulations require them?-- I didn't reflect on that, no.

We have had tendered now a number of documents which are from the Chief Inspector of mines to Tecreté approving the elements of Tecreté seals. Have you had a chance to review those?-- I have had a look at them, yes. I would have to see what they are.

Can I hand to you Exhibit 197 and 199, and 198 as well? Now, 197 is a letter from the Chief Inspector of Mines to Tecreté in June 1989. That was at a time when you were an inspector in the Rockhampton branch and Mr Wilson would have been the senior inspector; is that right?-- That would be correct, yeah - yeah, I think it would be right.

Middle of '89?-- I'm not exactly sure. I was acting senior inspector for some period before. I'm not quite sure when the-----

You will see this has been copied, the Senior Inspector of Coal Mines Rockhampton as one of the recipients?-- Yes.

Have you seen this document before this Inquiry, or perhaps you have no recollection of whether you have or haven't, but you might have?-- I don't have a recollection of it, but it is quite likely that I did if it came to the Rockhampton office. The copy from our file would indicate whether I had seen it or not.

There may be another copy of this on your own files?-- If that came in that form to our Rockhampton office it should be on our file.

You will see 198 relates to approvals from the Chief Inspector in relation to various bits of the machinery used in pumping Tecreté?-- Yeah, I've seen these documents - that is similar to those that we gathered up in the investigation process.

And 199 is a very early approval in 1983 in relation to Tecreté sprayed plaster in underground coal mines, or at least the expression that there is no objection to its use?-- Yeah, that's one that I'm most unlikely to have seen.

Because of its early date?-- Yes.

Now, from the Inspectorate's point of view, is it right to say that the use of Tecreté for these seals was approved?-- I would believe so.

Did anyone in the Inspectorate, to your knowledge, take the

view that there was no approval for the use of Tecreté in these seals?-- Could you-----

I'll start it again. Did anyone in the Inspectorate, to your knowledge, have the view that there was no approval for these Tecreté - for the use of Tecreté in these seals?-- I don't believe so.

There was some questioning about the state of approval for Tecreté in seals. Mr Martin asked questions of a number of persons on the 8th of March and as early as 15 February in the course of this Inquiry about whether there were, in fact, or were not, approvals of Tecreté for use in seals, yet these documents were only provided relatively recently, and sort of upon request. Do you know any reason for that?-- Could you just clarify that again?

I'm just asking if you can give me a reason why, notwithstanding that the questions about approval for Tecreté seals were asked as long ago as nearly a month ago on 15 February by Mr Martin of Mr Abrahamse, these documents were only forthcoming relatively recently?-- I don't know. I'm aware of the-----

I should make it clearer. 197 is the one produced most recently?-- 197 and 199 are documents that I haven't seen in recent times anyway. This is part of our documentation - the equipment - but no, I don't know why these - I don't know what the process was that gathered those.

It has certainly never been the Inspectorate's view that there was a lack of approval for these seals?-- I don't see why we would have that view.

Now, can I turn to another topic, if I may, and that is to comment - or at least solicit some comments upon the method of inspection that inspectors carry out, and tell me if I have understood this correctly: it seems that there are no written procedures for inspector's inspections?-- That would be correct.

And that it is really left to the individual inspector to govern how he might conduct his inspections?-- It is probably true to say that the inspection system - it would occur to me that the inspection system that - bear in mind that the inspectors are ex-mine managers - that the inspection system would closely reflect the mine manager's normal method of inspecting his mine, with perhaps a few differences; but, generally speaking, that would be the case, I believe.

So, it is a system that doesn't need writing down or written procedures in the sense that everyone knows pretty much how it should be conducted?-- That's a fairly broad brush statement. I think perhaps after this Inquiry - and indeed, to a degree, beforehand - we can recognise where we need to smarten up our act. That may, indeed, include documenting some aspects of our job. I don't have a clear idea what they would be, though, at this stage.

Now, you mentioned - or you were asked questions by Mr MacSporran about the obtaining of documents and how that occurred. In essence, anything you wanted, you got, and some more?-- Yes.

Mr Schaus adopted that position of volunteering more?-- Yes.

No doubt in this mine, as with any other mine around the place, there are many thousands of documents generated and kept in files?-- Yes.

Now, is it the fact that the incident control team were utilising the office of Mr Mason and Mr Schaus?-- That's correct.

And they did so for quite a period of time, didn't they?-- Yes, they did.

And it is from there, I think you said, that when the second explosion occurred, everyone gathered up what documents they could and got out?-- Yes, when the second explosion occurred and the dust cloud enveloped the area-----

What were done with those documents you took? Were they simply transposed to another room and left where they were, or where did everybody regroup with their documents, is what I'm interested in?-- I don't have a recollection of other people grabbing documents and regrouping anywhere. I have a recollection of myself and Mr McMaster, for example, gathering up the main mine plan that was being utilised to log the borehole progress and some - I can't specifically remember what documents, but a few pieces of paper from here and there that were lying on the table, and then, at a later date, we came and recopied the information from the white board in relation to the gas analyses that were taking place.

Do I understand from what you say that it wasn't a case of grabbing everything off the desk and clearing out, but just taking a few things?-- I don't recall that there was a - no, it wasn't a complete clearing of the desk at all. I can't recall what was actually there that was incidental, or whatever, but it was only a few bits and bobs of things.

Certainly whatever documents were on the desk during the time the incident control team were there were documents that you or McMaster or someone had perused and looked through?-- Yes.

Can I turn to one other matter, and that is the method by which statements were taken for the investigation. You were asked some questions about that. Am I right in saying that the level of representation of persons other than the witness was dependent upon who the witness was and to which organisation he belonged? Let me make it clearer: when union members were being interviewed, almost entirely, I think, it was just you and Mr Allison who interviewed them?-- Or Mr Dalliston.

Or Mr Dalliston?-- That's probably correct, but I don't recall a lot of people being present.

That's because the union representatives didn't want representatives of the staff association or management present when their members were being interviewed?-- I'm not quite sure.

I'm not saying it was a one-way street by arrangement, tacit or otherwise; equally when the Staff Colliery Association members were being interviewed, they didn't want union representatives there?-- That's correct, yes.

So, there was, in fact - who was there in addition to the witness was dictated by the association of which they belonged, effectively?-- Essentially, yes.

And some people had legal representatives there from BHP or otherwise?-- Yes.

And some chose not to?-- Yes.

Now, in the statement taking, particularly of ordinary miners, were the questions asked mostly by you, or pretty much by you and Mr Allison together?-- I don't know whether I can answer that factually, but I probably asked - probably asked most questions, but I don't really know what the division was.

Did some people need prompting to respond?-- Oh, yes.

And did some people get lost for words and need assistance in how to express what they were trying to say?-- That would be a fair comment.

So that in some cases the statements that we read won't necessarily reflect the way in which they expressed themselves, had it been up to themselves; it is the product of some suggestions made to them as to how they might express some event or some fact?-- Yes, it was a product of, if you like, assistance and talk through. Very often in some areas where there was confusion, there might be considerable - a reasonable period of discussion before anything was written down, and when it had all been sort of - become clear, then it would be written down.

So, the interviews themselves, in the large part, were not really a formal interview of question and answer, or anything else, but-----?-- No, I think-----

It was a much more general discussion of the topic?-- If there was any attempt to - or any intention to do that style of interview, I would anticipate that there would have been audio recording equipment used, for example.

Right. And was there any thought in your mind that maybe some people were being interviewed too close to the event - they may have been suffering from stress and that might affect the way in which they responded?-- I don't know to what degree I would have reflected on that, but I would certainly accept that that may, in fact, be the case.

So, if we are looking to the future, and we're interested in your views on the next time that an investigation has to be embarked upon, whether you might consider that a little more time between a traumatic event and the interview would be of assistance to the witness?-- I might have to give more thought to that. I was certainly of the view that - and I think, by and large, I still am - that the sooner an interview is done, the better.

Unless the person is suffering?-- Well, in that case - I mean, there isn't any argument as to whether there is a need to allow some time to occur. In fact, if a person wanted that time and demanded that time, I would be in no position to other than accede to that request.

Do you think it is a good idea for the future that the Inspectorate have the sort of people available to tell them - to give some sort of assessment as to whether someone is under strain? I'm sure you don't regard yourself as qualified to make that judgment yourself?-- I know when I'm under strain. Perhaps.

All right. Can I just ask you one last thing, if I may - one last topic: in relation to No 2 in the past couple of years, if I asked you to list what were, on a day-to-day basis, the major risks or hazards for miners to face, what would you say?-- I guess I would have to put it in the context of accepting that spontaneous combustion is - requires an ongoing discipline in order to address that possibility. The principal hazards at Moura would be as a result of the high gas emission and the possibilities of problems associated with high gas and roof and rib control.

And I think you may have, in fact, recorded at some stage that a significant proportion of the accidents were related to roof/rib control problems?-- Yes.

Anything as much as 30 per cent?-- Yes.

Now, can I ask you one other thing: when you conduct your own inspections, leaving aside investigations for the moment - your own inspections - you, no doubt, receive information both orally and by your own senses?-- Yes.

And if you were told, for instance, of a physical sign - let's take an example of a smell - a smell - one of the things you would do would be to go and check it out yourself?-- Yes.

That would almost be invariably the case unless you were prevented from doing so by logistic problems?-- That would be the case, and when you say "go and check it out" myself, I would always be accompanied by a senior official on that occasion, and probably a deputy.

I didn't mean to mean you alone, but you would certainly take yourself down a pit to check it out?-- Yes.

And in doing so, you would receive all the information you could by your perceptions - sight, smell, even sound, talking

to people down the pit?-- Yes.

And in making a judgment about the existence or otherwise of what you had been told about, or its continuation, or any other judgment to do with it, you would take into account your own experience, wouldn't you?-- Yes.

And obviously you would take into account what had been told to you by others?-- Yes.

And you would - would you not weigh what had been told to you by others, depending upon who it was? I'll give you some examples: if someone who didn't know anything about underground mining mentioned something he had seen down there, you would place less weight on that than if he had been an experienced underground miner?-- In essence, yes.

And, likewise, in weighing the information that you might be given, you would take into account - I don't mean ultimately, but you would take into account the person from whom the report had been received. Let me give you the example that I'm thinking of: if the person was someone that you had known for a long time to be an experienced and trusted underground miner, you may place greater weight on that - his report - than on someone that you didn't have that relationship with?-- Yes.

So that in your judgment-making, from your own point of view, the judgment is based upon a weighing and sifting of the information, both what comes from others and what comes from yourself?-- That's correct.

Are you of the school, as others seem to be, whereby you would place great reliance upon your own investigation?-- Yes.

And in doing that it is, in your view is it not, a reasonable thing to do, that is to say, to place weight upon your own inspection?-- Yes.

And in terms of assessment of the condition of the pit, if you had conflicting information, that is to say someone said this was happening, someone else said it wasn't and you went down and made your own inspection, would you regard it as reasonable to rely heavily on your own inspection?-- I think under those circumstances I might be in a slightly different position than someone who was at the mine on a day-to-day basis.

Well, would you see it then as more reasonable for someone who was there on a day-to-day basis to do so than perhaps yourself?-- Yes.

That's what you are getting at?-- Yes.

You would see it from the point of view then of, say, a manager of a mine who was there often and had familiarity with the pit, you would see that course of conduct as entirely reasonable?-- Yes.

When you went to this mine and others, am I right in thinking that you didn't actually take your own gas detection equipment?-- That's correct.

Would you, during any inspection, take some of the equipment from the mine with you and make your own tests?-- I have done on occasions, but in recent times - in fact for a long time I have found that to be unnecessary because the people I'm with are always equipped with those instruments, and other than in isolated instances I would observe the readings taken by those people.

From an undermanager's point of view, we have heard some undermanagers didn't take their own gas detection equipment, be it Drager or Multiwarn or anything else, but did so on the basis that deputies were available to take readings. Do you regard that as a reasonable course?-- I wouldn't agree with that situation. I would prefer that undermanagers had their own gas detection equipment.

If they were going to a particular panel where deputies were present and known to be present and able to take those readings, does the comment still apply?-- That would invariably be the case where deputies would have those instruments. I guess my background is from one where undermanagers did carry such equipment.

In relation to the assessment of readings that one got, for instance, on the monitoring system, it would be your experience, would it not, that every now and then you get a higher than normal reading - let's talk in parts for the moment - a higher than normal reading of parts in CO that

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comes and goes?-- I would imagine so.

Have you ever seen that yourself where you've had a course of readings that then jump up because perhaps a PJB is parked close to the monitor point and you get a burst of CO that doesn't stay -----?-- I've never been employed at a mine which had that type of equipment.

Not even seen that while you are inspector of such mines?-- No, this is really wonderful stuff which I wasn't -----

If you've had no experience -----?-- I didn't have the benefit of in my time.

Since you haven't had that experience of mines I won't ask you any further. I have nothing further, Your Worship.

WARDEN: Thank you, Mr Morrison. Mr Harrison?

MR HARRISON: Thank you, Your Worship.

CROSS-EXAMINATION:

MR HARRISON: Mr Walker, just going back from your involvement in the central division, you were appointed as an inspector in February of 1988?-- That's correct.

At that stage there was you and Mr Dave Wilson to cover the general inspectorate duties for the division; is that right?-- No, in addition to those there were mechanical and electrical inspectors. We were the mining -----

I'm confining myself to your duties as an inspector as opposed to the mechanical or electrical inspectors?-- That's correct, yes.

Was it the case that for various reasons from September 1989 onwards you were basically left on your own in terms of attending to the inspectorate duties with the exception of the mechanical and electrical inspection duties?-- Yes.

Did that arise initially because of the death of a Mr Hamment who was attached to the Mines Rescue Brigade?-- My predecessor, Dave Wilson, in his role as senior inspector at that time previously had a job also as secretary of the Mines Rescue for the central division, Mines Rescue Brigade. Mines Rescue restructured around that time and Mr Wilson was employed - was given the task basically of setting up the restructuring of the management structure of the Mines Rescue Brigade. Mr Hamment was the first State manager to be appointed for the Mines Rescue Brigade as part of that restructure. Unfortunately he was only in the task for about three months before he died and then Mr Wilson took on that position as a result, and I became acting senior inspector.

XXN: MR HARRISON

WIT: WALKER M P

And that left you basically in the position that you had to cover the general inspectorate duties that were previously undertaken by two people?-- That's correct.

And it basically remained that way from September 1989 right up until August last year, didn't it?-- Yes.

Although I might clarify this: Mr Mackie, for instance, was seconded to help you from time to time, he being the mechanical inspector; is that the case?-- No, I can't recognise what you are getting at in that question when you say he was seconded to help me.

Well, did he help you with some of the general inspectorate duties beyond just the mechanical duties?-- I see what you mean. Mr Mackie was - or is a dynamic personality and does not restrict himself purely to mechanical issues and is very capable of also being aware of mining issues at mines and is a great help in that area.

Would it be fair to say that from September 1989 right up until the time of this incident you did not have the capacity within the Department in the central division to provide the same coverage of the mines within your district that you had, say, from February of 1988 until September of 1989?-- I believe that's true.

That was a source of great concern to you, wasn't it?-- It was.

And you were certainly no shrinking violet when it came to expressing your opinion about that, were you?-- No.

You raised your concerns orally for some years; is that right?-- Yes.

You committed those concerns eventually to writing; is that correct?-- Yes.

Just taking you back, when you first started you told us yesterday that you perceived that the aim, I think you described it as, was to provide coverage by way of regular inspections at mines on the basis of once a month for an underground mine and once every quarter for an open-cut mine?-- That's a rule of thumb schedule that we all are mindful of.

It's one you tried your hardest to meet?-- Yes.

And it was one you found increasingly difficult to meet because of what I might refer to as staff shortages in the central division?-- Yes. I was assisted at times by inspectors for Brisbane, but by and large, yes, it was difficult.

It was becoming increasingly difficult?-- Yes.

One of the matters that you saw as important in your role as an inspector, I take it, was to try and improve the

relationships with the different individuals involved in the mining industry, and also to assess their knowledge in relation to safety matters?-- Yes.

You found it increasingly difficult to do that too, didn't you, because of the staff shortages that I referred to?-- Yes.

You would have preferred, had you had the assistance available, the staff numbers available, the funding available, to have concentrated to some extent on that aspect of assessing their safety knowledge and assisting them in that regard; would that be a fair comment?-- Yes, I think it's fair to say that I'm certainly mindful of the fact that there was a period when we were at full strength or - not at full strength, we haven't got an inspector, but at least when there was mechanical and electrical inspectors there we were reasonably passionate in our job as a team in Rockhampton and did embark upon putting together, as I mentioned yesterday I think, seminars for the industry. The ones I quoted were on noise, and another one was on hazards associated with drag lines. They come to mind, and - yeah, those sorts of things were tended to be stifled.

Now, you agreed with me earlier that you eventually committed your concerns to writing. I would like you to have a look at a document I have here. It's a copy of a memorandum dated 20 August 1993 which has been extracted from the Department file to which are attached a memorandum from you to Mr Lyne dated 22 June 1992, and a reply from Mr Lyne to you dated 6 July 1992. Your Worship, I do have copies available for the panel and also for those at the Bar table.

WARDEN: Thank you.

MR HARRISON: Just to get that in context, Mr Walker, the top document is the memorandum from you of 20 August 1993; is that right?-- Yes.

At that stage you attached those two earlier memorandums; is that correct?-- Yes.

What I would like you to do is turn to the one dated 22 June 1992 from you to Mr Lyne. I take it you clearly recall forwarding that memorandum to him?-- Well, reasonably clearly, yeah.

You certainly recall the matters that prompted you to do that, can't you, as set out there in -----?-- Yes.

I mentioned earlier, and you agreed with me, that you raised matters about staff shortages generally orally before you eventually committed things to writing?-- Most likely, yes.

You can imagine we haven't picked that up in our audit of your file. What I would like to ask you is over what period of time had you been raising problems associated with staff shortages prior to committing yourself to that memorandum of 22 June 1992?-- I honestly wouldn't be able to answer that.

I just couldn't remember the events sufficiently clearly, but

Would it be fair to say it was over a matter of years?-- I
couldn't say.

Getting back to that memorandum, you refer back to that
history about Mr Wilson that we discussed earlier. Do you see
that on the first page?-- Yes.

You go on to say that coal mining activities in your division
had expanded significantly, and you set that out also on the
first page?-- Yes.

I take it you are there saying that these activities had all
commenced since that period of time where you effectively had
been the only - if I can call it, general inspector attached
to the central division?-- That's probably the case, yes.

I take it also that these increased activities meant that
there was a far more substantial output of coal in the central
division throughout that time?-- Well, the outcome of these
new mines would have resulted in that, yes, and the expansions
that are referred to, yes.

I take it that it flows logically from that that the
Government would have derived substantially more income from
the coal mines in the central division throughout that time?--
That would be correct, yes.

Yet it would seem at the same time there was no increase in
terms of the facilities available to you in terms of staff,
for instance?-- That's correct.

In fact you were going backwards at the same time?-- It
certainly appeared to me to be that way, yes.

This prompted you to write this memorandum?-- Yes.

Would it be fair to say that you had raised these matters
orally with your superiors for a long time before then?-- I
would expect that I would have raised them before writing
this, yes, for some time.

I would just like to take you back one step further, if I can
sort out what's left of this rainforest. Do you recall in
1990 a report being delivered to the Department which I think
was referred to as the Tolcher report?-- Sorry?

T-o-l-c-h-e-r. It involved an address, I think, from a
Mr Tolcher outlining certain new directions - or certain new
proposed directions for the Department. Do you recall that?--
The name doesn't ring a bell, no.

What I might do is just get you to have a look at something.
This is another document that we have extracted from the
departmental files - my own writing has let me down here.
Torlach, T-o-r-l-a-c-h; does that sound better?-- That sounds
better.

It's a bit late in life for me to learn to write. I can't read it; I don't know what hope anyone else has got. What I've extracted here is a record of what Mr Torlach had to say and also a series of comments from different people within the Department including yourself towards his proposals. Just have a look at these two documents. Again, Your Worship, I've got copies for the panel and for those at the Bar table, not in my writing.

WARDEN: We will take a bit more of that rainforest then.

MR HARRISON: Now, Mr Walker, do you recall just what is

happening at that stage in terms of certain proposals being put forward about the way the department should go in the future and you and others being asked to comment on that?-- I'm struggling a little bit to remember this particular document. It's a very small part of a very large rainforest.

Was it about this time that the suggestions as to the proposed duty of care legislation first arose?-- That's probably the case.

Now, what I would like you to do - and I merely put all these documents in to place the thing in context - is have a look at your own comments which are at the back of the document which contains comments from various people, and in particular to a comment at the bottom of page 1 of your comments, "Constant inadequate staffing has resulted in the sacrifice of personal research and education." Do you see that?-- Yes.

Now, was it the case that even at that stage in 1990 inadequate staffing was a problem for you in the Central Division?-- Yes.

And even at that stage it was a problem in the sense that you, as an Inspector, were not able to provide, or was not able to provide the assistance that you would have preferred to do in relation to safety matters at the mines in your division?-- I think that would be the concern that I had. That would be the result of continuing problems.

And one of your concerns at that stage, I take it, was that you couldn't devote the time and effort that you would have liked to in relation to safety matters in the mines generally?-- I think I've always had the view that I could recognise where more needed to be done and wasn't able to do it.

If you could just turn over the page. This is where you deal with a suggestion to make routine inspections infrequent. Do you see that at the top of the page?-- Could you ask the question again, please?

It's the top of the following page?-- Page 2?

Yes. Headed up "Page 11", paragraphs 5 and 6, do you see that?-- Yes.

Now, it was here that you dealt with a suggestion in the report that the routine inspections should be infrequent?-- Right.

Now, you didn't agree with that, did you?-- No.

And one of your reasons for disagreeing with that was the very thing I raised with you before, in other words, the desire to improve relationships with individuals and assess their safety and health knowledge. You have set that out there, haven't you?-- Yes.

And that's the way you felt at the time?-- Yes.

Now, from our audit, if I can use that term, of your file, that's the first time we can find anything in writing from you in relation to the staffing matters. Would it be fair to say that from that time in 1990 up until you wrote the memorandum to Mr Lyne in 1992 you would have taken up with the department orally your concerns about the staffing shortages in the Central Division?-- I believe I would have.

Your Worship, I might at that stage seek to tender perhaps as one exhibit the report of Mr Torlach and the bundle of documents which I might refer to as the comments in relation to that report.

WARDEN: Exhibit 210.

ADMITTED AND MARKED "EXHIBIT 210"

WARDEN: I'll get you to verify the description with my clerk after. Thank you.

MR HARRISON: I will do that. Would it have been the case that you also brought to the attention of your superiors the fact that these staff shortages made it difficult for you to devote the time that was necessary to what you describe there as improving relationships with individuals and assessing their safety and health knowledge?-- That would be a consequence of having too much to do, yes.

Now, can I take you back to the memorandum of 22 June 1992 to Mr Lyne? You make a comment at the bottom of the first page of that memorandum, "Additional workload and disruption has also resulted from the departmental reviews and structural efficiency programs." To what extent was your workload being disrupted by these reviews and programs at that stage?-- I guess to the extent that, again, there is an awful lot of paperwork associated with these processes, these are basically bureaucratic processes, and the demands on attempting to keep up and provide comment on some of the aspects of things. I don't have a clear recollection of exactly what I might have had in mind at that time.

Were you concerned at that stage that you were being forced to devote more of your time as a bureaucrat and less of your time as an Inspector attending to matters such as safety?-- Yes.

And that was a very real concern you had at that stage, wasn't it?-- Yes.

I take it you would have felt very strongly about the matter before you went into print as you did on that occasion?-- Yes.

If you can turn to the following page. There is reference

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there to your comments along the lines that to be effective as an Inspector you have to remain in touch with the people involved in the industry. Do you see that at the top of the page?-- I believe that is the great strength of the Inspectorate.

Now, at that stage were you concerned that staff shortages plus what I might term the bureaucratic requirements were making it increasingly difficult for you to remain in touch with the people in the industry and the activities at the mines in your division?-- Yes.

Can you look at the next paragraph? You refer to a Coal Mines Act review workshop on 18 June. Now, without reading the whole paragraph, is it the case that what you were saying there, in effect, was that your responsibility in relation to the duties allocated to you from that review were taking even more time away from what you could do as an Inspector?-- Yes, and, as I recall, that particular occurrence is what prompted me to write that memo.

And your real concern was the monitoring of safety at the mines in your division, wasn't it?-- Yes.

In fact, you go on to say, "Those few of us who are available are committed to muddle on, and my concern is that time spent on the review and other matters will be to the further detriment of the monitoring of safety at the mines."; is that right?-- Yes.

"The further detriment". Was it the case that even up till then you had seen what had happened within the department as being to the detriment of the safety at the mines?-- I could see one thing adding to another, yes.

And this was a further detriment?-- Yes.

And you make the point again, I see, at the end of that letter that coal mining activity is continuing to increase in the area?-- Yes.

Now, you received a reply dated 6 July. Do you see a copy of that there?-- Yes.

That's from Mr Lyne, and he made the point in that letter, did he not, to tell you that really a lot of those extra responsibilities hadn't come into fruition yet and that if your workload became more onerous, your priorities at that time would be reviewed?-- Yes.

Now, they did become more onerous, didn't they, when those mines were further developed?-- I believe they were already more onerous, but yes.

Well, they got even worse, didn't they?-- Yes.

And no help was forthcoming, was it?-- Some assistance, as I say, with inspections being conducted by an Inspector from Brisbane were done.

In fairness I should retract that. You never got your Inspector that you had been chasing since 1989, did you?-- No.

But you got some assistance from time to time, is that the case?-- Yes.

Now, I think I cut you off there. Was there something you wanted to say?-- I was going to make the point that at some point, '90/'91 or thereabouts - I had forgotten about this till just - but the Blair Athol and Oaky Creek underground and Oaky Creek open-cut mines were taken from my area and put into the Northern Division which took the load of those three mines off me.

By the same token, I take it you were still left with a load in excess of what the Central Division would have had, say, from February 1988 till September of 1989?-- Yeah, I didn't include those three mines in those original mines that I spoke about.

You are just wanting to point out, in fairness, that that was part of the equation?-- Sorry?

You are just wanting to point out, in fairness, that you did lose those?-- Yes.

Even though you seemed to gain more?-- Yes.

Now, I would like you to turn to your letter - your memorandum, sorry, of 20 August 1993. Would it be fair to say that when you wrote the one in 1992 you were frustrated in the sense that you felt you couldn't carry out your duties as you felt they should be carried out?-- I was pretty annoyed.

And would it also be fair to say that by the time you wrote this memorandum of 20 August 1993 you were totally frustrated?-- Yes.

Now, just having a look at that memorandum, the first page, it seems from what you say in that at some time before you wrote that a decision had been made that an Inspector was not required in the Central Division and no funds had been allocated in the 1993/1994 budget?-- Yes, that's correct.

When did you find out about that?-- I would have been informed by Mr Lyne, I would think.

Now, up till then was it the case that you had been led to believe by your superiors that attempts were being made to fill that position?-- No, attempts had been made to fill that position on a number of occasions. For whatever reason they weren't consistently persisted with. Endeavours in that area of recruitment were invariably unsuccessful. I can only surmise that the cost of ongoing advertising with no result might have proven onerous.

Was this the first time that you were told it would not be filled?-- I don't think so. I think I was told - I don't think an allocation of funding for an Inspector in Rockhampton has been actually placed in the budget for the last three years.

Now if you can go down two paragraphs?-- I have never been able to understand why on one occasion it's been deemed necessary to have an Inspector and, therefore, advertise for one and then consequently the decision being reversed and then revert back again. It's confusing.

It was never explained adequately to you either, I take it?-- I would recognise that, in my opinion, on occasions when it has been advertised there has been a significant political motive.

I won't buy into politics. Getting back to that letter, you make the comment further down that same page: "The Inspector vacancy in the Central Division has now existed for four years. On 2 May, this year, during a somewhat heated discussion in which I was again expressing my concerns, you informed me that you believed the Inspector position was not justified. You have recently reiterated that belief and have been unable to offer a reasonable explanation." This is you talking to Mr Lyne, isn't it?-- I'm sorry, I missed where you were reading from.

It's page 1, two paragraphs under -----?-- Yes.

----- where we were?-- Yes.

Two paragraphs under the bold type. Just to make this clear, the position you were talking about, in effect, was the one you had from February 1988 until you acted in Mr Wilson's position?-- That's correct, yes.

That's the one that was never filled?-- Yes.

You had a heated discussion with Mr Lyne somewhere on 2 May that year; is that right?-- That's what it says, yes.

Where was that?-- Where was it?

Yes. Just over the telephone or did you meet him somewhere, or can't you recall?-- Probably on the telephone.

Now, was it then you discovered that it may well be that there would not be any filling of that position?-- I presume that relates to the fact that I had just been told that there was no allocation in that year's budget.

You must have been very upset about that?-- Yes.

And you sought an explanation?-- Yes.

Did you get one?-- Not really.

Is that a convenient time, Your Worship?

150395 D.44 Turn 6 mkg (Warden's Crt)

WARDEN: Yes, thank you. We will take the morning adjournment. Resume at 11.15, thank you.

THE COURT ADJOURNED AT 11 A.M.

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THE COURT RESUMED AT 11.15 A.M.

MICHAEL PAUL WALKER, CONTINUING:

MR HARRISON: Mr Walker, I was dealing with the memorandum from you to Mr Lyne on 20 August 1993. I would like you to look at the last paragraph now of the first page and I'll just read it: "At a meeting of inspectors on 27 July this year our Energy Division Director also asserted that the inspector position was not justified, but when asked for an explanation could only reply, 'We haven't received any complaints.'" Now, who is the Energy Division Director that you referred to there?-- I was referring to Mr Colin Taylor.

Now, does Mr Taylor have a background in coal mining?-- No.

Does he have a background in mining?-- Not to my knowledge. Oh, he has a background in mining in that I'm aware he was an electrical engineer at Mount Isa.

A far cry from coal?-- Yes.

And he expressed that same opinion - that the second position was not justified?-- Yes, and he said that - well, his flippant reply to me was that it can't be justified because they hadn't received any complaints.

See, right throughout this time this position was not filled. The attitude that came back to you from your superiors was basically this, wasn't it: that unless there are complaints, all's well?-- The comment would have been made in the context that during this period, with the structural reviews and goodness knows what there was, all sorts of surveys put out to the industry to ask how we performed our duties, and all that sort of thing, and I assume he was attuning his comment to the results of those surveys.

To use your words, you regarded that reply as "flippant"?-- Yes.

And was that because it didn't direct the matters you raised with him at the time?-- Sorry?

Didn't direct itself to them?-- I regarded it as a very inappropriate comment, and it annoyed me a great deal.

See, did you talk to him personally at that stage - to Mr Taylor?-- I believe so. I believe he was at that meeting.

Did you, on that occasion, in his presence, express your concerns about the inability of the Inspectorate to play what you believed to be was its proper role in matters of safety?-- I believe I would have.

And the only response was, "We haven't received any

complaints."?-- Yes.

I would like you to look at the top of page 2. Now, this is where you set out what you describe as the background facts against which the decision was made not to have a second inspector; do you see that?-- Yes.

Now, I would like you to read - sorry, I would like you to just look at the first point headed up in bold print, "The Central Division has always had two mining inspectors." Do you see that?-- Yes.

Underneath that you say, "It is only seven years since the Moura No 4 disaster when the need for a strong and professional inspectorate was highlighted. If another serious incident were to occur under the present circumstances, there would be serious ramifications." That's what you said, isn't it?-- Yes.

Ramifications for the Department; was that what you meant?-- Yes.

Now, it was your understanding, was it not, that the aftermath of the No 4 disaster did highlight a need for a strong and professional inspectorate?-- I believe that was the case, yes.

And was it your understanding that that need was addressed in the short-term after No 4?-- Could be regarded that way.

But certainly, from your experience, not in the long-term?-- No.

And you were concerned about possible ramifications for the Department of which you were a member?-- Yes.

Did you ever get any response to that?-- I beg your pardon?

Did you ever get a response to what you raised there?-- I'm not too sure. I would have thought that if I had it would have been on the file.

I'll come back to that. You then go on to talk about the advertising for the inspector's position for four years - do you see that? The next point?-- Yes.

You make the comment that it wasn't vigorous enough?-- Yes.

That's the way you saw it?-- That was my opinion, yes.

Did you express those views to your superiors from time to time?-- I believe I have, yes.

Now, in that same paragraph, you then deal with what had changed since that position was last advertised in late 1992; do you see that?-- Yes.

And you raised the question there - the question is: "What has changed since that time other than a diminishing budget?"

See that?-- Yes.

Had anything changed other than a diminishing budget in that time to your knowledge?-- My inference there was that it hadn't.

And did anyone ever come back to you and answer that particular query? Did anyone tell you what had changed other than a diminishing budget throughout that time?-- No, I was - in making that comment I was referring to a situation that we had been made aware of probably a short time before - some time before I wrote this - explained to us by - I think by the Director General himself-----

It might be a good time to bring him into it. That's Mr Daly, isn't it?-- Mr Breslin.

Sorry?-- Mr Paul Breslin.

In June of 1993, did you attend a meeting with the Director General of the Department?-- In June?

June of 1993?-- I've attended one or two meetings with the Director General. I'm not quite sure which one you might be referring to.

Now, what I would like you to have a look at here is an extract from your monthly report of June 1993. It is the last two pages of your report. I have purported to take out the whole report. It is under a heading "staff". If you could have a look at this document? Again, I can make copies available. I would like you to have a look at the entry under the heading "staff". Just have a quick browse through that, and I'm going to draw your attention to something at the top of page 6 of that document.

I'll just read that entry there. "All staff attended a meeting with the Director General on 18 June 1993 concerning the plan to relocate in Emerald. As no opportunity for consultation was offered before the decisions were announced the objective of the meeting was for the Director General to listen to grievances. Substantial arguments were presented to demonstrate that location in Emerald was inappropriate. Of deep concern was the Director General's description of the Rockhampton office as a shambles with a qualifying statement that there was no positive interaction between the different branches, no sharing of facilities or information. All officers were shocked and offended at this unfounded observation and were able to assert with good examples quite the opposite. That is that the professional interaction and co-operation between the six different branches in Rockhampton is a very good example to the rest of the Department. By contrast no substantial justification for the shambles criticism could be cited." Now, that was Mr Breslin, wasn't it?-- Yes.

that's what he told you at that meeting on 18 June?-- Yes.

Only a couple of months before you wrote that memorandum to Mr Lyne in August?-- Yes.

So you had been in a position where you had been seeking what you believed to be necessary staff for some three and three quarter years and when you met with the Director General he told you your office was a shambles?-- Yes.

That must have hurt you deeply?-- It did.

Particularly in view of the way you had been treated in your requests for what you believed was needed by way of proper assistance to carry out your duties including safety?-- Yes. I would like to point out, when you refer to my office in Rockhampton, it was no longer my office.

I'm going to get to that too. I'm aware of your subsequent problems in relation to the office, but by all means I didn't wish to cut you off?-- I was just going to make the point that I believe probably outside of Brisbane the Rockhampton office was probably the most complex office of the Department in that it comprised officers belonging to six different branches of the Department. So it was most complex in that way, and typically for a regional office, I would suggest, we generally speaking shared our office accommodation in a harmonious manner, in a close manner logistically amongst other things, and particularly with respect to the metalliferous inspectorate. When we were in their office we were interacting on a daily basis, and I thought, in my opinion, to a better degree than I had seen in evidence in Head Office in Brisbane and, yes, it did - at that stage I was not responsible for the office as a whole, but it did hurt my pride to hear those comments made that I believed to be unjustified, and I believed to be as a result of not listening to what we were trying to tell them that we wanted to achieve and improve in Rockhampton.

150395 D.44 Turn 8 dfc (Warden's Crt)

You had been trying to tell them for years at that stage, hadn't you?-- I had made a bit of a nuisance of myself, yes.

Mr Breslin, what's his background in mining?-- None.

None whatsoever?-- No. None that I noted.

Professional bureaucrat?-- That's probably the sort of title you could give him, yes.

Now, in that same extract you talk about inspectors feeling strongly about making the testing officer's position redundant. Do you see that?-- Yes.

It looks as though that decision at that stage was revoked - or some time after, was it?-- Yes.

Did he eventually resign in any event?-- Yes, he did.

When was that?-- I can't remember exactly when, but it was as a result of the - as did Mr Mackie, the mechanical inspector, which was 50 percent of my team, as a result of the persistent attempts of the Department to relocate us in Emerald.

I will come back to the relocation later. Before I go any further, Your Worship, I would seek to tender that extract from the monthly report of Mr Walker for June of 1993.

WARDEN: Using that as the description of the document that will be Exhibit 211.

ADMITTED AND MARKED "EXHIBIT 211"

MR HARRISON: If I can get back to page 2 of your memorandum of 20 August 1993, following on from where we were before, the third point you make on page 2 is headed, "During the past five years or so the industry has been embroiled in massive change and restructuring." Do you see that?-- Yes.

You go on to say, "This has been demanding on the inspectorate both in keeping up with the changes, but more importantly in endeavouring to be involved and influence those changes affecting health and safety. If better resourced more could have been done."?-- Yes.

Would I be fair in saying from that that your main concern, not necessarily your only concern, but your main concern was that the changes in the industry as referred to by you, coupled with your lack of staff, made it difficult for you to have a proper involvement in relation to matters involving health and safety for the mines in your division?-- Well, as I tried to point out, there was a lot going on in the industry with work models and everything associated with that area and it was more difficult to keep up with all those changes.

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WIT: WALKER M P

Not only keeping up with the changes, but did you see that as impacting adversely on your capacity to properly contribute to matters involving health and safety?-- I was expressing my fears in that area, yes.

If you can just skip two paragraphs, do you make the point again that mining in your area had expanded rapidly?-- Yes.

Over what time frame were you referring to there?-- I guess expansion commenced very shortly after my joining as an inspector in 1988 with the development from scratch of the Oaky Creek No 1 underground mine, and in addition to that those other projects that are listed in the other memo that we looked at were ongoing, one following the other. Development the Gordonstone mine was over a considerable period of time, I think commencing in '89 or thereabouts.

You finish off that point with this comment: "I am gravely concerned that the role and future of the Inspectorate is being dictated by budgetary constraints and a lack of appreciation of its value for the future."?-- Yes.

I've also discussed the budgetary constraints with you?-- But I -----

To some extent?-- I was going to offer a comment when the budgetary side of things was mentioned earlier, that at a meeting with the DG, I think in Emerald, it was pointed out to us, and it was pointed out as a matter of concern to him, I might add, that our departmental budget was tied to a one percent per annum dividend payback to Treasury. That is it would reduce by one percent per year.

Reduce?-- That was on the basis that the salary to operational fund ratio for the Department was something like 20/80, i.e. 80 percent was salary and only 20 percent were operational funds. That meant one percent per year equated to a reduction of five percent per year from the operational funds unless jobs were cut.

Did he explain that on the basis that this is being foisted upon him from above?-- Yes, I understood the dividend to be a payback to Treasury of the capital invested in the Department to undergo structural change and productivity gains.

Certainly I take it that what was being put back into the coal mining industry in your division was not in any way related to what was being taken out?-- No.

You talk in that passage I just referred to about a lack of appreciation of the value of the Inspectorate for the future; a lack of appreciation by whom?-- I think by the bureaucracy in general.

Can you turn to the next paragraph? It's headed up, "2. Mining activity has significantly increased.". Do you see that?-- Yes.

You make a reference there to "undue concerns". You were

referring back, I take it, to the earlier memo that we dealt with from Mr Lyne to you on 6 July '92?-- Yes, I was, yes.

Were you there making the point that what he referred to as undue concerns in terms of other mines were now real concerns because they were on track?-- That's right.

If you can turn to the following page, have a look at the heading, "3. Legislation review activities have proved to be more onerous than anticipated." Do you see that?-- Yes.

Now, without reading what is contained in the first part of that, was it the case that considerable manpower from the Inspectorate was being diverted to assist in relation to this review of the legislation?-- Yes.

Which still hadn't eventuated?-- Yes.

And which you full knew would take years to eventuate even at that stage?-- I think most people involved knew, but scheduled finished dates were always put there. I think everyone realised for the most part that the dates, the completion dates that were being proffered were not realistic, but nonetheless we had to work - try to work to them on paper.

Would it be fair to say that at that stage this was placing an even greater strain on your time and making it even more difficult for you to attend to matters of safety and health along the lines of what we have discussed this morning?-- I felt it was, yes.

Again you made no secret of that fact to your superiors?-- No.

I would like you to look at the paragraph referring to Mr Mackie further down. "Unfortunately Mr Mackie has now been pressured into taking on that chairmanship" - referring to the - I presume the legislation review body?-- That's the chairmanship that I resigned from, chairmanship of the underground regulation committee No 2.

"... and I am aware that he has expressed his concerns to you in writing." Mr Mackie in fact provided you with a copy of those written concerns, didn't he?-- I believe he did.

I would like you to have a look at this document. That is a copy again extracted from the file of a memorandum of 5 August 1993 from Mr Mackie to Mr Lyne. If you just have a look at the second page of that, Mr Walker, you will see that it's marked that a copy was forwarded to you amongst others?-- Yes.

150395 D.44 Turn 9 mkg (Warden's Crt)

Is that what you were referring to in your letter?-- Yes, it was, yes.

And I take it also that you discussed concerns with Mr Mackie as a workmate before he forwarded this particular letter?-- Yes, we were pretty well in a catch-22 situation.

And pretty well in agreement with each other as to how serious the situation was becoming?-- Yes.

In paragraph 3 of that letter he talks about your having resigned chairmanship from the Underground Committee No 2?-- Yes.

And that was done, I take it, because the demands of that were cutting far too much into your ability to act properly, as you saw it, as an Inspector?-- Yes, it was a matter of principle.

I tender that letter from Mr Mackie, or that memorandum from Mr Mackie to Mr Lyne dated 5 August 1993, Your Worship.

WARDEN: Exhibit 212.

ADMITTED AND MARKED "EXHIBIT 212"

MR HARRISON: Now, in your memorandum of 20 August you talk about Mr Mackie being pressured into taking that chairmanship; do you see that?-- Yes.

Did you subsequently receive a copy of a letter confirming that Mr Mackie had in fact been appointed chairman of that committee?-- I'm not sure.

Just to refresh your memory I will ask you to have a look at this document again. Copies are available. You will see it's a letter addressed to Mr J Smith, but that's crossed out - in Mackay - and halfway down it's got, "B/c Mr M Walker, Senior Inspector of Coal Mines", etc, "Rockhampton"?-- Yes.

Now, off to the side of it there is some writing, "This is a very undesirable" - I think the word is - "situation. The process is likely to take another two years.", and there is some initials there; do you see that?-- Yes.

Are they yours?-- That's a "W", yes, that's my initial.

So, Mr Mackie was someone who, from time to time, helped you out with your duties over and above his Mechanical Inspector duties; is that right?-- Yes.

Did you see at that stage that his capacity to do so into the future was going to be further eroded because of this?-- In addition to his capacity to undertake his own side of things, yes.

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WIT: WALKER M P

Is that what you meant by "undesirable", bearing in mind that you thought that this would drag on for another couple of years?-- Yes.

I tender that memorandum from Mr Lyne dated 10 August 1993, Your Worship.

WARDEN: Marked Exhibit 213.

ADMITTED AND MARKED "EXHIBIT 213"

WITNESS: I think I would like to add that when I say this is an undesirable situation, another aspect that I saw to that was from the point of view that other people had been allocated Mr Mackie's duties, other people from other regions, other offices, and that, in turn, as I am supposed to be the Senior Inspector for the Central Division, makes it much more difficult to manage the efforts of people who were located in Mackay or Brisbane or Emerald or wherever rather than, if you like, being under your wing directly.

You saw the impact going beyond your division?-- Oh, the impact was - people from other divisions were undertaking Mr Mackie's duties to allow him to have time to undertake the regulation review, and from a coordination management point of view and trying to maintain any sort of a team effort becomes very difficult.

And you set out, do you not, further on on page 3 of the memorandum of 20 August 1993 the problems you perceived associated with his appointment. If I can summarise them this way: creating internal communication problems, creating external communication problems, dismantling the team work established in the Central Division, adding to the already seriously low morale, demonstrating to industry our inability to maintain services and operate professionally, and justifying further staff reductions to those who are seeking to abrogate the responsibilities of the Inspectorate. That's the effect you saw it as having on your division?-- Those are the dot points that I was just trying to relate to, yes.

What did you mean when you said, "Justify further staff reductions to those who are seeking to abrogate the responsibilities of the Inspectorate."?-- I have a view, a personal view, that may in fact be shared by other Inspectors that the Inspectorate is not held in the proper esteem by the department and its bureaucrats; that they do not perceive the safety role that we have to play in the industry. As an example I would - as an example I would quote the move to relocate the Inspectorate for the Central Division from Rockhampton to Emerald, against the advice of the industry generally, against a passionate campaign of the Inspectorate as a whole that to do so would, in effect, dismantle the Inspectorate in that as we are unable to recruit suitable

people, or at least find it very difficult to recruit suitable people in locations such as Emerald - as Rockhampton and Mackay, the thoughts of being able to accomplish that task by offering positions in Emerald where the - where Inspectors would be working directly alongside people in the industry who operate within the industry pay scales would be very much more onerous and, therefore, as an Inspectorate we expressed these concerns and that we saw that it would reduce the Inspectorate very significantly. Against all that advice and pressure, a philosophy or an ideology was pursued, and is still being pursued, to place the Inspectorate in Emerald. I am of the view that if you have a serious concern - that you don't gamble with things for which you have a serious concern.

And you already had those serious concerns, didn't you?--
Yes, I had.

Mainly because of the budgetary constraints and the lack of staff to carry out your duties as you saw they should be done?-- Yes.

And it did lead to mass resignations, didn't it, the transfer to Emerald?-- It led to resignations. During that period of 1993 through to 1994 it resulted in an awful lot of stress for the people involved.

Including yourself?-- Including myself.

Mr Mackie resigned?-- Yes.

The testing officer resigned?-- Yes.

Who was that?-- Robert Milburn.

An administration officer in the Rockhampton office resigned; is that right? Is that a Mrs Kim Smith?-- In essence, yes, she resigned.

And that was to do with what you have just told us?-- Miss Smith was given the same ultimatum that we were given, go to Emerald or get out basically, and she was in a position whereby she was the principal breadwinner for her family and took advantage of going to another position.

In another department?-- In another department, yes.

Now, I would like you to turn to page 4. You talk about department change in philosophy towards safety in coal mines together with a diminishing budget allocation; do you see that?-- Yes.

Now, is it here that you deal with the proposed duty of care principles?-- Yes.

Just reading further down the page, do you go on to express your concerns about a change from the Inspector's role, as what might be termed a policing role, to what you described as the role of an auditor?-- Yes.

And you make the point there in bold type that the Inspectorate should be extremely proactive and preventative, in effect; you see that? I am about seven-eighths of the way down the page?-- I think the context or the way that is written, I say that, "Although presented with positive evidence from a number of reviews and with the Inspectors in the field strongly asserting that our close professional liaison with each and every mines results in our being extremely proactive and preventative in effect." I believe that we achieve that goal to a significant degree.

Despite the fact that you don't have the adequate staff or the adequate funding?-- As a result of our present mode of operation as opposed to being auditors, I guess, is what I was alluding to, or to something else.

I take it that you have always considered that it is important to the Inspectorate to try and be proactive and preventative in relation to matters of safety?-- I think the Inspectorate must have, or be seen to have and have a leadership role within the industry.

And a leadership role in relation to safety within the industry?-- Specifically, yes.

Would I be fair in saying that your overriding concern right throughout this is the inability to play what you perceive to be the proper role in matters of safety?-- Yes.

You make a point there in the second last paragraph about the morale. You referred to it earlier. You make the comment, "At present, the morale of the Inspectorate is at a very low ebb with its future open to speculation."?-- Yes.

Now, that morale did not improve from August 1993 to August 1994, did it?-- I don't think it's improved to date.

I would like to turn your attention to the comments in the very last paragraph on that page: "I also feel professionally exposed. If, God forbid, a serious incident should occur, I have no illusions that every attempt would be made to pass the responsibility downwards from Government until it could go no lower." Do you see that?-- Yes.

Now, would I be fair in saying that you were very concerned there that you, as a Senior Inspector for the Central Division, could be made a scapegoat if there was a repetition of a serious incident like Moura No 4?-- Yes.

You had a very real concern for your own position; correct?-- Yes.

And, as it turned out, there was, in the sense of seriousness, a repetition of the Moura No 4 incident?-- Yes.

And, no doubt, a very real concern on your part that people would try and make you a scapegoat for that?-- Yes.

Were you concerned that you may have been subjected to the

same type of questioning that some of the people at the mine were subjected to in the course of these proceedings?-- Yes.

And were you concerned that from within your own department the buck may have been passed down the tree until it stopped with you?-- Yes.

Well, I can assure you, Mr Walker, that in pursuing this line of questioning with you I'm not in any way attempting to make you a scapegoat and not in any way challenging your integrity. I would just like to make that clear. I would like you to turn to -----?-- I -----

Sorry?-- I don't - I don't see within our organisation that we had a John Grubb type person to protract downwards a company commitment, and that's where all those concerns and fears basically emanate. We are critical as an Inspectorate of mining companies. We are very mindful of the fact that until any - I would hazard a guess that any operation, whether it be a mine or otherwise - until the corporate commitment is effectively projected downwards and it is understood that the commitment is solid, then progress is extremely slow in the safety area.

Now -----?-- Mr Grubb - at the time Mr Grubb came to Moura I perceived that he fulfilled that role and from then on progress was made in a positive way. Nothing was perfect, things take time, but until that commitment is projected downwards you can keep sticking your finger in the holes in the dyke and it's very difficult to make real and ongoing progress, and I felt very strongly that we were without that structure or element.

Are you saying that not only should that type of structure apply in relation to mine operators but also the Inspectorate itself?-- I think in any venture.

Would it be fair, from what you are saying, the department itself of which the Inspectorate is only a part?-- Those were the basis of the things that I was expressing in that memo.

Just look at the top of page 5, which is the final paragraph of that letter. You make the comment: "The inspectorate is a specialised group of professionals selected and constituted to oversee and safeguard working of coal mines." See that?-- Yes.

Again, safety is very much of prime concern?-- Our principal concern, yes.

"It must be independent of the industry and to a certain degree needs to be independent of the Public Service system. There is no point in having such a professional body if their activities are more and more influenced and directed by administrators and others who are not similarly qualified and who do not share the same objectives or commitments." That's how you finish the letter off, isn't it?-- Yes.

Now, that letter generally - did you ever get a formal response to that?-- I really can't recall.

Why I ask you is that we have been unable to find one in the file, and I just thought that you may have some recollection of one?-- I would have thought if there was one it would have been on the file.

Your Worship, I tender perhaps as one exhibit the memorandum of 20 August 1993 to which are attached copies of the memorandum of 22 June 1992 from Mr Walker to Mr Lyne, and of the memorandum of 6 July 1992 from Mr Lyne to Mr Walker.

WARDEN: Thank you, Exhibit 214 as described.

ADMITTED AND MARKED "EXHIBIT 214"

MR HARRISON: You can probably gather from what I've been questioning about, Mr Walker, that I've had access to Departmental files?-- Yes.

Do you know off-hand whether or not the Department has claimed privilege in relation to any of the information contained in the files and not disclosed them?-- I don't have knowledge of that.

Anyway, getting back to what I asked you about: you can't recall any specific reply to your memorandum of 20 August 1993?-- No, no, I can't.

I want to turn to a few other things. You have been here since the start of this Inquiry, haven't you?-- Yes.

Probably been more involved than anybody, when one looks at the preparation and attending?-- As much as, yes.

You have heard numerous people from the level of deputy, undermanager, undermanager-in-charge and manager at Moura No 2

talk about their limited knowledge or, in some cases, no knowledge of spontaneous combustion and CO make?-- Yes.

Now, I take it that, bearing in mind that you have had the knowledge you have told us about, particularly as a result of the SIMTARS conference in 1989, you were surprised to hear of what I might term generally as this "lack of knowledge" by those people?-- Yes.

Now, had it been the case that you had the funding that you felt you needed and had the staff that you felt you needed, would you have hoped in your desire to - as you described it in that document I referred you to earlier, "desire to improve relationships with individuals and assess their safety and health knowledge", that you may have come across this problem before August of 1994?-- I would say that with a fully staffed team, with a good morale and well motivated - which, generally speaking, the people involved - the professionals from the industry are normally self-motivated - properly funded, who knows what we could achieve. We would do better.

I'm not saying it would have come to the surface, I'm suggesting may have come to the surface?-- May have. I would have liked to have thought so. I have a view that, in hindsight from these proceedings, that it occurred to me that I was in a position where I knew full well what Phil Reed knew, because I went on the course with him and I spoke with him about it. I hadn't appreciated that that knowledge had remained with Phil - that when Phil Reed left, it left something of a vacuum.

I don't want to rehash the evidence on that, but certainly there was no evidence before this Inquiry to suggest that it really got passed down the line?-- No, and I guess if I hadn't have attended - it is quite likely, I suppose, that without that training course by SIMTARS, quite a number of other people might not have been as up-to-speed.

See, had there been positive responses to your requests over a period of years, would you have hoped, I take it, to have put much more into assessing the safety knowledge of the people involved in the industry in your division?-- I have expressed those objectives, yes.

In fact, when we look at it, you bashed your head against a brick wall for years, didn't you, trying to get proper staffing levels and proper funding for the Central Division of the Inspectorate?-- Yes.

To no avail?-- Yes.

Thank you very much for your openness. I have nothing further, Your Worship.

RE-EXAMINATION:

MR CLAIR: Just one matter, Your Worship.

Have you got that Exhibit 214 in front of you, Mr Walker - that's the memorandum?-- No.

20 August 1993?-- Yes.

Can you look to page 4 of that memorandum? It is in the section headed "4)" and in the first of the dot points just before the middle of the page there, you make reference to the "'Duty of Care' principles, being overly focused upon in the new legislation..."?-- Yes.

And you go on, two paragraphs further down, to say "'Duty of Care' has limited application where risk is high. Over reliance on 'Duty of Care' in our industry could have tragic consequences."?-- Yes.

Can you expand on that for me - first of all, what you were referring to by way of "duty of care principles"?-- I guess duty of care, coupled with a self-regulatory system, but where there is an expectation on the part of every individual to understand what he needs to do, particularly in safety, and to do it, so that there is a very large personal responsibility on the people involved. I believe that if the consequences are high of a failure in someone not doing what they should do, then there is a need for regulatory controls.

Hence your reference to over-reliance on duty of care possibly having tragic consequences?-- Yes, I was concerned that - from what I understood of the style of the direction of the new regulations, that too much reliance might be placed on duty of care as opposed to regulatory control.

Thank you, Mr Walker.

EXAMINATION:

MR PARKIN: Mr Walker, I would just like to follow a few things on from where Mr Harrison left off. Mr Walker, just so that I can understand, can you just recall briefly the number of mines that you had when you first started in your role as inspector at Rockhampton?-- Yes. As I said a little while ago, we carved up a couple of mines to go to the Northern Division, probably in 1991 or 1992 or thereabouts, but in 1988, Central Division comprised Callide and Boundary Hill open cuts, Moura open-cut and No 2 underground, Blackwater open-cut, South Blackwater open-cut, Laleham No 1 underground, Cook underground, Curragh open-cut, Yarrabee open-cut, Gregory open-cut, Blair Athol open-cut and Oaky Creek open-cut - that

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was in 1988.

And how does that compare with what that division has got now?-- As I said, shortly after that the No 1 underground at Oaky Creek was added to that list, but subsequently that went, but as of today, we have Laleham underground and Cook underground, the new Kenmare underground in construction, South Blackwater open-cut, Blackwater open-cut, Curragh open-cut, Yarrabee open-cut, Jellinbah open-cut, Gregory open-cut, Ensham open-cut, Crinum underground mine, and Gordonstone underground mine.

So, in effect, the size and scope of that job has increased dramatically?-- Yes.

Can you tell me one thing as well: I think Mr Mackie - it has been mentioned he resigned. Was he ever replaced in your area?-- Attempts were made to replace him, but there were no suitable candidates as a result of those attempts, and Mr Mackie's position remained vacant from November 1993 until he rejoined us in February this year.

Well, did that exacerbate your problems in the Department?-- Me personally?

Well, I mean, for instance, you are now a mechanical inspector down, you have admitted that you were a mines inspector down, and your responsibilities have increased dramatically?-- The situation was pretty hopeless. Again, in Mr Mackie's absence, responsibilities mechanically for those mines were disseminated amongst inspectors in Brisbane and Mackay, so, again, it left me in a position of trying to lead a team located in the four corners of the globe, and, in addition to that, those duties of Mr Mackie's were additional duties for those other inspectors also. Quite logically, they would not be able - assuming they were fully employed in the first place, something had to give.

Now, I think you mentioned yesterday that you visited the underground operations at the expense of visiting the open-cut operations; is that true?-- In essence that would occur, yes. It is a matter of prioritising your time.

I want to ask you another question: I mean, we have obviously heard from Mr Harrison that you are short-staffed - I think that's been well and truly documented - but are you short-staffed to such an extent that you are not able to carry out your duties in a manner consistent with the requirements of the Coal Mines Act with regard to underground coal mines?-- That's pretty hard to answer.

It is a fair question?-- The underground coal mine regulations are quite extensive. Coal mines are quite complex. It is a reasonably difficult task to maintain a vigilance on all aspects of an underground coal mine and all aspects of all underground coal mines, and while attempts were made to do that, I don't know that I would be able to answer your question in a quantifiable way. By and large I think by prioritising the underground mines, to a large degree I was

able to cope with those, yes. I would like to do better,
but-----

You certainly give the undergrounds the preference?-- Yes. I might add that I'm of a very firm belief that we should not be down-grading our service to the open-cut mines. Some people appear to have that opinion - that they are not as important - and from a risk point of view, it could be argued - from a disaster risk point of view - they aren't as important as the underground, but nonetheless, I believe that the basic coal mining disciplinary structures that have flowed on to the open-cut - I believe those disciplinary structures have served the open-cut industry well, and, as a result, their safety standards have - or their safety standards reflect that discipline. Putting potential for disasters aside, the open-cut industry does have a very high potential to kill people with heavy equipment, and statistics, I believe, would show that perhaps even to the extent of a near miss every week, or two, throughout the industry as a whole is occurring. I have actually been asked by a General Manager that I can think of particular at an open-cut coal mine to endeavour to visit his mine more regularly.

I certainly don't disagree with your comments, and I certainly don't wish to detract from anything that came out in Mr Harrison's cross-examination. The point was that you did mention in evidence you visited underground operations at the expense of open cuts?-- Yes.

That was the reason for my question?-- Yes.

Just one other point, Mr Walker: why could you not fill the vacancy for the second inspector? Why did it take so long to fill the vacancy?-- Well, you can't say it took so long, it hasn't been filled, but-----

Well, why hasn't it been filled?-- Because suitable applicants weren't forthcoming.

Why is that?-- Because I believe - essentially because the salary levels of the inspectorate are so far out of whack with industry salary levels and therefore people with the expertise that's required for the inspectorate can find employment at higher salaries within the industry, and it really - under those circumstances, successful recruitment - the scope for successful recruitment is very much diminished to hoping to come across inspectors with particular requirements in their employment, rather than general ones.

Can we turn to another issue? I would like to talk to you about safety at Moura Mine and I would like to refer you to your document, Moura No 2 inspections?-- Is that the 1994 one?

Yes?-- Okay. 208.

I just want to take you through a few things you mentioned during yesterday during that cross-examination. I think you mentioned in evidence that - I think it was New Year's Eve there was a double fatality that occurred at Moura Mine; is that right?-- That's correct. I was actually on leave but at home and was contacted by Barry Biggam who was duty officer during the Christmas leave who told me of the incident, and I decided to join him on the investigation of that incident. He picked me up on his way down from Mackay, in Rockhampton, and we went to the mine on New Year's Eve and commenced the investigation of that incident.

On 31/1/934 you attended or conducted an accident investigation when a miner driver was trapped for a period of time beneath a roof fall; correct?-- Yes.

Was that person injured?-- No, he wasn't. Frightened, but not injured.

And that was a roof fall, was it?-- Yes.

Did you investigate that incident yourself?-- Yes.

You found nothing untoward about that, did you, or -----?-- The accident had occurred as a result of the miner attempting to take out a punch into the side of a pillar in an area where converging, pronounced jointings or faulting came together in a triangular fashion. Probably in addition to that, as I recall, certainly in the case of one of those features it didn't project itself through to the immediate roof that was visible to the people at the time. It commenced about half a metre above the immediate roof, and after exposing or taking out a concern amount of coal that triangular section collapsed on top of the machine, but it was - as a result of that I made - I did make the points and the comments that some areas of the - in looking at the design stage of extraction panels and what coal is to be extracted and what places it's to be extracted from, that more decisions - or some decisions can be made on the basis of geological examination at the design stage and some of those areas are taken off the proposal rather than get to those areas, and perhaps be - those areas - the assessment of those areas left to the deputy or the crew, but perhaps in the case of where the geological conditions are obvious that they can be written out at the design stage. That was the principal result of that.

You mentioned also on the same occasion the manager of the open-cut informed you of a serious accident to a railway worker employed on the construction of the rail loop. You investigated that incident yourself, I think?-- The accident - I passed by the site of the accident probably within a quarter of an hour of it occurring on my way home from - I

don't know whether it was that particular investigation at the underground or elsewhere, but I was actually leaving Moura Mine when that incident occurred. So when I got home I basically had to come back again to do that, but as it turned out it was on the construction of the new rail loop which in fact was on an easement belonging to the railways. So although I did the investigation to some degree looking at the area and photographing the area and all that sort of thing, it was during the course of the day - clarification was gained as to whose jurisdiction it was and it was actually workplace health and safety.

So that was -----?-- So I stepped out of that.

What's the rail loop, this is what I want to understand. The rail loop actually on the mine site itself, but -----?-- Adjacent to the mine site, not actually on the lease.

I see. On 10/2/94 you were informed by Mr Schaus that a miner had suffered a broken leg when a section of rib collapsed on him in the 4 South panel; correct?-- Yes.

On 28/2 you conducted an accident investigation in the open-cut mine where a contractor fell from a drag line and suffered a broken leg; is that correct?-- That's correct.

If I've got this correct, in the period of approximately two months there has been two fatalities, two broken legs, a miner has been trapped and a contractor has been injured - what were his injuries incidentally?-- This is the railway contractor?

Yes?-- I understood he had serious crushing injuries to the chest and abdomen area. He was pinned beneath his machine.

Well, I guess in line with what Mr Harrison's cross-examination brought about you would be a very busy boy in that two months, wouldn't you, Mr Walker?-- Things were a little frantic, yes.

Well, you've had all these incidents in two months?-- Yes.

And you are short staffed to boot; what did you do about that situation?-- What did I do about it?

Yes?-- What could I do about it?

Well, let me say this: I'm pretty sure that the management of the Moura Mine and certainly the chief executive of BHP Australia Coal would be very concerned about that situation, and I guess what I'm asking you is, you know, somebody would say, "Well, look fellas, we have had a few problems here. What are we going to do about it?"?-- I'm sorry, Mr Parkin, I misunderstood your question. I thought you were asking what did I do about being so busy.

Okay, there is two things there. There is the staff problem, there is also what are we going to do about this safety problem?-- Throughout this whole period we did - I did hold meetings and conferences and review with senior management at

Moura Mine these incidences, and as a result of these incidences the concerns at Moura were - probably true to say that they were at an extreme level. I mean people were quite aware, and I suppose mindful that, you know, Christ, we can't afford one more. It's just - you know, it had just reached - it's probably best to say it had reached a pitch of concern whereby - and frustration for management, I guess, that these accidents had occurred, and concerns were at a pitch and people were basically treading on eggshells in the pursuit of the operation, and extremely mindful of not allowing any circumstances to occur to have another one. As you can see

So what you are saying, in effect, is there was a concerted effort with the management and yourselves to try and overcome this situation?-- Yes, there was, yes.

Mr Walker, can I just refer you to your document summary of record book entries, '88 to '94? I think this was raised by Mr Martin yesterday. The question I've got is why it took so long to implement the safety plan at Moura No 2 Mine, because if I've got this right, and please correct me if I am wrong, but you mention it in April '91 and it had still not been completed in August '94; is that right?-- Yes.

Why is that?-- I don't know whether I can answer that. When I first started to raise that issue I was pushing a barrow of my own based on the beliefs and what I've seen and read elsewhere, and the way I thought - what I thought was a good way of managing safety. That was subsequently - was taken on board essentially through the direction of John Grubb. In that period, and I can't be specific, but I have a recollection of one or two documents moving towards that event, viewing those and having conferences with senior management about it, but the time has gone by.

So they did listen to what you had to say then, Mr Walker?-- I believe so. I don't believe before Mr John Grubb came on the scene that there was the corporate commitment to make things happen to the same degree as it was afterwards.

So you've said you got on pretty well with the management at Moura No 2?-- Very well, yes.

One would have thought that - it's not a difficult job to put a management safety plan into place, is it?-- No.

Just to change the subject, Mr Walker, in cross-examination by Mr Clair you were asked about the Inspectorate's role with regards to training. I would just like to ask you the question, who do you think should have the responsibility for training people in our industry?-- I think the industry should have the responsibility for training.

Thank you?-- And the Inspectorate's role would be one supportive of that, and particularly in disseminating new information where appropriate.

Now, if I could take you briefly to the 512 Panel, when you

visited the 512 Panel on 27/7/94 did anyone ever mention the meeting of the 22nd when Dave Kerr visited the operation because of a CO make reading of 14.6 lpm?-- Did anyone mention to me?

Mention to you?-- Only through what Mr Mason said in evidence, that he eluded to that to me on that day, but I don't have a recollection of that.

You don't have any recollection about the litres per minute?-- I don't have any recollection of him telling me anything about 22 July.

Because you were very well aware, of course, that over 10 lpm there is a problem?-- That's correct.

Well, did you know that this information had been communicated to the chief inspector of coal mines and Paul Mackenzie-Wood?-- I was made aware of that fact when I took the statement from David Kerr.

Just a few points of clarification, these graphs Mr Reed set up, a system on CO make based on the seminar course that you attended with him. Now, you visited the mine on numerous occasions since that time. Did anybody at any time discuss the graphs with you, the weekly graphs?-- That graph was discussed in conjunction with the '91 sealing of 5 North West. Other than that occasion I can't recall - I can't recall ever discussing the graphs with anyone.

So Phil Reed never discussed it with you at any time as to -----?-- May have, may have in either before or after that - '91, I don't know, but - I can't recall. I guess in essence the monitoring system is there and basically designed to raise an alert which I would expect to be made aware of generally speaking at that time.

But no doubt if you had been aware of 14.6 you would have had some concern yourself any way?-- Yes.

Just one question here on ventilation changes. I guess that major ventilation changes would be communicated to you normally, wouldn't they?-- According to the Act, yes, they would, ventilation, major changes in ventilation.

On your visit on the 27th did anyone tell you that from 15/7 to the 23rd the ventilation quantity in 512 had been reduced by 20 cubic metres per second?-- No.

I mean that's a 35 per cent reduction and that's a fairly significant event I would have thought?-- Yes.

One final question, during these proceedings you are aware of the two Quality Assurance documents which have been discussed, namely the underground procedures and work instructions and the underground ventilation procedures?-- Yes.

Now, the undermanager -----?-- I'm sorry, what was the question?

I'm coming to the question in a minute?-- I'm sorry.

The undermanager-in-charge at Moura No 2 was not involved in their preparation and he never had the opportunity to review them. These two documents represent a major part of his statutory duties. What's your views on that situation?-- I think it would be logical for him to be involved in that process.

You would at least have thought that, you know, since he's got statutory responsibilities for those two areas at least he should have had the opportunity to at least review them in order to ascertain their correctness?-- I would agree with that.

Thank you very much. I have no further questions.

EXAMINATION:

MR NEILSON: I only have one for you, Mr Walker. I was going to ask you about your views of the staffing arrangements with the Inspectorate, but I don't think I'll bother going into that. Mr Walker, in terms of the role of the Inspectorate, or to be more precise, the role of an inspector such as yourself, you were asked some questions by Mr Clair, and I think again by Mr Morrison, in respect of what you did or what you did not do in terms of perusing deputies' reports?-- Yes.

Can I ask you do you see that it's a role of the Inspectorate to go to every mine and sit down and read every deputy's report?-- Certainly not. I didn't intend to convey that that was the case, I would only be - as I said, this was a personal - what I believed to be a personal good practice and it was a good practice that was - that I observed with an inspector in New South Wales in the way that he did the job at my mine, and on any visit to the mine that perusal of the deputies' inspection reports would be a perusal of those that would be on the noticeboard. That is, no more than that day and perhaps the day or two days before the visit. So there would only be six, or a dozen at most, inspection reports to look at anyway. So it would only be a - very much a sampling exercise. As I said, perhaps to look at who was saying what and how they said it as much as anything. I think Mr Clair in that context tried to make the point that even if that was done religiously and diligently on every occasion, it's not a system that you would or could rely upon to ensure that you were made - that appropriate information, vital information was made available to you. It's just another adjunct to the process.

Okay. So, I mean, if there was something fairly significant reported by a deputy, how would you expect that information to be, or for you to be made aware of that information, if it was information that you should be made aware of? I mean, how would that happen?-- The normal process in the management structure of the mine through the statutory reporting system would be that management would collate all that information and where that information was significant and necessary to be brought to my attention, that would occur.

Thank you, Mr Walker.

EXAMINATION:

WARDEN: Thank you. Getting back to the mines under your jurisdiction and the ones you nominated, you are aware there is several more applications pending?-- Yes.

The new underground mine at Moranbah North?-- I don't have a detailed knowledge of them, but yes.

Two more in the Emerald area?-- I knew of one, but -----

Burton Downs, Gordonstone West?-- Yeah, righto.

Going through the application stage. They will all come under your jurisdiction eventually?-- There is one to the south of Emerald, Torago, which, as I understand, is in the wings, but -----

Okay, there is a couple in South-east Queensland not in your area. What's going to be the situation with visits and inspections if these new mines come on stream?-- Draw your own conclusions, if that's not being flippant.

What's the situation - you are the only bloke baling out the boat, what happens when you go on holidays?-- There isn't a hard and fast rule for that, but if I'm on leave for an extended period, another Inspector would visit the area to inspect the mines as best he could in the time available.

From Brisbane or Mackay?-- Normally from Brisbane.

So, he flies in, does a job and then flies out?-- Basically.

There is no continuing presence there or availability of him in that area while you are away?-- No.

It's a matter of phone calls and aeroplanes?-- I don't know whether that has been the case. I don't think that has been the case where he moves into the office, so to speak, for a period. It could be arranged that way.

Thank you. The department, your employer, recruits people from the industry who have got the experience, the

qualifications and the dedication to do the job, don't they? That's the only way they can get them?-- They attempt to do that, yes.

They attempt to do that. Is the failure to attract suitable personnel linked to the remuneration and conditions of employment?-- It's closely linked to that.

Slightly askew to that, is the metalliferous section having the same trouble, to your knowledge?-- I really don't have a knowledge of that.

Thank you. The position of testing officer, was that brought about specifically as a result of the last Inquiry?-- I think it might have been as a result of the Box Flat Inquiry.

Okay. And that officer resigned and left for other employment?-- Yes, he was under the same threat of being relocated in Emerald and in the meantime he was offered a position at Cook Colliery. The pressure became too great, I guess, and he opted to take that position at Cook. His family remained in Rockhampton and he commuted.

Thank you.

EXAMINATION:

PROF ROXBOROUGH: Mr Walker, I would be pleased if you could clear up a couple of points for me. Was it a requirement for barrier pillars to be left between adjacent panels at Moura No 2?-- Yes.

I guess the pillars were there for several purposes, primarily containment and support?-- Yes.

Did the legislation prescribe a minimum width for those pillars?-- Yes.

What was it?-- 45 metres, I believe.

Is there a reason why the pillar between 512 and 5 South should be less than 45 metres?-- Is it?

Yes. I think you will find in all the plans that its width is 37 metres - the plans that I've seen?-- I'll have to think about that one.

Could it be the subject of any exemption or discretionary -----?-- Exemptions -----

----- latitude by the Inspectorate?-- Exemptions have been processed to enable, in some circumstances, for those barriers to be reduced between contiguous panels and things like that. I think, in essence, the rule really is, in effect, to prevent you actually mining to any closer than 45 metres. The answer

to that, therefore, may lie in the fact that 5 South was already driven, and with respect to the developments and the driveages in 512, in that respect you weren't actually driving towards any sort of a goaf area. 5 South was an open panel. Subsequently the panel was sealed and became a sealed area and, therefore, any further closer driveage towards that sealed area would be prohibited unless some exemptions. The answer may lie in that area.

Are stone dust or water barriers a legal requirement in Queensland?-- Yes, they are.

What were used at Moura, stone dust barriers or water barriers?-- Water barriers.

Are you able to say, from your inspections at Moura No 2, that the barriers relating to the 512 Panel and 5 South district were in place and in order?-- I have no reason to believe that they were other than that.

That's something that would be part of your inspection program?-- Yes, and certainly it would be my experience in Queensland that location of barrier - of water barriers is fairly - quite jealously monitored and regarded by the mine workforce generally. I don't have a great deal of - hardly any problem in not maintaining those where they should be.

Thank you.

EXAMINATION:

MR ELLICOTT: What was the role of the testing officer?-- The testing officer's primary role was to - firstly, to take samples of roadway dust in an organised manner at underground coal mines, to sample the efficacy of the mine's own sampling regime. The whole mine is set out on a zone basis and the mine systematically, through a zoning principle, systematically and repeatedly do their own sampling of roadways. The testing officer's primary job was to, through his own sampling, to test the efficacy of those arrangements. In addition to that he also undertook the monitoring and measuring of respirable dust at mining faces and in mining circumstances by placing personal dust samplers onto various members of the workforce. That involved him going onto various shifts to cover those people. When the results of those - when the results of those - that monitoring was received back from the laboratory we would then inform those individuals what the results were, what the dust was that they were breathing on that day, along with management, and if there were any problems, take appropriate action to find out why standards weren't in place. In addition to that, he also undertook noise monitoring to at least maintain our awareness of where noise problems were, and noise problems, particularly on longwall, are significant. In addition to that he was unofficially my assistant and assisted me in, you know, all

the horrible little jobs that you don't really want to do.

With the possible exception of the horrible little jobs, have those other roles been replaced by some alternative arrangement?-- Yes.

Can you describe those arrangements?-- Could you perhaps -----

Well, he had a role with regard to roadway dust, with regard to respirable dust and with regard to noise monitoring. Has there been any alternative arrangements put in place to cater for his disappearance in those roles?-- Mr Milburn was an experienced deputy and open-cut examiner and had spent - and was a product of the industry with a lot of experience. In his own way he was a dynamic sort of an individual also, and probably I would be doing him an injustice not to mention the fact that not only did he do that sampling role but he was also, because of his experience, very capable of providing advice to management when things weren't right, where dust might be being produced and how they might best correct the situation. Bob's replacement - when Bob left - when Bob's position - Bob's position was first made redundant and then the intervention of the Union forced retraction. At the same time a gas examiner in Brisbane was made redundant and he opted not to leave but to go for retraining, and when Bob left essentially that person, the gas examiner from Brisbane, was seconded to that role, even though he had no mining experience at all. Additionally, because of the regionalisation moves and the moves to put the Inspectorate in Emerald, those of us that are in Rockhampton now are only in Rockhampton under sufferance. Should I leave, my position would be re-advertised under the present arrangements with an option to be in Emerald or Mackay or Rockhampton and, in essence, if I were to leave, should a person take my place, he could opt to actually live in Mackay and attempt to run the Central Division from Mackay, along with Barry Biggam. I was diverging a little bit. In line with the department's moves to relocate the Inspectorate to Emerald, the Emerald offices were revamped to accommodate us, and the new position now of testing officer, not being Mr Milburn, was in fact placed in - I'm sorry, in Emerald - was placed in Emerald, so the testing officer now who is relatively - very, very fresh to the game, he is located in Emerald but essentially part of my team, and, again, it is a difficult situation to manage effectively.

Thank you, nothing further.

MR MARTIN: Your Worship, I have a couple of questions of Mr Walker, one arising out of some questions I asked yesterday and another by leave.

WARDEN: Yes, thank you. Could I ask, are there any more? I would like to finish him by lunch time, but if there is considerable more I will adjourn.

MR MARTIN: There is not very much from my point of view.

WARDEN: Thank you, we will keep you here a bit longer.

FURTHER CROSS-EXAMINATION:

MR MARTIN: Mr Walker, I would just like you to look at these two documents, see if you can identify them for me. Do you recall yesterday we were talking about the August 1993 attendance at Moura No 2, or in fact Moura No 4?-- Yes.

Those two documents, I suggest to you - the first is your handwriting dated 4 August 1993?-- Yes.

Which relates to the incidents we were talking about yesterday?-- Yes.

And the other document, the typed document, is the one that you had typed up, I suggest?-- Yes, this would be the original document handwritten into the record book and this would be having had it typed up in my office and sent to the mine.

So, you can see from that, can't you, that the inspection you conducted in relation to the spontaneous combustion incident was with Mr Schaus and Mr Mason?-- Yes, it was, yes.

Well, if you just cast your eye over that very quickly and see if it reminds you of anything?-- Yes.

Well, are you responding yes, it does remind you of things, or are you just saying you have read it?-- Yes, well, yes, in essence, it does remind me of things, yes.

Does it remind you of any conversation with Mr Mason or Mr Schaus in relation to that incident?-- Not specifically, no.

Can you just tell us whether you went to the mine in response to a telephone call from either of those two men?-- I've no recollection of that.

Well, I won't pursue that any further. I tender both of those documents, thank you, Your Worship. They are handwritten and typed documents being the entries of 4 August 1993 from the mine record book.

WARDEN: Thank you. I think it's Exhibit 215.

ADMITTED AND MARKED "EXHIBIT 215"

MR MARTIN: The only other thing I want to pursue by leave-----

WARDEN: By leave.

FXXN: MR MARTIN

WIT: WALKER M P

MR MARTIN: ----- is: I think you were responding to Mr Morrison in relation to Tecrete?-- Yes.

Now, this is the case, isn't it: that when a panel is extracted, it's completed, the option of keeping up ventilation and inspections and monitoring is to seal it? The only other alternative to continuing ventilation, monitoring and inspection is to seal it?-- The only viable alternative is to seal it, yes.

And that's a final seal?-- Not in all mines, but generally it's found not to be viable to try and keep them open.

And that's a final seal when that occurs?-- Final for that panel, yes.

And you are aware, of course, aren't you, of general rule - what is it - 3.5(6)(a); do you recall that?-- Yes.

Which says, "Every stopping that is constructed as a final seal shall comply with the following additional requirements: (a) the stopping shall be capable of withstanding a pressure of at least 345 kPa." Do you recall that?-- Yes.

Now, what I am suggesting to you is that there is no documentation whatever or any oral or tacit approval for Tecrete product to be used as a final seal by your department?-- My understanding is that materials for the construction of stoppings between an intake and a return roadway must be of brick, concrete or cementitious material or some other approved material, which means if it's other than those it has to be approved.

In what position?-- I'm not aware of any - of any requirement in the regulations whereby it asserts that there is an approval necessary, or there is an approval system to - having assessed the capability of a seal, whether or not it will withstand 345 kPa.

Can you then tell us if there has been any testing at any time as to Tecrete withstanding 345 kPa conducted by your Department?-- It would probably be unusual for that testing to be done by our Department. I understand such testing is taking place currently. I'm not aware otherwise.

And that is in relation to the usage of that product as final seal, I suggest?-- Well, in relation - this is the testing I've just referred to that is going on?

Yes?-- I understand it is being done to test the seal's capability of meeting that 345 kPa, or to find out what - how big it has to be to cater for that.

Thank you. Just to put it to rest - finally, I hope - could the witness see Exhibit 199?-- Yes, I have it here.

You see that? That's a letter from the Department of Mines to Tecrete dated 27 September 1983, isn't it?-- Yes.

And obviously, from the content of that document, Tecrete had applied for approval for the use of Tecrete spray for the construction of ventilator stoppings and overcasts?-- That's what is specified as its use, yes.

And the approval for that Tecrete usage was in respect of ventilator stoppings and overcasts and nothing else, I suggest?-- As that's written - that could be understood.

It is indisputable, isn't it?-- Yes.

Thank you.

WARDEN: Thank you. Mr Morrison?

FURTHER CROSS-EXAMINATION:

MR MORRISON: Mr Walker, I wanted to ask a couple of things: you were taken to the 1994 inspections by Mr Parkin who drew your attention to a number of accidents that occurred in the January to the end of February period?-- Yes.

Do you recall that? In fact, only one of those was at the underground, wasn't it - the 18 January one was an investigation of the open-cut?-- Two of them were. Bruce West being trapped in the mining cab and David Camplin's broken leg.

Mr West wasn't injured, it was-----?-- No, it wasn't an

accident, it was an incident.

The others were in the open-cut, and in the case of the railway worker, it was nothing to do with the mine in reality?-- In effect, yes.

So, in all of those, in terms of people being injured, only one of those related to underground?-- Yes.

Now, you were asked also whether you had some comment to make about Mr Mason not having been involved in or having an opportunity to review the underground procedures?-- Yes.

Now, you would review those underground procedures with a view to seeing that they were accurate and reflecting what was happening, wouldn't you?-- Yes.

And if they did, in fact, reflect what was happening underground and were, in fact, accurate, then the fact that someone hasn't reviewed them doesn't have a big impact, does it?-- No.

Now, in relation to the 45 metres, can I just direct your attention to Part 19 of the regulations, which I think you will confirm for me, when you get them, provide that a potential inrush area is relevantly here one that's within 45 metres of old workings?-- Sorry, what is it you are asking me?

I think you will confirm when you read the rule that a potential inrush area is one that is within 45 metres - here the only relevant bit being in the definition, "any disused workings", subparagraph (b) of general rule 19.1?-- Yes.

So that if we looked at these two continuous panels, 5 South is not old workings?-- No.

And therefore 512 wouldn't be a potential inrush area requiring to be 45 metres away?-- No.

The reverse doesn't apply as between 512 and 511. 511 is, of course, old workings, and therefore in terms of its relationship with 511, it could be a potential inrush area and you would need to keep away the 45 metres?-- If you were mining towards it, yes.

Yes, that's right. So, in fact, in relation to 5 South, it is not a potential inrush area, or towards which one is mining, and therefore you don't need the 45 metre distance?-- Essentially, yes.

Now, in relation to the seals, are you aware of any mine that has seals which, in your opinion, could withstand 345 kPa? Let's confine ourselves to Queensland and not the UK and places elsewhere?-- I am aware of the seals that are used at Gordonstone, which are of the order of one to two metres in thickness and not Tecrete. I can't remember what they are. They are basically two - two lots of shuttering with material propped into the cavity between to fill the void, and I've

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recently been made aware, or been informed that they are - they do meet the explosion-proof parameter. I don't know whether that's a fact.

I was going to say, you haven't had a chance to test that?-- No.

In relation to any seal, normal brick and mortar structure, it is hardly likely to withstand 345, is it?-- No.

Would you just have a look at these two documents, please? It is in relation to the safety plan that you were asked about. Did you have the occasion to see the Occupational Health and Safety Policy issued by BHP in February 1994, or alternatively, the memorandum from Mr Grubb to mine managers of 10 March 1994 concerning the updated version of standards for health and safety programs?-- I think I've certainly seen this policy document.

You are not sure about the other?-- I think I may have seen that also. I'm not sure.

I tender both those documents as one exhibit. They can be entitled "Occupational Health and Safety Policy to February 1994" and "Memorandum from Mr Grubb, 10 March 1994".

WARDEN: Exhibit 216.

ADMITTED AND MARKED "EXHIBIT 216"

MR MORRISON: Under the general rules that Mr Martin referred you to it's the case, isn't it, that there is no definition of what a final seal is?-- No, there is not.

It merely refers to the case where a ventilation stopping is used as a final seal, isn't that right? It's in subrule 6 to which you've been referred?-- Will you quote that again?

Just have a look at this. Subrule 6 says simply, "Every stopping that is constructed as a final seal -----?-- Yes.

Has to be of a certain capacity. So in fact the regulations only really deal with the requirements of stoppings generally, and in relation to a certain category of stopping, namely those that happen to be built as final seals, an extra requirement of 345 kPa plus other matters?-- Yes, I think there is probably room for a bit of clarification in that area.

Sorry?-- I say there is possibly a bit of room for clarification in that area.

Yes, but you understand you don't need approval merely for a final seal as such provided it's used as a final stopping?-- That would be correct.

I will tender that page of the rules. I think it should be incorporated with Exhibit 200 which, I think, is the rest of that part. I may have omitted it from the original one.

WARDEN: Thank you. If there is no objection we will incorporate that as part of 200.

ADMITTED AND MARKED "EXHIBIT 200"

MR MORRISON: Lastly, Mr Walker, to turn to one matter that you mentioned before, you were asked by Mr Harrison, I think, about the knowledge that you derived from the SIMTARS conference about CO make?-- Yes.

And how that had been the source of your knowledge, and you started to say, I think, that had you not gone to the conference, you yourself may well not have found out about it, and I think you then broadened it to say some people as well?-- I hesitated only because of the work - I reflected on the working relationship I had with John Brady at the time, so without the SIMTARS conference - training course, that knowledge most likely would have come from that direction, but - yes.

Absent the conference and the contact you had with Brady or the sort of contact you had with Brady, it's not surprising that people that didn't go to the conference wouldn't know about it?-- Yes.

Thank you. I have nothing further.

WARDEN: Thank you.

MR HARRISON: Your Worship, can I just raise one very brief thing before you adjourn?

WARDEN: Thank you

MR HARRISON: It is something very dear to my heart. Your Worship, loath as I am to use the word, for budgetary reasons the ACSA is not seeking to be legally represented at the expert evidence stage of these proceedings. Mr Bowden, the State secretary, will be seeking to appear as agent for the Association and I would point out that the Association was served with a notice under section 74(ii) of the Act, and I would merely be asking your leave at this stage for Mr Taylor and I to withdraw from the proceedings, to return once the evidence proper recommences, if I can call it that, and for leave for Mr Bowden to appear for the Association in the interim.

WARDEN: Yes, thank you, Mr Harrison. Leave granted accordingly, but please wait for Professor Roxborough to have the final question, please.

MR HARRISON: Sorry, Professor.

FURTHER EXAMINATION:

PROF ROXBOROUGH: Not a question, a comment. Finally with regard to the 45 metre wide barrier pillars, whereas I agree with Mr Morrison that 5 South is not a potential inrush area to 512, the reverse is not the case, I would maintain, and 512 would have become a potential inrush area to 5 South had the mine still be operating?-- Unless you were mining towards 512 I wouldn't see that as the case. It might also be regarded as such had you flooded the panel.

I suppose my point is that the disposition of 511, panel 511 to 512, and the necessity for a barrier pillar 45 metres wide between those two panels apply equally well to 512 and 5 South?-- From the point of view of support or ongoing stability?

From the point of view of the legal requirements?-- I'd have to give that some considerable thought.

WARDEN: Perhaps over lunch then. Could we adjourn and resume at 2.30? You finally got a 2.30 out of me. Thank you.

THE COURT ADJOURNED AT 1.15 P.M. UNTIL 2.30 P.M.

THE COURT RESUMED AT 2.38 P.M.

MICHAEL PAUL WALKER, CONTINUING:

MR CLAIR: I must say I assumed Mr Walker was finished with his evidence, but he has dutifully reported back because there was an unanswered question, or at least a question with the answer, as I recall it, "I would need some time to think about that.", and it was at that point that the Inquiry was adjourned, but it was Mr Morrison's question.

MR MORRISON: Don't look at me. It was Professor Roxborough's questions.

PROF ROXBOROUGH: I'm all done and finished.

WARDEN: The witness is formally stood down and excused. Thank you. You may leave.

WITNESS EXCUSED

MR CLAIR: We are about to move into a phase where the witnesses that will be called will fall into the category of expert witnesses, not that some of the witnesses we have had here haven't been experts, but I have advised Your Worship and members of the panel, and I'll place on the record now that some weeks ago my instructing solicitor wrote to the other parties and indicated that really, for the purpose of avoiding duplication and saving time, that the approach that would be taken with the expert witnesses is that I would call the witness, simply have the witness state his name and then allow the evidence in chief to be led by the party who had engaged that expert witness, or the party with whom the expert witness is associated. In that way, there will effectively be only one, as it were, evidence in chief. I've discussed then the prospect of cross-examination taking place in the order that it has been up to this point, with my next - or with my questioning then occurring as re-examination before re-examination by counsel who, in effect, led the evidence in chief. I don't think there is any objection to that course from the Bar table.

WARDEN: No. Thank you, Mr Clair. I can't see any problems with that. Proceed on that basis.

MR CLAIR: Thank you, Your Worship. I call David Humphries, Your Worship.

WIT: WALKER M P

DAVID ROBERT HUMPHREYS, ON AFFIRMATION, EXAMINED:

MR CLAIR: Mr Humphreys, could you state your full name, please?-- My name is David Robert Humphreys.

You are a Principal Engineer (Mining Research) with SIMTARS?-- That is right.

You have contributed to the preparation of a report; is that so?-- That is right.

Dealing with the events which occurred at Moura and with which the Inquiry is concerned. You have seen that report tendered?-- Yes, I have.

I think the report, in fact, is Exhibit 5 in the proceedings. Thank you, Your Worship.

EXAMINATION:

MR MacSPORRAN: Your Worship, perhaps the witness can formally see that exhibit and the appendices so that he can have those with him during the course of giving his evidence. It is 5, 5A and the two SIMTARS volumes.

Mr Humphreys, while that's being obtained, can you give us some details of your formal qualifications and background and experience?-- I graduated from University of Queensland in 1976 with a degree in mining engineering. I subsequently followed on from that and continued to do my Master of Engineering science degree in research, which took a couple of years. I then commenced employment with ACIRL for a period of about eight and a half years; worked on - ACIRL is Australian Coal Industry Research Laboratories - worked on a large range of research and investigative projects with ACIRL, including the installation and use of a 20 point tube bundle system in an experimental panel at Collinsville Coal Company. I then joined Western Collieries in Western Australia and spent a number of years working in production, planning and design in both underground and open-cut mines, and had a period of time working on various coal-related projects, large open-cut designs, usage of coal products and the like, and more latterly joined SIMTARS in about April last year as Principal Engineer (Mining Research) and have been there since that time.

And over the years have you published any literature, or had published any literature?-- Not a huge quantity. I published a paper - a number of papers based on my research at the university. I published a number of papers while I was with ACIRL. While I was with ACIRL, and because of my interest in spon com, the Department of Mines, as I think they were called

at the time, asked ACIRL to prepare a publication on spontaneous combustion - sorry, ventilation and mining practice in coal mines liable to spontaneous combustion. With Andrew Richmond, a colleague, we did that, and the Department eventually published that book in about '85, I think it was. Obviously while I was with Western Collieries, being in a production-related position, there was less opportunity for doing that, although I did publish some work on the project that took me to Western Australia with ACIRL, which was on a project managing an underground de-watering project to introduce total extraction mining to the Collie Coal Basin.

Now, it is the case, is it not, that personnel from SIMTARS were on site at the mine at Moura No 2 reasonably soon after the event on 8 August last year?-- Yes, as I understand it, when the call-out was made, three personnel were despatched very soon, they being Col Hester, Sam Billau and Darren Brady.

They were gas chemists; is that so?-- They were gas chemists flown to Moura with various equipment to operate the chromatograph on site, to provide emergency gas analysis services.

And later the same day - that's Monday, the 8th - further personnel from SIMTARS arrived on site, those parties being Dr Golledge, Mr Byers, Mr Bell, and Mr Reinhart?-- Yes, that's right.

Now, the investigation was ongoing and ultimately led to the production of the report, which - can you formally identify that for us? It's in front of you?-- Yes.

Five is the draft report of October 1994 - 5A, I think, is the-----?-- Can I see that exhibit, please? I make the point that initially it was published as a draft and it was revised in some minor ways during the break between the first session of this Inquiry and early in the New Year, and was - the revised version was submitted to the Warden on January the 18th, I think it was.

The draft report for Exhibit 5 was, I think, tendered on the first day of hearings?-- I believe so. I wasn't here for the first day.

Back on 18 October last year?-- Yes.

The final report was tendered - or provided to the Warden, as you say, in January of this year, and formally tendered on the first day of the resumed sittings - I think it was 6 February?-- I believe so.

There were some minor changes to the draft in the final reports?-- I think we put a comment in the final report that minor changes were made, but they did not make any substantive changes to any of the conclusions drawn by the report.

Now, the report, as it indicates in its contents, was a product of various parties; is that so?-- That's true.

Those parties are set out on page 1 of the report?-- Yes.

As being Dr Golledge, yourself, Mr Cliff, Mr Reinhart and Mr Hester?-- That's correct.

Now, is it the case that each of those parties, including yourself, has expertise in different areas, basically?-- That is right.

And is that how it came about - that you had that body of people contributing to form the totality of the report that's been tendered?-- Yes, in the - the initial brief for the report was provided by the Chief Inspector of Coal Mines and covered a large area of subjects, and it was felt that given the expertise that we had within SIMTARS - it was spread over a large number of people - they had different expertises in different areas - those five people contributed - or contributed to the report in varying degrees and in varying parts of the report.

Just briefly, if you would, outline the areas of expertise that the parties possess, starting with Dr Golledge?-- Dr Golledge is the manager of the mining research group and was the principal author of the report. His area of expertise is in that of coal dust and methane explosions. I believe Dr Golledge's first qualification is as a mining engineer. David Cliff's first qualification is a Bachelor of Science degree in chemistry. As I understand it, David's area of expertise is in chemistry, gas analysis, spectroscopy, and David also was one of the co-authors of the report on the study in about 1990, '92 on Bowen coal seam fire gas indicators which was looking at the evolution of different gases as spontaneous combustion took place in Queensland coals. Don Reinhart was a computer engineer and his role was in providing support in obtaining - looking at the electronic side of things, looking at computer - obtaining the data off the computer on site and generally assisting the group with the vast amount of data that had to be handled and putting it in a form that was more readily handled. Col Hester is - his first discipline is chemistry and he is largely in charge of SIMTARS gas analysis and gas chromatography services and the CAMGAS services.

Of those people you've mentioned, are they all in fact present and available with the exception of Mr Reinhart?-- That is true.

In any event, if I could deal with some aspects of your report, I take you initially to - I think to page 10 of the report where you start to deal with the issue of on site air monitoring systems referring to the tube bundle system and associated matters at Moura No 2. Do you have that?-- Yes.

I don't want to deal at any length with this topic, but is it the case that the investigations of those systems revealed that they were basically operating at an acceptable level?-- Yes, that would be reasonable to say. Checks were made on the performance, particularly - on the performance of the tube bundle system with particular reference to the functionality, one might say, of the gas analysers in the system to give confidence that the data that we were going to obtain from the computer which controlled that system wasn't in any way particularly in error so that we could trust the gas analysis that was coming off. The checks were made, I believe, after the second explosion, on or around about 16 August, I think it is, and it showed that the - in particular three infrared analysers used for analysing carbon monoxide, carbon dioxide and methane were linear in their response and were spanned and zeroed to an acceptable standard. The oxygen analyser didn't come up as well. It was in error, but it showed - it was shown to have a linear response to oxygen, but the span - span and/or the zero were out at that time.

I will come back in a moment to the calibration of the analysers, but can I take you to the question of the integrity of the tube bundle system itself? You deal with this, I think, at page 12 of your report. Was that found to be functional with the exception - with notable exceptions, I should say, of points 8 and 18?-- Yes, that's right. This

isn't work that we from SIMTARS actually carried out. It's based on looking at the results of the integrity tests, as I prefer to call them, that were carried out by BHP employees on the Sunday, 7 August, and for the most part, yes, the only points that show anything to be of concern are points 8, 1 North West return and point 18. 1 North West return shows an acceptable lag time for its position, but because the carbon monoxide concentration that was detected from that point is low compared to the value of the gas used, it could be - it is reasonable to say there was some sort of leakage into that tube. Point 18, as we have heard in evidence here, I believe the gentleman doing the tests basically abandoned waiting for the span gas to come out of point 18, and unfortunately they obviously never got back to looking at the data because the explosion intervened, but in our examination of the data later on one could see the carbon monoxide spike turned up at around about 10 p.m. on the night of the 7th. So it had an exceptionally long lag time, in the order of 10 hours, and because the concentration had dropped to about 24 ppm then that tube was also leaking.

So that's a drop to about 24 ppm of a known concentration of 44?-- Yes.

Those results are tabulated in table 2.1.3.1 on page 13 of your report?-- That is right. I would make the point that in the analysis of the data that SIMTARS carried out due cognisance has been made of the fact that the 1 North West tube was leaking and may have been drawing air or gas from another air split other than where the sampling point was, and basically the data from point 18, 510 north returns has been written off as providing anything of any great use.

Were there further investigations carried out in relation to the functioning of point 18?-- Yes.

And especially its behaviour during the span gas testing on 7 August?-- Yes. I think it was one of the first things we spotted when perusing the data initially, and that was that point 18 in the period of - we were at the time probably unaware that integrity tests were taking place at that time, and on point 18 the methane concentration suddenly shot up to about 4.5, 4.9 per cent. It showed an odd behaviour in that it either had one of two states. It was either about 4.5 per cent or it was .02 per cent. And at first we thought something untoward was happening underground. A more thorough examination of the data for that point suggests that that behaviour commences when - I'll just backtrack a little bit. It appears that in doing the integrity tests, at some stage point 18 was taken out of the system and wasn't sampled for a period. When point 18 was added to the - what I call a cycle table of sample points it began to show this peculiar behaviour. When they abandoned looking for point 18 span gas and put - restored the cycle table back to the normal routine to sample all of the points that behaviour disappeared.

Did that assist you to draw some conclusion about whether in reality there was that percentage of methane present during -----?-- Well, that plus the fact that if one was to look at

the oxygen concentrations in that time as well they appear to have dropped initially and then, even though the methane drops from, say 4.5 per cent to zero, there is no corresponding change in oxygen that would suggest that we have actually got some methane coming in and displacing air and oxygen. There is no indication of that happening. If one was to add five per cent methane to air you would surely expect about a one or one and a quarter per cent decrease in the oxygen concentration at the same time. So the fact that there is no change in the oxygen concentration, the fact that the behaviour appears to be limited to the time while point 18 is in what I call a reduced cycle time suggests that it is not a real phenomena associated with real gas. It's some aberrant behaviour that is yet to be satisfactorily explained other than to say I don't believe that it is truly anything to do with gases at point 18.

You think it may be more of a computer software or electronic problem?-- This is what I think we hypothesise in the report, but we just don't have enough information to say that it's anything other than not really associated with gas.

Can I take you then back to your -----?-- Just on that, I would point out that given that the lag time was also 10 hours, if it was something associated with gas it was something that was occurring at about midnight on the Saturday night/Sunday morning.

As opposed to during the span gas testing?-- As opposed to during the span gas. which is what - the initial thought was that somebody was, I think, draining a gas drainage range. Given the lag time of 10 hours that was confirmed at the same time, there is no way that anybody could have been down there at midday causing that behaviour on point 18.

Can I take you then to the question of calibration check on the analysers as part of the system, and there are four analysers you've told us?-- Yes.

Three infrared ones, one each for carbon monoxide, carbon dioxide and methane?-- Yes.

And one paramagnetic analyser which analyses the oxygen concentration?-- Yes, that's true.

They were checked as part of the investigation?-- That's true.

Can you tell us briefly the results of that?-- I believe that -----

This is page 17, I think, of your report. It starts at 17?-- I believe the gist of it is to say that the carbon monoxide, the methane and the carbon dioxide analysers showed linear response to gases and appeared to be within an acceptable tolerance in terms of zero and span checks. As I earlier indicated, the oxygen analyser was considerably in error, but it had been - the whole system at some stage had been switched on and off and I don't think there - anybody was particularly

surprised about that. Its performance was adequate in terms of linearity, and when it was spanned up, I believe it appeared to operate satisfactorily - to an acceptable standard.

The investigation indicates a problem with the methane analyser when it changed ranges in terms of measuring concentration of methane?-- Yes, not apparent from the tests that were done to check the linearity span and zero of the instruments that were carried out on 16 August, it wasn't apparent from that, but in an examination again of the tube bundle data which - after we had down loaded data from the controlling computer it became apparent that there was something a little bit odd about the performance of the methane analyser, and in particular on point 5, I think it is - I'll just check.

That's Volume 1?-- Volume 1, appendix 2.1.7D, page 23. This is data obtained for point 5, 512 seals in the time between about 2100 hours on 7 August to about - to just prior to the explosion. If one checks the methane concentration as reported by the computer there is a sudden change at 2255. At 2241 we have 4.99 per cent methane, at 2255 we have 10.65 per cent methane.

Just so we can be sure where you are, that's Volume 1 of the volumes, appendix 2.1.7D; is that so?-- That's correct.

Which is the data for point 5, 512 seals and that page is 23 of 26?-- That is right.

You say there is a jump in methane?-- Yes.

From the 7th, 2228 -----?-- 2241.

2241 to 2255?-- If one examined that as a trend, which is what we tried - well, it became apparent from the trend that the methane was gradually increasing, and then at five per cent suddenly jumped up by about 5.65 per cent. If you go on a little bit further you can see that at 2349 it was originally 10.75 and it's now come down to five per cent again. What we believe is happening is that - the methane analyser was a two range analyser. The lower range was nought to five per cent and when a concentration in excess of the full scale deflection on the first range was encountered the computer or the system changed the range on the methane analyser to a scale of nought to 100 per cent and there was some sort of offset error between the two ranges. I think in the end - and as a result that caused a jump whenever there was a sample that required the second range of the methane analyser to be utilised. .

Are you saying by that that the jump is not in fact a real measurement -----?-- It's artificial. It's artificial.

There is no 10 per cent methane at that point?-- No. Again if you look at the analysis between 2241 and 2255, if there had been 5.65 per cent additional methane there then we would have expected a considerable drop in the oxygen concentration

whereas we have only seen a drop of .03 per cent. We should have seen something like a quarter of five per cent, about a 1.25 per cent drop.

Again it's an artificial readout, it's not a real gas reading?-- Yes, I would make the point also that that behaviour was reproduced on site during a visit by David Cliff and in company with BHP representatives.

That was reproduced on the methane analyser, was it?-- Yes, I believe so. That is why the fifth column of gas analysis in all of our volumes showed a corrected methane. All the methane concentrations that were above five per cent were corrected by subtracting 5.65 per cent so that there weren't - you know, the error was taken out of the gas analysis.

So the reading you have then would be the actual reading -----?-- Yes.

----- of gas concentration?-- More like the actual reading.

Was that problem, if I can call it that, with the methane analyser apparent in data from a previous sealing at No 2 when checks were done?-- Yes, I've - I have seen data from the 401/402 sealing which took place, I think, in February '93 or thereabouts.

In any event, again it's not a real reading, it's an artificial reading?-- Well, you can see again in the trends that methane is gradually increasing after the panel was sealed and jumps up at five per cent to about the same level, to about 10.6 per cent. I can't be exact on that upper figure.

Can I take you then back to the oxygen analyser? Upon further investigation did there appear to be a difficulty with the readings being produced by it?-- Yes, I think initially it didn't appear to be such a - "serious" isn't necessarily the right word - important factor. The analyser performed satisfactorily, had linearity and could be spanned satisfactorily or acceptably, but in spite of that, if one examines the analyses for the point 14 which was a tube, I believe, I've been told more recently, not into the pump room but just outside of the pump room, the pump room being the room in which the analysis equipment was housed on the surface. Analyses were taken of the air drawn from that tube and recorded on the computer, and if I can quickly -----

Is the data that relates to that contained in Volume 1, appendix 2.1.7I?-- 2.1.7I, pages 18 to 22. What I'm showing here is the actual oxygen concentrations as reported by the computer for the period of 6 August and they show that the oxygen concentration reported from the pump room, as you can see, is consistently somewhere between about 20.35 per cent and 20.5.

Mr Humphreys, it might just be me, but is that out of focus slightly?-- It could be your eyes.

150395 D.44 Turn 16 dfc (Warden's Crt)

As long as I can see it, that's the main thing?-- Is that better? I can see it. I only used these by way of example to illustrate the period of time from 27 July when we obtained the first data - sorry, 27 July when the new computer was installed, to about 10 August when the data runs out.

All right. Carry on, sorry, carry on. Your Worship, there are copies of these documents I can hand around now that might be convenient, copies of the ones that Mr Humphreys is going to be referring to?-- And that is for the period of 7 August, and you can see that for that day the characteristics are the same but the oxygen lies somewhere between about 20.4 and 20.55. Normally one would expect in air, unless the greenhouse effect has really taken a hold, a concentration of 20.93 per cent oxygen.

So that, you say, is the pump room which you now know is - the monitoring point is actually outside the room and should be monitoring fresh air; is that so?-- That's right.

With an oxygen concentration of somewhere around 20.9?-- That's right.

And for both of those days, 6 and 7 August, that point was actually reading much lower; is that so?-- Yes, that's right, and if you check the complete set of data in Appendix 2.1.7I, it is consistently always less than 20.93 per cent oxygen.

Now, those two graphs you have just referred to are simply graphs of the data contained in the Appendix 2.1.7I in Volume 1; is that so?-- That's right.

Your Worship, I should formally tender those two graphs of that point at this stage.

WARDEN: Exhibit 217.

ADMITTED AND MARKED "EXHIBIT 217"

MR MACSPORRAN: Mr Humphreys, we will come back to this, but are you aware of any reason why that analyser may in fact have been reading low at that point?-- I can't really speculate on why that would be. I'm - the most likely answer is some sort of offset in the - or slight error in the calibration, although that - it would still be acceptable in terms of the tolerances set for the operation of the Unor system.

Now, does it, however, have some significant effect upon a calculation of the Graham's Ratio?-- Yes, it does.

Perhaps we will come back to that a little later. Can I take you then to page 23 of your report where you refer to the CAMGAS system; is that so?-- Yes, that's so.

Can you just tell us whether the system - firstly, what the system is and whether or not it was, as far as you could tell, operational as at 7 August when it was - or 8 August when it was inspected?-- The CAMGAS system, as I understand it, not being particularly associated with that service at SIMTARS office, but as I understand it, is a service to provide an

on site properly calibrated and functioning chromatograph at each of the mine sites in a functional state at all times. It came out - it came about as a result of problems in the past in organisations such as SIMTARS and ACIRL responding to emergencies and the problems they had with the logistics of relocating chromatographs from city centres, their centres of business, to remote mine sites. It is not meant to be a replacement for mine atmosphere monitoring but an adjunct to it. The concept behind CAMGAS is to have that chromatograph on site ready to go using operators who are not trained chromatographers - that's the right word - chromatographers but who are able to maintain and calibrate and operate the GC while having access to a modem link back to SIMTARS that provides - that allows them access to trained chromatographers for the purposes of being able to better calibrate and operate their chromatographs and to provide a better service of interpretation of the chromatograms.

Now, upon examination of that system on 8 August, or soon thereafter, was the system actually functional?-- The reports I have from Col Hester and the people that went to Moura was yes, when they arrived in Moura the system was fully functional.

And had there been in fact a record of regular and appropriate calibrations of that system with SIMTARS?-- I believe so.

Can I take you to page 30 of your report which deals with the topic of calculation of the time of the first explosion from the tube bundle data. Can we summarise that aspect this way: that the tube bundle data was found to be reasonably accurate and from that data it was possible to track through the events leading up to the explosion latish on the night of Sunday, 7 August?-- I'd say that's a reasonable statement.

And the time is pinpointed at what ultimately?-- I think I calculate a window of between 23.28 and 23.37 on 7 August.

And, as we say, data leading up to that point is consistent for the tube bundle system operating acceptably to give readings from all sample points except the two you mentioned?-- Yes, that's true. I point out that after that there is some doubt as to where some of the tube bundle system - tube bundle sample points were located.

Can I take you then to page 32 which deals with the alarm log data?-- Yes.

Now, the actual log of that data is Appendix 2.1.7M -----?-- That is correct.

----- in the SIMTARS material?-- Yes.

What does that log actually record?-- That log simply reflects the log that was recorded on the computer controlling the tube bundle system which we take to be a log of the alarms that were recorded by the computer. We have made no attempt to determine the veracity of that data to see whether alarms could be generated and not be recorded, and I don't think we

have any reason to believe that, and we have to accept the log at face value and no - and we undertook no investigations as to how the alarm system worked, nor was reset, the functionality of the alarm system.

You are simply looking at what the computer system was capable of doing and what it recorded as opposed to whether it was functioning correctly or not?-- It's simply a reporting of what the computer reported were the alarms that were generated.

Can I take you then to page 41 which deals with the topic of spontaneous combustion? Could I ask you, firstly, to give us some brief details about what is spontaneous combustion?-- Spontaneous combustion of coal is a self heating of coal brought about by the oxidisation of coal under conditions which do not permit the removal of the heat of oxidisation of the coal by whatever means, conduction, convection, radiation. Coal, like many materials, will oxidise in the presence of air. That oxidisation process will liberate heat. If the heat cannot be dissipated by whatever means, by air movement, by conduction into other material, the heat will tend to cause - will cause the temperature of the coal to rise, the rise in temperature of the coal causes the rate of oxidisation to increase, that increases the rate at which temperature tends to rise. It's sort of a ----

Ongoing process?-- Ongoing process.

We have heard many descriptions in relation to spontaneous combustion which include the word "exponential". Are you able to comment on the use of that term in connection with spontaneous combustion?-- Yes, I think I could.

Your Worship, could the witness see Exhibit 29, please? It's the SIMTARS training manual?-- I will press on, if you like.

Mr Humphreys, can you just confirm for us that the item you have on the screen at the moment is in fact figure 4.1 on page 4.3 of Volume 1 of the SIMTARS literature from the '89 seminar, Exhibit 29?-- No, I can't. This appears to be different.

Well, do you have section 4 there?-- Oh, sorry. I'm looking at section 1. There is something peculiar here. It's unit 2.

Unit 2?-- Unit 2 of Volume 1.

Unit 2, page 4.3?-- Page 4.3.

Figure 4.1?-- Yes.

I think this was referred to in evidence with Mr Reed, I think, in terms of whether it displayed some form of exponential increase in - or the behaviour being exponential when a heating in coal occurs?-- Yes.

Can you explain what the figure relates to and tell us something about it?-- The figure relates to the research

that I did for my masters degree, and they are self heating curves derived for Queensland coals in an adiabatic apparatus which is used to simulate crudely the self heating of coal in a real situation. Being quite familiar with the data, I can say that they are characterised by a quite long - as a proportion of the total time involved in this test, they are characterised by a quite long, almost linear first stage of self heating up to about 70 degrees C. After about 70 degrees C the rate of increase in temperature does tend to become exponential.

Just so we can be clear, we are dealing with the figure 4.1, the horizontal axis is oxidation period in hours?-- Yes, this is time, this is temperature.

And the vertical axis is temperature?-- That's right.

And the various rates are represented by the various curves; is that so?-- The rates indicated here are the average slope of that curve from the start of the test to the time when the individual test reaches 70 degrees C. This test - this sort of test has been used by many researchers in the past to examine behaviour of spontaneous combustion and I used this particular - developed this test while at the university and used it to investigate various aspects of spon com for Queensland coals.

So, you have a stage when the coal is heating to a temperature of about 70 degrees C?-- Yes.

And then a different behaviour with higher temperatures; is that so?-- That is right. What is happening is that there can be an initial quite rapid increase here but it quickly levels down to a fairly constant rate of increase in this period between 40 degrees and 70 degrees C. 70 - it's just a broad area, but essentially up to about 70 degrees C the rate of self heating is quite linear, and -----

But up to 70 degrees C do you still have coal heating, do you?-- Well, if the temperature is rising, it must be heating.

And then at 70 the heating takes on a different pattern?-- Well, it's all part of the same pattern really, but from 70 degrees C the rate - the rate of change in the rate of self heating becomes quite high.

The rate changes?-- Yes.

After about 70 degrees C?-- Yes.

And does the text of that section refer to what happens at about that temperature in terms of whether you can control the rate of rise? This, again, is an extract from the same section of the SIMTARS material; is that so?-- Yes, that is right.

Can you tell us what it says?-- How are your eyes? Just almost exactly what I've said here, below 70 degrees C the

rate of self heating is almost constant but at about 70 degrees C the rate of self heating increases rapidly. For this reason once the temperature of the coal in a mine exceeds 70 degrees C, it would be very difficult to prevent the temperature rising further.

So, how do we relate that to whether or not you looked for an exponential rise in trends to detect spontaneous combustion? Does that figure have some relevance in that area?-- Because the method of detecting - the favoured method of detecting spontaneous combustion is to look for carbon monoxide gas in the mine air, or the returns of a ventilated panel, then one would expect that in the early stages of a heating the rate at which the heating would - the rate at which the temperature would tend to rise would be quite low and wouldn't increase very rapidly with time in the same manner as this, but after a while because of the rules, the chemical rules, controlling this reaction, the rate of reaction becomes very rapid after 70 degrees C and the rate at which carbon monoxide will be produced by the reaction will begin to climb very rapidly after that period of time. So, the heating will be characterised by a gradual increase in carbon monoxide production, almost a long linear rate of production, or a long linear trend in carbon monoxide production followed by a very rapid increase in carbon monoxide production prior to the onset of very hot conditions possibly leading to open fire.

And again, as the figure indicates, at temperatures above 70 degrees it's very difficult to control the increases above that, is that translatable to the ability to control a heating at the level where it rises in an exponential way?-- Well, we have - it would be possible to control it by excluding air, but one is hopefully trying to reach this - to detect this heating and control it before it is going into this transition phase from being an incipient or developing heating to being an open fire or an outright fire.

I will come back to that concept, but can I take you generally to what indicators there are of spontaneous combustion or heating taking place?-- Indicators of spon com.

Can I ask you, firstly, for instance, about smell? Is that one of the indicators?-- Yes. The indicators of spontaneous combustion - the physical indicators that you and I might detect would be smell, haze, which is a water vapour, sweating and smoke, possibly obviously other things like temperature effects, hot coals, if it's really got quite advanced.

Before we leave those, can I ask you to deal more fully with a question of smell? What sort of a smell are we talking about in terms of detection of a spontaneous combustion?-- A steam train smell. I think anybody who has ever ridden a steam train would know what I'm talking about. You know, I always associate it with steam smells - the smell of the coal - the partly burnt coal. I think that - I have heard many people talking about smell and I find it impossible to describe a smell. I think anybody who has ever smelled a heating around an old waste dump or smelled a badly burning coal fire would know what fire stink, as I would call it, smells like.

Does the smell associated with a heating - is that relevant to the temperature at which the heating-----?-- As I believe it - as I understand it, as the temperature of the heating gets higher, the smells are likely to become stronger. I think that's reasonably logical.

You have mentioned smell, haze and sweating?-- Yes.

What about carbon monoxide in parts per million?-- Yes. The reaction - the reaction that is actually taking place is not fully understood, but essentially what is happening is coal is absorbing oxygen out of the atmosphere and it is releasing carbon dioxide, carbon monoxide, hydrogen, and other, what I call, light hydrocarbon gases into the atmosphere. Probably in the order of the - in proportion - sorry, in the relative volumes - in the order of relative volumes, carbon dioxide is by far the most, carbon monoxide next, hydrogen and the other gases following. For the purposes of early detection of spontaneous combustion, carbon monoxide is considered to be the primary indicator of the onset of self-heating, because even though carbon dioxide is given off in larger quantities, it is present in coal mines due to other processes, such as diesel equipment, through breathing - not that that contributes a great deal - and seam gases. Carbon monoxide - and also carbon dioxide is present in the - in normal air. Carbon monoxide is not generally present in the normal atmosphere. It can be present due to the action of shotfiring and diesel equipment, but generally the presence of the gas - of carbon monoxide in the mine due to shotfiring and diesels can usually be identified as being a transient peak on a continuous monitoring record.

That's parts per million. CO make is another way of detecting spon com; is that so?-- Yes.

And then the ratios are Graham's Ratio?-- Yes.

Morris' ratio?-- Yes.

The-----?-- The main ones for the purposes of detecting the early signs of self-heating would be either carbon monoxide trends in parts per million, looking for an upward trend in parts per million generally over some sort of normal background level established for each mine or each district or each panel. The problem with carbon monoxide concentrations is - as a primary tool for spon com detection - is that it is subject to variations caused by the air quantities passing

through a district. So that given a heating which is producing an amount of carbon monoxide, in litres per minute - we have said it is make - the problem will be that if the air quantity changes, the carbon monoxide concentrations will change; so that as the air quantity goes up, the CO concentration is likely to go down, and vice versa. It makes it difficult to compare, perhaps, trends from one panel to another panel with different air velocities - air quantities.

Is that one of the reasons that CO make is the - is a useful tool to detect spontaneous combustion?-- Yes.

Do you have any material with you there to demonstrate the point you are making about the variation in parts per million with air quantities? I think the copies that have been distributed are black and white, so if you can bear that in mind when you are describing what is on the screen in colour?-- If we were to take - I'll call it hypothetical, for the time being - a hypothetical development of carbon monoxide make in a mine - and it just happens to be a set of data for 512 that we will get to later - and said what would be the carbon monoxide concentrations in 40 cubic metres per second air flow, we would get a trend over time following this green line here.

That's the bottom line?-- The bottom line. So, we start at a very low concentration of only a couple of ppm of carbon monoxide, build up over a period of weeks to 5 ppm, and then follow quite a low rate until we got to here, and then we see a change. But, if - if - and I'm not suggesting for a minute that 512 panel could have been ventilated with as little as 15 cubic metres per second - there are other factors that come into the amount of air that's needed to ventilate a panel other than detection of spontaneous combustion-----

But you are using this as an example of different rates?-- The problem with ventilating 512 panel with 15 cubic metres per second would be the problem of control of methane; but if methane weren't a problem, then you can see that the rate at which the CO would increase would be considerably faster. Everything has increased by a factor of 40 on 15, the rate at which the carbon monoxide increases over time, and the absolute concentrations have increased by a factor of 40 on 15.

Now, just to go back to the bottom line of that representation is what? The parts per million curve in what velocity?-- The bottom line is what would be the parts per million if we had a - an air quantity of 40 cubic metres per second. So, it is distributing the CO make amongst 40 cubic metres per second. The top line is if we only had 15 cubic metres per second air flow through the panel.

And the middle line is?-- Is - sorry, the middle line is at 20 cubic metres per second. So, from 40 to 20 the concentrations will double, and the slopes of the curves will all double. At 15 cubic metres per second, it is all - all the values are increased by a factor of 40 on 15, and all the slopes are increased by a factor of 40 on 15.

So, at the lowest velocity, you have the highest parts per million?-- Sorry?

At the lowest velocity, you have the highest parts per million?-- Yes, and vice versa.

I will tender that representation, Your Worship.

WARDEN: Exhibit 218.

ADMITTED AND MARKED "EXHIBIT 218"

MR MacSPORRAN: Again, to be absolutely clear, you have drawn those graphs simply to illustrate the effect of air velocity or air quantity on CO parts per million?-- Yes. I have taken no cognisance of the fact - of the requirement to ventilate the panel. As I said, it is more determined by the requirements to remove methane from the panel rather than one of maximising the chances of detecting spon com.

Could I take you then, quickly, to Exhibit 110? Could the witness see that, please, Your Worship? Mr Humphreys, do you see these appear to be copies of CO make graphs for the 512 panel throughout its life on a weekly basis, it would purport to be on a weekly basis; do you see that?-- Yes.

I think you have been present, at least for occasions when these graphs were being referred to by various witnesses, as being the ones that were posted at the mine from time to time - usually week to week on a Friday?-- Yes.

The only thing I want to ask you about in relation to them at this stage is a brief comment about the method of plotting those graphs, and particular reference to the horizontal and vertical axes on various of them?-- They all show to me an upward trend, although there are reversals in that upward trend in the carbon monoxide make. To some extent, I find them a little difficult to read because the length of the horizontal axis is staying the same, even though the period of time as being represented is getting longer and longer. The vertical scale, even though, again, the length of the vertical scale - of the vertical axis is the same, the - what it purports - what it represents varies from graph to graph. For example, we start off on the first one, where it represents 8 lpm-----

Can you just identify the graph by date - the last date on the-----?-- 3 May represents 8 lpm and the final one, 6 August, and 22 July have 20 lpm. Now, that may not be too bad if everything is sort of expanding by the same ratios all the time, but if something should be happening that the time was stretching - was representing a longer period, and the vertical scale wasn't changing, then we might get a steepening of the graphs for no apparent reason, or if we extended the

vertical axis, we might get what looks like an apparent decrease in the trend. I wouldn't - never mind.

Is the effect of all of that, when you are looking at them week to week, you are not comparing directly one thing with another because of the change in axes?-- Well, at a quick glance, I would almost say that the graph for the 22nd of the 7th looks very similar to the graph for 3 May, without - you know, without sitting down and looking at what the period of time was involved and the vertical scale.

You can put that to one side, unless you have any further comment to make about that exhibit at that stage?-- Not particularly.

Could I take you then to the next item in your collection there? Is that a graph of CO make for the period 27 April 1994 to 5 August 1994? Is Your Worship having an afternoon break?

WARDEN: We are making such good progress I am loath to interrupt you.

MR MacSPORRAN: I'm happy to go on.

WARDEN: I am in your hands. If you want 5 or 10 minutes, you can, or we can go on.

MR MacSPORRAN: I am happy to carry on.

WARDEN: Thank you. Then we will carry on.

MR MacSPORRAN: Mr Humphreys, what graph does that represent?-- I'll just pull it down a little more. From the data that was supplied by BHP Australia Coal, at the request of the inspectorate and passed on to SIMTARS, that is a graph of CO make on 512 panel for the period from the start of extraction to and including 5 August of last year.

Does that data come from the BHP spread sheet, does it, for the calculated CO make weekly?-- Yes, I think there is a reference number to it - FB 700 010.

You have drawn that afresh?-- Yes.

Are you able to make any comment about the trend that is apparently evident on that graph from start to finish? When I say "finish", 5 August we are talking about?-- There are reversals in what I would regard as being an initial upward trend from the period of the start of extraction, which I think is about 27 April, up to about 15 July. Essentially I would - I'd regard this as one continuous upward trend. There is some sort of reversal taking place here, for whatever reason-----

Sorry, when you say "here", can you identify for the record-----?-- At about the 11th of June there is some sort of - perhaps a steeper part and then a reversal and then it is returned back to that upward trend and then appears here to

have stabilised up to the time of sealing.

Now-----?-- I use "stabilise" sort of advisedly.

Can I ask you - firstly, can you tell us anything about the appearance of that graph and the trend it displays and signs of spontaneous combustion?-- In the literature, reference is made to absolute levels of carbon monoxide make, which could be used as indicators of the onset of a heating. These are quoted by various authors. If I may, I'll quote a couple - we have heard of Mackenzie-Wood Strange saying that greater than 10 lpm requires investigation and greater than 20 lpm implies considerable danger. I believe that is from a personal communication with a gentleman in Germany. I would be - I would be concerned in the absence of other information that this trend here would be one that has me going towards 20 lpm.

Now, again, just so that we can have that on the record, you are saying the trend from start to what point?-- 15 July.

And that's at around about just below 15 lpm; is that so?-- Yes.

Which is right in the middle of the parameters that the Strang Mackenzie-Wood book refers to - 10 to 20?-- Yes.

So, you would have concerns, you say, at that level, which is about the 15th of July?-- Yes, I think so, but I'd modify that by saying that given the nature of the 512 panel and the fact that we are looking for some sort of - that we could expect that as coal was being left - loose coal was being left in the panel, it is very - it is probably quite difficult to tell what proportion of all of this is due to loose coal being left in the panel and what proportion might be the on - indications of the onset of spontaneous combustion.

Wouldn't it be very difficult to determine?-- Just from the CO make, I think, yes, unless we blindly accept that 10 litres and 20 lpm and say that at that point there, or here-----

Which is?-- The 11th of June - if we just slavishly stuck to 10 lpm, saying, "This is the onset of spontaneous combustion.", that would be - without examining whether some of this might not be due to the amount of coal being left in the panel.

Some of that, you say, is the start of the panel to 11 June, that trend you are talking about?-- Yes.

Is there any way currently it's possible to establish whether such a trend is due to loose coal as opposed to the onset of a heating from the CO make data I'm talking about?-- One might be able to do it by comparing the trends of 512 Panel against another similar panel to see what levels of carbon monoxide make were produced in a similar sort of panel.

That is a panel which was sealed?-- Similar mining method, similar seam - same seam, hopefully the same mine.

A panel that's perhaps sealed in the ordinary course without any duress?-- Yes.

But in any event, other than comparing it to another panel, for instance, or other panels, would it be very difficult to actually calculate in any way a figure of CO make as relating to a method of mining or loose coal being left or things of that kind?-- I think I'd have difficulty working that one out.

Is there any other aspect of that graph in particular you want to raise at this stage before we move on?-- Not particularly.

I tender that graph as a separate exhibit, Your Worship.

WARDEN: Exhibit 219.

ADMITTED AND MARKED "EXHIBIT 219"

MR MACSPORRAN: Can I take you to the next graph you prepared? Is that a graph of the 512 CO make, the same period, that is 27 April to 5 August 1994, which uses the Drager tube readings as the parts per million data for the make?-- That's correct.

Again so we can be clear, where did the Drager tube data come from for the purposes of this graph?-- I actually got them from Exhibit 152 which is the BHP record of the shift-by-shift velocities and Drager tube readings taken by the deputies from 23 July onwards.

The earlier -----?-- I would point out something, this graph is slightly different because I've also - in the period up to 22 July I've also used the Drager tube readings in that first part up to 22 July, so that while the previous graph used Unor gas analysis in the period of time from 27 April to 22 July, all of this data is based on Drager tube readings taken from the BHP spread sheet.

Can you comment generally upon the appearance of that graph and its trend given that it takes account of the Drager readings as opposed to the Unor readings?-- Yes, I'd say that in general up until the odd reading, the exceptionally high

reading that was observed on 22 July which consequently has been shown to be wrong and so really this point is actually false.

That's 22 July?-- 22 July. That's not really a good reading in there. Up until that time we have got the same sort of slope on this part of the curve. After 22 July when the deputies began taking shift-by-shift Drager tube readings and recording those, you can see that the - there is - some are quite consistent, but there is some considerable scatter from shift to shift between the results of the CO make that had been obtained by this method, particularly here - I've forgotten the shift number, I think that was related to 3 ppm, the following shift we had 8 ppm. So it makes it very difficult to draw any trends on that although one might suspect that there is some sort of trend going on at the back end here.

Just so we can have it on the record here, those two, what you refer to as perhaps rogue readings, one high and low, can you just identify them for us so we can have it for the record? Perhaps firstly by date?-- The first low reading here corresponds to shift - deputy's report number 3747 on the afternoon shift of 27 July. The next shift where it goes up is obviously the following shift, 3748, night shift of 28 July.

So what final comment do you make about the trend display using Drager readings as opposed to the Unor?-- Well, it appears to have been quite good in this period here and correlates quite well with the Unor results, but in this period here from the 22nd onwards there certainly are some very, very large changes on a shift-by-shift or day-by-day basis that makes - either things are changing very rapidly down there or it makes it very difficult to trend that data.

Now, that data is in fact the CO make?-- Yes.

Which in turn relies upon the parts per million measured in that case by Draggers?-- That's right.

And the air velocity recording?-- Yes.

So I suppose it's possible, is it not, that there is some error potentially creeping into either the Drager readings or the air velocity readings?-- Most of it appears to be associated with the Drager tube readings because the air velocities for this period of time here appear to have been - sorry, for the period of time from about the 22nd onwards - I won't swear to this, but they are being quite consistent and very often only about .1 metre per second the difference from shift to shift.

In fact we will come back to that. One of your graphs, I think 158, has the air quantity plotted on the same graph as the CO make; is that so?-- Yes.

I tender that graph, if Your Worship pleases.

150395 D.44 Turn 19 dfc (Warden's Crt)

WARDEN: Exhibit 220.

ADMITTED AND MARKED "EXHIBIT 220"

MR MACSPORRAN: Is that a convenient time, Your Worship?

WARDEN: Yes, thank you. Can we take a short break, please?

THE COURT ADJOURNED AT 3.58 P.M.

THE COURT RESUMED AT 4.18 P.M.

DAVID ROBERT HUMPHREYS, CONTINUING:

MR MACSPORRAN: Mr Humphreys, before we adjourned I think I had finished showing you, and tendered, a graph that had Drager readings on it as part of a method used for calculating CO make in 512 over that relevant period. Could I take you then to the next graph which is the same period, 512, 27 April to 6 August?-- Yes.

I beg your pardon, this goes to 6 August at a time of 20.30 which is 8.30 at night, and uses, the legend says, BHP data as reported plus Exhibit 152. Firstly, can you explain what that data is for us?-- It's an amalgam of the data from the BHP spread sheet which was used to calculate the CO make. The data on this graph, which is drawn from a spread sheet, represents the period from 27 April to 22 July. From then on it uses data on Exhibit 152 which gives the deputies' velocities by shift and gives Unor carbon monoxide concentrations corresponding to those shifts, and I believe the very last point, which unfortunately is just plotted off this, is about - is 25.23, so rather than adjusting the scales on this graph, it is plotted off it, and it is approximately just a little bit above the top axis.

The 25.23 or whatever the figure was you mentioned off the axis is a reading relating to that taken by Mr Tuffs, is it?-- That's right, at 20.30 on the 6th.

Now, what can you tell us about the appearance of that trend in total from start on the graph through to the last point traceable for the axis?-- Obviously the graph is the same as the original BHP CO make graph up to and including 22 July. From then on there is obviously considerably more data, data points, because we are getting velocity readings more or less on a shift by shift basis. There are a couple of shifts that are missed where the deputies haven't taken a velocity reading, but essentially we have almost got a full record shift by shift from the 22nd to the end of - till the time when the panel was sealed, and my interpretation of that is that we have from around about 29 July a resumption of the upward - if we regard this period here from 15 July to about 29 July as some sort of interruption to that upward trend and from 29 July we certainly resumed an upward trend, that one could almost say that it's tending to increase in slope as well.

So, up to 15 July how would you describe the trend?-- Apart from the reversal associated with 11 June, I would regard that as being almost linear, constant upward trend. The rate of increase in carbon monoxide make is fairly constant over that period. There are periods of time here where the rate of increase, if we accept the two end points on that segment there from - what would that be - about 4 June to 11 June,

150395 D.44 Turn 20 mkg (Warden's Crt)

that's quite steep, but if we look at the trend overall, it's quite consistent.

Consistently upward?-- Consistently upward, quite a constant slope.

And passing 10 lpm?-- Towards the end of June.

End of June, and continuing upwards past that point to almost 15 lpm?-- Yes.

And the parameters are what?-- Mackenzie-Wood, greater than 10 requires investigation, greater than 20 considerable danger, so halfway between requiring investigation and considerable danger.

And those parameters, they are still in vogue, are they? I mean, there is no knowledge past those to change those parameters at this stage?-- They are derived, I believe, from overseas experience, and it's difficult to say exactly how they apply to Australian conditions and Australian mining methods, but in the absence of some other guidelines, they would have to be a first point of call.

And what does that say about what would ordinarily happen when a CO make level passes the bottom parameter of 10 lpm, or what should happen, in terms of action?-- I think you would have to be keeping in mind the possibility of the commencement of a spontaneous heating and begin some sort of investigation. I don't think you necessarily have to fly into a blind panic about it, but keep it in mind as to what that trend is doing. If it persists - the more it persists, the more concerned one would have to become.

What if the upward trend, consistent upward trend, that rate of increase itself increases?-- I would be very concerned.

Is that what you have got on the graph on the screen at the moment, a rate of increase that itself increases at about 29 July?-- Yes, and I think we can quantify that if we go onto the next graph.

All right?-- I'm not telling you how to -----

No, no, that's all right, I'm more than happy to go to the next graph. I will tender that graph, Your Worship.

WARDEN: Exhibit 221.

ADMITTED AND MARKED "EXHIBIT 221"

MR MACSPORRAN: Can I show you then Exhibit 158? Firstly, you have got a copy of that on the screen; is that so?-- That's correct.

XN: MR MACSPORRAN

WIT: HUMPHREYS D R

150395 D.44 Turn 20 mkg (Warden's Crt)

Or at least the graphical representation of it is on the screen?-- It's - the source is exactly the same, it's just a case of telling the computer to print it on an A4 sheet of paper instead of an A4 - instead of an A3 sheet of paper.

Can I ask you, firstly, to explain the source of data for each of those graphical representations?-- On the first page of 158, which is the table of data, there are three columns on the right-hand side which indicate the source. I think in hindsight I haven't gone really quite back far enough in describing the source, but I'll try to do that at this stage. Looking at the first column, the bottom gas - bottom return gas data source, what I am indicating there is the carbon monoxide and methane concentrations which are shown on the left-hand side under 512 bottom returns. I'm indicating that - well, the first group of data is derived directly from the BHP spread sheet FB 700 100 which is the -----

Tabulation?-- The tabulation.

Which is in evidence?-- Yes. I think it forms part of our report.

Yes, all right?-- From where it says "Unor daily average", the actual source data for that is a set of photocopied records for point 15.

Point 5?-- Yes, sorry, I've written this down, point 5 which is 512 bottom return. Hourly averages are derived from the old computer that used to control the tube bundle system up to 29 July or thereabouts.

That's July last year?-- To obtain that I went through those records that were supplied to me by BHP at the end of the last session and looked through the hourly averages for each of the dates on which the make determinations were made, tallied up the hourly averages for the day and calculated a daily average.

You did that yourself, did you?-- Yes.

From the raw data supplied to you by - was it Mr Clark from BHP?-- Yes.

Now, that data is not currently in evidence, but you still have copies of the data you used to calculate these Unor averages; is that so?-- Yes.

Your Worship, I will undertake to provide that for the record at some convenient time.

WARDEN: Thank you.

MR MACSPORRAN: Carry on?-- The centre column, top return gas data source, up to - I apologise for those with poor eyesight - up to night shift on 27 July where the source of the data is again a photocopy of a print-out from the old computer system of point 16 hourly averages covering that period and they have either been tallied up to give a daily

XN: MR MACSPORRAN

WIT: HUMPHREYS D R

150395 D.44 Turn 20 mkg (Warden's Crt)

average up to 22/7 or else a shift average from 22/7 to 29/7.

Again, did that data come from Mr Clark being referable to the old computer records for point 16 for that period?-- Yes, yes.

Again, I can undertake to provide that, Your Worship, at some convenient time?-- From - what did I say - the - from and including afternoon shift of 27 July, sometime during the day shift the Unor system was shut down and the computer system changed, recommissioned with the computer that was impounded, or whatever you want to call it, at the time - after the incident. The data to form the shift averages there is basically that which is in Volume 1, and again I just wrote a little spread sheet to save me a lot of transcription. It's actually derived from point values in that period of time to give a - again, an average for the shift. The very last gas data source is a point value from the Unor system corresponding - I realised today I made a slight mistake - corresponding to the time when Neil Tuffs would have taken an anemometer reading underground at 20.30 hours, plus 73 minutes lag time for point 16. I think I somehow messed it up and I am out by about 15 or 20 minutes, so -----

The reading you have recorded for parts per million for that reading is-----?-- 10.5.

10.5?-- Yes.

The fact of your being out 15 or so minutes, what effect does that have on the parts per million reading?-- If you want to check volume 1 at that time, it might make it slightly higher - 10.6 or something.

Instead of 10.5, it should be 10.6?-- Yes, but that's not going to make any difference to that result. The last source of data - the source of the velocity information used to calculate the air quantities, I think, are fairly self-explanatory. They are either from the BHP tabulation of CO makes for 512 panel, or else the deputies' reports, as they are indicated on the right hand side, or else - I don't know what exhibit number it is, but Tuffs' handwritten note.

That covers the source of all of that data?-- Yes.

Can I now take you to the screen representation?-- Could I just make a small point with regard to the times? The dates, not a problem. The times that I've used there I used to give an approximate time for the purposes of plotting the data on the horizontal scale, and for the daily averages I have put it at midday. For the shift averages, I have put it at approximately the mid-point of the shift.

So, you nominated that time as being-----?-- Because I don't know exactly when the anemometer readings were taken, and the net result is that it really doesn't make much difference in this area here, it is going to move the data point fractions.

And again, for the record, that area there you were talking about is the - what area? What dates?-- The area I'm talking about where the deputies have taken their shift by shift velocities and Drager tube readings, so from the 22nd of July onwards.

All right. Well, looking at the graphical representation, I want you to deal, firstly, with the air quantity graph?-- Yes.

Now, can you tell us about that? Tell us what that displays - the air quantity graph - for the start of the panel - start to finish?-- Start to finish? It shows the total air quantity passing through the 512 panel, some for both the bottom and top returns. I haven't split it between top and bottom returns at all, so that it represents the air quantity upon which the CO make calculation is made.

And obviously displays the variation in the air quantity over that period - peaks and troughs?-- Yes. It shows quite steady conditions towards the end of the panel here when - I think this was at the point when the bottom return was no longer used, and we have got a fairly - a quite constant air flow through 512 top returns.

150395 D.44 Turn 21 sbd (Warden's Crt)

And that period, again for the record, is 23 July to 6 August?-- Yes.

And there are - or there appear to be on the graph a couple of readings that don't fit that tidy pattern towards the end. Do they correspond to any other readings that seem to be out of sync?-- Yes, this reading here is Neil Tuffs' reading. This is the very last reading just on 25 lpm. There is a reading here which is shift number 3776, I think it is. The velocity associated with that is here at about 35 cubic metres per second, which is a drop from the previous shift of roughly 4 cubic metres per second. We have seen a corresponding - whether it is related to air velocity or something else, a corresponding drop in CO make. Similarly, on two shifts before that, 3773, we have got a similar drop in air quantity here from the previous shift, and the following shift. Whether the reversals in the CO make are associated with the air velocity or some true reversal of CO make, I can't say.

Well, can I take you then to the next graphical representation, which is the - I think it is orange, but you might be able to confirm it - it is the CO make which is the BHP data, if I can refer to it that way, up to the - or as at 5 August?-- I'm not sure I've got a copy of that.

Well, do you have 158 with you? Look at the - look at the key to 158?-- Yes.

The graph itself or the graphs themselves?-- Oh.

If you look at that?-- Yes.

The graphs - and is there one of those that represents the BHP data for CO make?-- Yes. Sorry, I've just got that somewhere else at the moment.

All right. I think it is on 158, isn't it?-- No, I don't think so.

Just look at 158 again, the orange one - do you have that? Do you see the key?-- Sorry, I'm thinking of something else.

That's all right. If you go to 158?-- You are talking about this graph here.

The orange one?-- Yes.

There is a key on the graph that indicates that's the CO make BHP data as at 5 August 1994?-- Yes, sorry, I was thinking of something totally different.

Well, this - the evidence seems to indicate - was the graph that was, in fact, on display as at 5 August - that is, the last graph that went up before the explosion?-- Yes, a representation like that.

What does that trend indicate looking at it?-- From here, the 15th or so of July, there has actually been a dip downwards, and come the 5th of August there has been essentially no

XN: MR MacSPORRAN

WIT: HUMPHREYS D R

increase from the 15th or so of July.

All right. And the trend up to the 15th of July?-- Well, I've drawn on here a linear regression of my analysis, and you can see that the orange graph follows very similarly - follows very closely that linear regression.

Which you describe in what fashion?-- As a constant - a constant rate of increase in CO make.

Thereafter, 15 July to 5 August, there is a slight dip and the re-establishing of the level of 15 July?-- Yes. Are you talking about the blue data now?

No, the same data, for the time being?-- Well, it is quite - it dips and comes back up, but you could - you would have to say that that's basically a constant CO make.

All right. Now, if you looked to the graph that you have added to that, which is the data available from the 23rd of July through to 6 August?-- Yes.

What trend does that display?-- Lost in there to some extent is another green line which is a linear regression of the data from shift 3749 to 3776, which actually is that point there on this graph. It excludes the Tuffs point, and the slope of that trend is about 3.5 lpm per week. On the earlier trend, the slope is about 1.1 lpm per week.

Well, perhaps to assist you with that, if you turn the - turn over 158 to figure 2, do you have that linear regression you have just referred to for the latter period?-- Yes.

So-----?-- You can see the - that the slope of this may appear to have changed because of the change in the axes to fit the paper, but that line there - this is exactly the same data as displayed on the previous graph. The slope on that line there from shift 3749 to 3776 - the regression through that is about 3.5 lpm per week.

When you say 3749, that's around the 28th, or slightly after the 28th, I think, of July?-- Yes.

Through to 6 August, 3776 - that's the-----?-- Yes.

The green linear regression graph; is that so?-- Yes.

The point you are making is that that linear regression, compared with the earlier linear regression, is a - represents a substantial increase in rate of CO production; is that so?-- Yes, yes. Can I go back to the previous graph?

Yes, by all means?-- I'm not suggesting that these rates that I'm talking about in the 1 lpm per week and 3.5 lpm per week have any significance in themselves. I am only using them to compare the rate at which the CO graph is increasing in this period of time compared to the rate that is here. We have heard talk about how this was felt - it was felt that it was due to - that this period of time here - the fact that the CO

make was continuing to increase rapidly to a point of 15 and establishing a background level of 15 was due to the amount of coal that was left behind in the panel.

And that's the period up to the 15th of July?-- That's the period up to the 15th of July. I would have to express some concerns - if I saw that this - without knowing what the trigger levels were for Australian conditions and this mining method - I would have to express concerns if I saw a CO make graph that initially showed a slope like that and then later showed a slope like that. This may be due to some combination of the nature of the coal and the mining method, but I would have to question what is happening here.

Just for the record, this has got to be reported, you see, and understood. When you say what's happening here, you are referring to the latter stages between 23 July and 6 August; is that so?-- Yes.

150395 D.44 Turn 22 dfc (Warden's Crt)

Now, when you say the initial slope which is the start of extraction through to 15 July?-- Yes.

That may be explicable on the basis of the mining method or loose coal et cetera. What if you simply didn't know what it was or wasn't?-- I think you would have to err on the cautious side. You could compare it against other similar panels.

And would there be some relevance in that assessment to the CO make parameters of 10 and 20 lpm?-- There might be.

Well, would there be? Is that the guideline that was in existence?-- Well, that was the guidelines that were in existence then with very little evidence to suggest anything against them, and perhaps a degree of reticence in this case to accept them because of the mining method and the vast difference there is between a long wall mining method and the bord and pillar mining method that was being used here and the amount of coal that was being left behind, but I think that one would have to be cautious with trying to debunk those levels until there was some way of showing that they could be debunked.

In any event, what you have in two stages, the first represented by April to July 1994 and the second July to August 1994, is a change in rate of increase -----?-- Yes.

----- of the production of CO?-- Yes.

And a significant change?-- Yes, it's treble.

Now, just reverting back very quickly to that orange graph, you have a similar trend that follows linear regression to 15 July; is that so?-- It tends to follow linear regression. I'm not saying that's linear regression for that data.

No, it's consistent with it?-- Yes.

You then have it dipping slightly?-- Yes.

But then even on that available data a rising trend to achieve back around the level it had been at July 15?-- Yes, we have had an increasing trend from the start of extraction to 15 July.

Of course had the data been plotted as you've done, that rise would have expressed itself further in a substantial rise thereafter?-- You mean when we are looking at the more detailed data from 22 July?

Yes?-- Yes.

Now, you mention one way of ascertaining what the background level of CO make might be for that panel. You would compare it - or try to compare it with other panels that had been extracted previously?-- That's one way of doing it.

There is data to allow such comparison, isn't there, in the

150395 D.44 Turn 22 dfc (Warden's Crt)

SIMTARS material?-- I believe so.

Would you look at - I believe it's Volume 2, appendix 5.4A?-- I don't think I can put that one up there.

That's all right. I think we all have at least access to it. It's in the SIMTARS Volume 2, appendix 5.4A; is that right?-- That's so.

Does that refer to a comparison of CO make all panels, and the panels represented on that appendix are 402 and 401?-- Yes.

511?-- Yes.

403?-- Yes.

5 North?-- Yes.

And 512?-- Yes.

It's coded colour-wise to represent the various panels?-- Yes.

What are you able to say about the rate of increase in the production of CO for 512 compared with all other panels represented in that appendix?-- Looking at the overall trend, there appears in 511 to be something similar between about day 25 and day 50, similar sort of trend, but it doesn't persist beyond 10 lpm. 512 in comparison to all of the other panels, which I believe were non-heating panels, is - certainly exceeded or - was the first to reach very close to 15 lpm whereas the other panels apart from 403 never exceeded 10 lpm during the life of their extraction, and at the point of inflection which would correspond to this point here on 15 July, the point of inflection on that red curve for 512, there is - to me there is a difference between all the other graphs, non-heating panel graphs, and 512 Panel in the order of 5 lpm or 33 per cent of the total make.

What's the significance of that?-- I think - if we accept that the other panels had similar amounts of loose coal in them and they were similar mining methods, which I believe they were, then one would have to say that perhaps 512 by 15 lpm had exceeded the background level that one would expect for that sort of panel.

What would that in turn tell you about the rate of increase and its significance for 512 Panel?-- I think it would tend to indicate that the increase perhaps over and above the 10 lpm was due to the possible onset of a heating.

That was on the representation as early as the middle of July?-- 15 July.

Dealing with the other panels, excluding 5 North, the heating panel, dealing with 403 which - beg your pardon, 402/401 which does go past 10 lpm?-- Yes.

What are you able to say about that?-- Sorry?

XN: MR MACSPORRAN

WIT: HUMPHREYS D R

What are you able to say about that curve?-- I know it's incomplete.

What about the trend?-- It's very flat.

It goes past 10; is that so?-- It reverses and goes back, and I think if you looked at the BHP exhibit there is a bit of a kick up, and subsequent to that the panel was sealed.

But achieves nothing like in excess of 15 lpm?-- No.

5 North is depicted on the -----?-- Yes.

For the purposes of comparison as well. The rate of increase in 5 North to just over 20 lpm, what are you able to say about that rate of increase compared with 512, just that section first?-- To the initial 20 lpm?

Yes?-- I think it's hard to - overall from the time when the graph started to 20 lpm it's sort of similar to 512, but there are obviously some large reversals around about day 25 which make it difficult to be able to trend that data. I mean the number of data points that actually represents that trend is quite small, so there are some very large reversals in establishing that trend.

The data used to plot the 5 North graph consisted of what to your knowledge?-- As I understand it the CO concentrations that we determined for 5 North, and I can stand to be corrected, were determined by Drager tube readings.

Well, if we take the point after the initial achieving of just over 20 lpm, what does the trend then show for 5 North?-- There has been a bit of a reversal down to about day 75. It remains flat. There is a rapid increase from about day 130 or thereabouts to day 150, again another reversal down to a couple of readings at 20 lpm, and then having seen the data, know that it went from 20 lpm to 40 lpm basically overnight.

If we accept that it was sealed at that time, that is at the end of its life, which apparently was about 19 April 1986?-- Yes.

----- at that level, and apparently took off in that fashion at that time?-- Yes.

And was a confirmed heating?-- Yes.

That is 5 North?-- Yes.

Would such an appearance of such a graph as 5 North from 1986 give you any comfort to ignore the parameters of 10 to 20 lpm?-- No, I don't believe so.

Would that especially be the case given the rate of increase in 512 graph as depicted in this representation, rate of increase over and above other panels?-- It seems obvious to me that if 512 had continued it was soon going to exceed - if

150395 D.44 Turn 22 dfc (Warden's Crt)

it persisted with that trend up to 15 July it was soon going to exceed the CO make of 5 North. There are differences between 512 and 5 North associated with the mining method and that may to some extent explain the nature of the 5 North curve.

Your Worship, I'm about to explore that further, but in a way that will take longer than the few minutes we have left. Is that a convenient time?

WARDEN: Yes, thank you. 9.15 tomorrow morning.

THE COURT ADJOURNED AT 4.55 P.M. UNTIL 9.15 A.M. THE FOLLOWING DAY

WARDEN'S COURT

MR F W WINDRIDGE, Warden and Coroner
MR R J PARKIN, General Manager, Capricorn Coal Pty Ltd
MR P J NEILSON, District Secretary, United Mine Workers' Union
MR C ELLICOTT, Training and Development Officer, Department of
Mineral Resources, New South Wales
PROF F F ROXBOROUGH, Professor of Mining Engineering, School
of Mines, University of New South Wales

IN THE MATTER OF A CORONIAL INQUIRY IN CONJUNCTION WITH
AN INQUIRY (PURSUANT TO SECTION 74 OF THE COAL MINING
ACT 1925) INTO THE NATURE AND CAUSE OF AN ACCIDENT AT
MOURA UNDERGROUND MINE NO 2 ON SUNDAY-MONDAY, 7-8 AUGUST
1994

GLADSTONE

..DATE 16/03/95

..DAY 45

THE COURT RESUMED AT 9.16 A.M.

DAVID ROBERT HUMPHREYS, CONTINUING:

WARDEN: Before you start, Mr MacSporran, I can just indicate to you it will be a probable three o'clock finish this afternoon. I can also indicate that Mr Mackenzie-Wood has been contacted and will be brought to Gladstone and interposed possibly Wednesday afternoon or Thursday morning next week as soon as we can interpose him. Thank you.

MR MACSPORRAN: Thank you, Your Worship. Mr Humphreys, I think you had reached the stage before we adjourned yesterday where I had asked you to look at, and you had in fact looked at, the graph that gives a representation of a comparison of the CO makes in all panels at Moura No 2?-- Yes.

If you wouldn't mind turning that up again, it's in Volume 2 of the SIMTARS exhibit. It's appendix 5.4A?-- I have that.

You've spoken of this yesterday, but could I just take you back to it in this sense: you have agreed, I think, that the rate of increase in the CO make of the 512 Panel as it's represented on that graph indicates a greater increase than the other panels; is that so?-- Greater and persisted longer.

How would you go about establishing that such a rate of increase was not due to spontaneous combustion inside the panel? Would that be possible firstly?-- I said yesterday that I didn't think it was possible to prove that it was due to oxidation of loose coal, but it may well be possible to show the corollary, the opposite of that, that it was due to spontaneous heating. The tube bundle system - I was nearly going to say Collie there - in Moura included Graham's Ratio as part of the analysis taking place and that was recorded on a regular basis and could have been trended in the same way that - perhaps even in a more efficient way than the CO make has been done in this case. I'm not suggesting for a minute there is anything wrong with the frequency with which they have done this at this stage, but obviously the Graham's Ratio has been calculated by the computer on 14 minute intervals.

We will come back to Graham's Ratio shortly, but what other steps are available and would have been available at the time to carry out an investigation of the rate of increase in the 512 Panel in CO make?-- Well, to see if it was due to possible heatings, obviously physical inspections of the workings, the Probeye possibly could have been activated to see if any hot spots could have been detected, and as I say, the Graham's Ratio, maybe other ratios.

That information, that is the Graham's Ratio in particular, was data that was available as at the life of the 512 Panel?-- Yes, it was - I don't know that it was recorded on the data files, but it certainly was displayed after each analysis was

taking place, and if anybody - as I understand it, when the data was printed out from the system, Graham's Ratio was part of that data that was printed.

Could the witness have Exhibit 217 again, please, Your Worship? It might not be necessary to put it on the screen at this stage, I just want to again confirm with you that Exhibit 217 refers to the actual oxygen level being recorded so far as that exhibit is concerned, point 14, which is the pump room or outside the pump room on 6 and 7 August?-- Yes, yes. That can be confirmed by checking the appropriate appendices in Volume 1.

The source of that data is in the SIMTARS appendix?-- Yes.

Now, as I think you said yesterday, the error in oxygen can have a quite significant effect upon the ultimate Graham's Ratio that is calculated; is that so?-- That's right.

You have your graph to display which indicates the potential significance of such a low oxygen reading?-- I do.

Would you put that up, please? Could I ask you to tell us firstly, looking at Exhibit 217, what is the error in oxygen reading on average?-- Typically over those two days it was in the order of - the oxygen was running typically at somewhere between 20.45 and 20.5, perhaps achieved 20.55 late on 7 August.

So that gives an average error in oxygen -----?-- .4, .5 per cent.

Low?-- Low, an underestimate.

Now, the graph you have on the screen at the moment, what does that depict or seek to illustrate?-- That depicts the calculation of Graham's Ratio for a particular atmosphere that occurred in the 512 top returns on the evening of 6 August.

That's a Saturday night?-- Yes.

During the course of sealing?-- During the course of the sealing. 10.5 ppm carbon monoxide were present, 0.4 per cent carbon dioxide, 0.52 per cent methane and the oxygen concentration is actually that point there at 20.24 per cent.

That's the red star on the graph?-- Yes. The vertical axis on this graph shows the Graham's Ratio that would have been calculated for each of these oxygen concentrations along the or horizontal. The red star is used to highlight that point there on the curve which is at 20.24 percent oxygen, the actual corresponding oxygen concentration that was determined by the tube bundle system at that time giving a Graham's Ratio of approximately 0.15 per cent.

As read on the monitor if you looked?-- As read on the monitor if you would have looked at it at that time.

In other words taking into account the error, the error would

read out an ultimate Graham's Ratio of .15 or thereabouts?-- Given the data as the system saw it at the time it began analysis - as the system saw it at the time, the Graham's Ratio would have been .15 per cent.

Just to be totally clear the reading that you've used of parts per million is 10.5; is that so?-- That's right.

At what time on Saturday night, approximately, was that?-- Approximately 8.30 p.m..

Correcting it for the error which appears to have been in the oxygen?-- The way I've drawn this graph is to show what Graham's Ratio would have resulted had the oxygen concentration been something, shall we say, other than 20.24 per cent, and you can see that as the oxygen concentration increases the Graham's Ratio increases. That is because the oxygen deficiency which is the lower half of that formula decreases and causes the Graham's Ratio in actual fact to increase. So if the oxygen concentration was not at that time 20.24 per cent, but 20.64 per cent, say, we would have had a Graham's Ratio of 0.4, a 300 fold increase.

And a Graham's Ratio of 0.4 -----?-- 300 per cent increase, sorry.

Graham's Ratio of 0.4, what is that in terms of the parameters for Graham's Ratio in terms of indications of spontaneous combustion?-- On the table in our report it indicates that less than 0.4 is a normal value, but I would point out that we are getting to the upper end of normal values and any further increase in the error on this oxygen analyser would suggest that it could get be to .5, an indication of a heating.

You are talking of a time prior to the completion of the sealing process; is that so?-- Yes. I would point out that the determination of this Graham's Ratio is also complicated by the high quantities of air involved here because it involves - it means that the concentration of methane for a given - not methane, carbon monoxide is lower and the oxygen deficiencies are lower and the impact of the relative errors in all of those calculations means that it becomes much more difficult to calculate an accurate Graham's Ratio in very high air quantities.

Well, what would that tell you in terms of whether you could exclude the prospect that all of the signs related to spontaneous combustion as opposed to something else?-- I would be concerned that you couldn't exclude spontaneous combustion as a possibility.

Again we are talking about a period before the seals were completed; is that so?-- That's right, and I would make the point that because this oxygen concentration has such an impact then it might prove that any trending that one could do on Graham's Ratio is also damped down, if you know what I mean. The trends would be very small, whereas if a more truly representative value of Graham's Ratio could be calculated the trends which also impact on the analysis of Graham's Ratio

might also have been much more obvious, but that's why we haven't particularly referred to Graham's Ratio from the tube bundle system.

You are saying the approach would be more conservative than anything - should be more conservative if anything in dealing with the signs?-- Yes.

Your Worship, I tender that graph.

WARDEN: Exhibit 222.

ADMITTED AND MARKED "EXHIBIT 222"

MR MACSPORRAN: Mr Humphreys, that deals with the significance and use of a Graham's Ratio prior to sealing or sealing being completed. Can you tell us what your opinion is about the value and significance if any of Graham's Ratio after sealing?-- Probably even before sealing there is some debate as to the usefulness of Graham's Ratio which probably comes about from a number of possible problems that impact on the calculation of Graham's Ratio, and we have already indicated one on that, and that is the accuracy of the - the analysis errors involved the mine air monitoring. That is, the errors involved in the determination of all of the gases involved in determining the Graham's Ratio, in particular the oxygen concentration.

Those errors reflect a lower Graham's Ratio than -----?-- In

general, my experience is that the - that it can actually impact on - it can actually reflect a higher one, but obviously the oxygen analyser would have to be overestimating the oxygen that's present in that case, and that was really illustrated in that graph, but in this particular case we have got an oxygen analyser which is tending to underestimate the oxygen present and, therefore, overestimate the oxygen deficiency.

I want you to deal then with the significance of a Graham's Ratio after sealing?-- Again, analysis errors cause the same sort of problems of error either up or down in Graham's Ratio. The possible interference in carbon monoxide concentrations in the panel are due to different forms of chemical processes or other actions in the panel. The possibility is also that in panels which don't have substantial quantities of seam gas, the carbon monoxide from the oxidisation or heating can linger in the goaf long after the heating may have reduced in intensity, yet the Graham's Ratio may actually stay up and that's because the carbon monoxide is persistent in the goaf. That's dependent on the lack of seam gas to displace. In that case we don't have this and I think also in the - probably in the first few tens of hours after sealing the Graham's Ratio trend would be what to look at as well as the values. If it was on the way up, then something must be causing that to increase, and if it started to approach the values that were - we have quoted, .5 and 1 per cent, then you would have to be concerned that there was some process in there, such as a heating, which was causing that Graham's Ratio to increase.

Are you saying, in your opinion, the Graham's Ratio can be used - the trend of it can be used post sealing as a possible indication of a heating inside a sealed area?-- Yes.

Could the witness have Exhibit 178, please, Your Worship? Mr Humphreys, is Exhibit 178 a graph of the Graham's Ratio trend for the point 5, which is the 512 seals, after sealing on Sunday, 7 August?-- Yes.

Could I then ask you to display a graph you have that duplicates to a large extent that exhibit and illustrates a trend of Graham's Ratio after sealing corrected for the oxygen error?-- Yes.

Now, the trend depicted in 178 is the lower line on that graph; is that so?-- Yes, it appears to be.

And the line representing the trend corrected for oxygen error is the green -----?-- Is the green line on top.

Well, if we deal with, firstly, the line that represents, in effect, the trend from Exhibit 178, can you comment on the Graham's Ratio values depicted there?-- We can see that it begins from a low value of about .17 or thereabouts, which is similar to the value that we got from the 512 top returns at 8.30 p.m. on that - just before sealing, and you can see that the trend is one of increasing up to a Graham's Ratio of .8 per cent at a little before midnight. These are - these times

160395 D.45 Turn 2 mkg (Warden's Crt)

here are sample times on the surface uncorrected, so -----

Don't take account of lag times?-- Don't take account of lag times. This is when they would have been on the surface.

So, it's about the time of the explosion that the Graham's Ratio was showing, uncorrected, about .8?-- .8. That's actually after we have made allowance for the methane offset, but this is the true trend of the Graham's Ratio.

It shows a Graham's Ratio ever increasing after sealing?-- Yes.

When does it pass the first parameter that's deemed to be significant?-- Approximately - a little before midday, 10 a.m. on Sunday the 7th.

And the value there recorded?-- .5.

And is that a significant value in terms of the parameters for Graham's Ratio?-- For the purposes of mine air monitoring .5 indicates a heating, and I think the important thing is that it is also trending upwards, continuing to trend upwards.

Now, as you have told us, that is in fact the Graham's Ratio that would have been observable on the monitor screen on 7 August; is that so?-- Yes. I just make a small point: at the final end here, because of the methane error, the Graham's Ratio would have actually risen to a much higher value than that, but it was not a true reading.

And that relates to the difficulty we talked about yesterday?-- That relates to the difficulty in the methane analyser.

Then the top line on that graph represents the trend for Graham's Ratio but corrected for the oxygen?-- That is correct.

So that at sealing what would the Graham's Ratio have been if it had been corrected for oxygen?-- Approximately 1.1.

No, at sealing?-- Sorry, approximately .4.

And, again, following an upward trend continuously?-- Yes, it will follow a very similar trend to this, and eventually reaches a trend - a value of about 1.1 per cent.

At about the time of the explosion?-- At about the time of the explosion.

I tender that graph, if Your Worship pleases.

WARDEN: Exhibit 223.

ADMITTED AND MARKED "EXHIBIT 223"

XN: MR MACSPORRAN

WIT: HUMPHREYS D R

MR MACSPORRAN: Can I ask you something in relation to the expected increase in carbon monoxide parts per million concentration after sealing?-- Yes.

Is there a trend observable, or to be observed, after sealing with CO parts per million?-- Well, yes, there is. It's - the indications are the carbon monoxide is increasing almost in a linear fashion - well, at a constant rate, at about 6 or 7 ppm per hour, after the sealing.

We are talking now about 512, are we?-- Yes.

Can you make any comment in relation to that rate of increase in terms of what might have been happening behind the seals in 512?-- I think the rate of increase in the carbon monoxide concentration would depend on the CO make that's still in the panel and the size of the panel, so perhaps in a different sized panel we might have got a different rate at which the carbon monoxide accumulated in that panel, at least initially.

Can the rate of increase be significant in terms of a possible heating behind the seals?-- I would say that if you had a heating which is giving off more carbon monoxide - let's say we are comparing the same panel, one with a heating, one without a heating, then the one with a heating will obviously have a higher rate at which the carbon monoxide will accumulate in the goaf after sealing because you have got a process in there that is producing carbon monoxide at a greater rate than that which would be from ambient temperature oxidisation which you are going to have in a panel without a heating as well, so you have got something on top of something as well.

Can you say anything about the expected behaviour of the CO behind the seals after a time? Does it continue to rise?-- I would expect in a mine like Moura with the high methane emissions, that given enough time that it would peak out at some level and then begin to diminish.

Have you done some investigation of another panel at Moura No 2 in relation to the CO in parts per million and the behaviour of that trend after sealing?-- Yes, 401/402 panel data was made available on post sealing goaf gas analysis after it was sealed in approximately February last year.

Your Worship, again, this data, that is, the data in 402/401, is not yet in evidence but I undertake to provide that at some convenient time.

WARDEN: Thank you.

MR MACSPORRAN: Can you display that material, Mr Humphreys? Now, to say nothing about the focus, but can you tell us what the colours represent?-- I've separated the red and orange for our colour-blind friends. The red line along the bottom here is carbon dioxide plotted against the vertical axis and plotted against the date from 21/2 when the panel, I

understand, was sealed. The green line going up here is the methane concentration, again plotted against the left-hand vertical axis. That's been corrected for the oxygen - the methane offset. The orangey/brown line coming down here is the oxygen concentration, again plotted against the left-hand axis, and the blue line is the carbon monoxide concentration plotted against the right-hand axis.

Can you just, firstly, briefly just tell us the behaviour of each of those gases after sealing - carbon dioxide first perhaps?-- I will start with oxygen. Oxygen diminishes in an almost linear fashion. I think this graph had shown out, it would show to eventually - the rate at which the oxygen was decreasing would eventually decrease and the curve would become flatter. Methane is increasing during this period of time almost in a linear fashion at a constant rate. In time obviously that would tend to - the rate at which methane concentration increases would diminish until eventually we reached a level of methane in there indicative of the seam gas of whatever it is, 98 per cent or 100 per cent methane. CO₂ is increasing slightly and doesn't appear to have any great significance in this. Carbon monoxide has, as you can see, taken a linear increase in the first few days and then eventually peaks out, rolls over and starts to diminish. That's a combination of the reduction of oxidisation in the panel producing less carbon monoxide and the start of - and displacement of the oxygen and carbon monoxide by continued methane emissions.

Which is the green line arising-----?-- Which is the green line here.

Well, the behaviour of the carbon monoxide - that is the increase initially, the plateauing and, as you say, the rolling over and decreasing - is that expected behaviour?-- In the long-term behaviour of a panel, yes.

Can you tell us what the rate of increase of the carbon monoxide inbye the seals in 401, 402 was?-- Each of these points is one day apart. The axis here - the dates are one week apart. You can see here at the initial rate of rise we have got about 25 or so parts per million, maybe a little bit higher after the first day. So, the rate in here is something like approximately 1 ppm per hour.

So, that's the rate of increase in the first linear stage of the-----?-- Yes, the front slope of this part.

1 ppm per hour?-- Yes.

And what did you say the rate of increase in your 512 panel was?-- Well, it had achieved the value of - I think about 180 ppm or 170 ppm - just off the top of my head - after 24 hours. So, that's roughly 6 ppm per hour.

Are you able to offer any opinion as to the comparison between those rates of increase for 401, 402 and 512 in parts per million?-- I don't think one could draw much comfort from seeing that it was rising at 6 ppm in 512 compared to - sorry, 6 ppm per hour in 512 compared to 1 ppm per hour in 401, 402, but it is not something that I particularly subscribe to as being an indicator of spon com or not being an indicator of spon com.

If you were trying to investigate to exclude the possibility of spon com behind the seals, would that give you any comfort?-- Well, not particularly. I would be looking for other more conventional indications of a heating, such as the Graham's Ratio or other ratios or the presence of other gases.

I will tender that graph, Your Worship.

WARDEN: Exhibit 224.

ADMITTED AND MARKED "EXHIBIT 224"

MR MacSPORRAN: Mr Humphreys, you talked about the fact that you would be looking, as part of an investigation, for other ways to exclude the possibility that indications were of spontaneous combustion; is that so?-- Yeah. We are talking post-sealing?

Post-sealing?-- Yes.

Well, if I talk generally, leading up to and post-sealing, would the gas chromatograph be of use?-- I'll take post-sealing first.

Right?-- Obviously as the panel is sealed and the concentration of the gases increases in the panel, we can see that after 24 hours we have got 150 - 170 or so ppm carbon monoxide in the panel. Then at some stage during that, it would have been quite possible to have taken a sample from the tube bundle system, run it through the gas chromatograph to see if there were signs of any other indicator gases of a heating, such as hydrogen, ethylene, etc.

The chromatograph is designed to detect those gases?-- It is designed to detect a range of gases that's - that the tube bundle system can't.

And are those gases - or can those gases and certain levels of them be clear signs of spontaneous combustion?-- Yes, the presence of hydrogen and ethylene and the like can be the indications of a spontaneous heating and, obviously, if in sealing the panel you can concentrate them into a level that can be detected by the chromatograph, then you have a possibility of being able to detect those; whereas during the normal ventilation of the panel, with the low concentrations of those gases, that may not be possible to particularly pick them up on the chromatograph.

I think you have told us yesterday that the SIMTARS investigation revealed the CAMGAS system was operational as at 7 August; is that so?-- It wasn't the investigation, it was the fact the people turned up and it was ready to go when they were called out for the incident.

And had been regularly calibrated and maintained up to that date?-- Yes, I believe as a - there is a log of the maintenance, you might call it, of the chromatograph that has been kept.

I want to take you, then, to this proposition: you have mentioned smell as being one indicator pointing towards the presence of a heating?-- Yes.

Can I ask you to assume, for the purposes of the question I'm going to ask you, these facts: that on 17 June 1994 there was a report, or a detection, I should say, of a very, very slight tarry smell inside 512, but on the 24th of June there was a deputy's report in writing referring to a strong - a benzene type smell inside 512?-- Yes.

Coupled with an oral indication of a "strange smell, a bit benzeney", something along those lines?-- Yes.

Well, as at that time, that is 24 June, and given the other indications that you have spoken of, including the CO make trend, does the presence - if you accept those smells as being detected and reported, what are you able to say about whether or not at that stage there was a heating inside 512?-- We are talking at 24 June?

That stage, firstly?-- I take the reports of the smells to be serious reports. I can't comment on their veracity.

If you accept that they were?-- If I accept they were there, then I consider them to be serious indications of a heating - possible indications of a heating.

And how do they relate to the CO make trend?-- Well, at the 25th of June, we had - sorry, on the BHP graph, we have just had a fairly major reversal - well, a reversal in the trend. It has come down from the value of 11 June and - but then come back up to 10 lpm. You know, it still indicates an upward - an increase in trend overall in carbon monoxide make, but compared to the other panels, it may have just deviated from what you might regard the background levels of the other panels.

And the deviation in the background levels from the other panels would indicate what?-- The early stages of a heating. They almost seem to be in contradiction - the smells in the early stage - but it has only just deviated, looking at the comparison graph - from 511 panel at approximately the same time in its life.

If we go to the next step and revise the trend up to and including 15 July?-- Yes.

And again accept the reports - or detection, at least, of smells of 17 and 24 June?-- Yes.

What are you able to say about the situation as at that stage at 15 July?-- We have had more reports of smells.

No, the same reports of smells and the trend as evidenced as at 15 July?-- I'd be - it has deviated well from the other similar panels at that stage, or the other graphs that we have for other CO makes at that point in time by 5 or 6 lpm. It has persisted in its upward trend, and I think that you would have to be all the more concerned.

Well, we will move forward then to the weekend of the sealing, and if you accept for the purposes of this area that there was a report of a strong tarry smell on Friday, 5 August, reports of a haze on the 6th of August and a further report of a stink on the Saturday night, 6 August - if you accept those signs as having been detected?-- Mmm.

And look at the trend of CO make at the same time, what are you able to say?-- I think it depends on which trend of CO make you use. On the data as it was recorded at the mine, you would think some situation had maybe stabilised - maybe-----

Just before you leave that topic-----

MR MORRISON: Let him finish, please.

MR MacSPORRAN: Could I ask you this: you have spoken of the trend of 15 July?-- Yes.

The trend from 15 July to the 5th of August on the data recorded - not the data available, the data recorded - I am asking about those trends coupled with the smells I have referred you to?-- I don't think it would give me much comfort to believe that there was not a heating. I would not get any comfort from that, and coupled with the fact that we have had a persistent trend, although it appears to have maybe stopped - not that I'm saying the reactions that are causing that have stopped, because they haven't - I don't get - I wouldn't draw much comfort from it. I would be quite concerned about those reports of smell and haze.

And again, accepting the reports of smell and haze that I have referred you to, and taking into account the trend from data available, but not plotted, and plotted by you, what's your opinion as to whether or not there was a heating inside 512 at the time of the seal - this is the trend I'm talking about between 23 July and 6 August?-- Yes. I think in the end I don't think I could think of much of a logical explanation that would account for all of the data that - the information that you are giving me - the trends, the smells, the haze, other than to say that there was a heating in the panel.

We have covered, I think already, the question of the Graham's Ratio?-- Yes.

And its relevance to the question of whether or not there was a heating at the time of sealing and after?-- Yes.

Could I turn, then, finally, to the question of the SIMTARS seminar in 1989. You weren't at SIMTARS at that stage?-- No, no.

But you became aware of the fact that the seminar had been conducted and which information from that seminar had been disseminated?-- Yes, I can't particularly recall how.

Do you have with you a list of publications and instances of dissemination of information since that seminar conducted in 1989?-- Yes, I have, but I have forgotten what I've done with it.

Perhaps I can show you this to save time. I will hand around copies of this, Your Worship. Could the witness see this? That's a list, as it clearly indicates on its face, prepared by Dr David Cliff from SIMTARS?-- Yes.

And summarises, by reference to the various articles and publications, efforts made by SIMTARS and its staff in December 1989 to disseminate information about that - the topics relevant to this Inquiry?-- Yes, it appears to be.

I will tender that list, if Your Worship pleases.

WARDEN: Exhibit 225.

ADMITTED AND MARKED "EXHIBIT 225"

MR MacSPORRAN: Could I, in the same vein, ask you to look at a publication included in the SIMTARS material itself? If you go to Volume 2, Appendix 5.2A?-- Yes.

Now, I think this publication is actually referred to on the list that I've just tendered, but it is set out in full in the appendix?-- Yes, it appears to be.

It is a paper prepared by those nominated, including Dr Cliff, Mr Bell, Mr Reinhart of SIMTARS; is that so?-- Yes.

And that was in 1992?-- I believe so.

And as part of that paper, can you confirm for us that towards the end of it there are a series of tabulations, if you like, that refer to the signs of spontaneous combustion - it is page 7 of the article - "Signs of Spontaneous Combustion"?-- Yes.

And current state of knowledge as to the usefulness of each of those signs and notes as to how some of them should perhaps be treated with caution?-- Yes, it appears to be.

I have nothing further.

CROSS-EXAMINATION:

MR MARTIN: Mr Humphreys, a few things, please. There has been a discussion in this Inquiry from time to time about the ease of interruption of the Unor system at the Unor room to take a bag sample for usage in the gas chromatograph?-- Yes.

Is it an easy matter?-- I really can't say how difficult or easy it would have been at Moura, but I should imagine that from my experience of tube bundle systems there wouldn't have been a great deal of problem in organising some system to be able to organise - to inflate one of the bags that are used typically for taking samples underground. The gas sample has to be pumped out, it's only a case maybe of identifying the particular line and inflating the bag.

And some work with a screwdriver and -----?-- Take a shifter and a screwdriver or something, although it would be easy enough to organise some sort of tap to do that as well.

Just talking about Exhibit 225 which was the document prepared by Dr Cliff, how was notice given of these seminars, for instance?-- I really couldn't tell you. Most of these have taken place before my time at SIMTARS. I said yesterday that I had started in April last year. I presume notices in the Government mining gazette or similar. That's purely presumption on my part.

But certainly some of them seem to have been given for the Queensland coal operators?-- I presume -----

More particularly the safety conference of August?-- Which one are you referring to?

It's on the second page towards the bottom, about the -----?-- I would presume they would canvas their members in some fashion.

Do you know how any of these publications or technical papers on the first page were disseminated?-- Well, generally you can see for the most part how they are disseminated. Let's pick something - the Queensland Government Mining Journal, five from the bottom, the End of Grant Report on National Energy Research Demonstration and Development Program which anybody can purchase a copy of. I think some of them have been in SIMTARS own newsletter.

I was going to ask you about that and I will soon. Can you, just so far as you know, give us some of the history of the

formation of SIMTARS? My understanding - and I ask whether it is yours - it came into existence soon after Kianga and the Inquiry into Kianga, it was perceived as a necessity as far back as that?-- I didn't think it was as old as that, Mr Martin. Kianga was 19 ----

'75?-- '75.

About that?-- It came into existence between Kianga and the explosion at Moura No 4, so probably about 1984, I guess, '85.

I was going to suggest it was really still a skeleton operation ----?-- By the time I became aware of the existence of SIMTARS I was heading for the Western Australia with a project with ACIRL. I went to Western Australia in 1986, but I knew that some operations had been established at Redbank and I thought - they were so new I never actually got a chance once I was being transferred to Western Australia to actually get down and have a look at those operations, but I became aware of SIMTARS existence while in Western Australia.

SIMTARS publishes a magazine, doesn't it?-- Yes, I believe so.

You've obviously seen them, I take it?-- Yeah, yeah, read a couple.

Is there a mailing list that distributes these magazines?-- I would assume so. I've not seen it, but I assume we have one.

Can you say whether disseminated through those magazines over time has been information relating to CO make litres per minute and the parameters? Do you know?-- The last paper on that list is one that was published in SIMTARS news, and if it's of the form of the paper in the Volume 2 then I presume there has. I can't be emphatic about that. I haven't read every one of them.

Do you know yourself why it was that the 1989 spontaneous combustion seminar wasn't repeated?-- In so far as I know - again keeping in mind that it was before I started with SIMTARS and I couldn't attend - I personally didn't attend that, as far as I know it was due to a lack of funding.

That's the point I was going to make, that the first conference, the '89 conference, was industry funded, I'm suggesting to you, and when it was to be repeated the funding couldn't be obtained?-- As far as I know the funding for that was from the National Energy Research Demonstration and Development Program and funded from within the Department.

Subsequently ----?-- As far as I know.

No funding was available as far as you know?-- To the best of my knowledge, as far as I've been made acquainted, no.

Since you first became employed by SIMTARS, which I think from memory was about April 1994?-- That's right.

To your knowledge has any coal operator contacted SIMTARS for information about its facilities?-- I presume so.

You personally?-- I've had some contacts with operators. I've been obviously heavily committed to this process since August last year.

I'm really talking before August?-- Yeah, we have contact with industry.

What about?-- It can be initiated by them or by us.

What about the facility which existed for the Telecom modem transmission of information from a mine to -----?-- You are talking about the CAMGAS system now.

Yes?-- Yes.

Was that used by coal operators before August 1994?-- I'm sure it was. I make the point on that, that that is something that operators - they initiate that contact.

Yes?-- And it was - the CAMGAS was established as a voluntary thing and the contact - the modem link with the on-site chromatograph was something to be initiated by the operators at their behest. That was the way, as I understand it, they wanted the system to work.

Can I just ask you a few things about the introduction into Australia, if I can call it that, of the CO litres per minute make?-- Yes.

That concept and the parameters as we hear about them, the 10 to 20 lpm?-- Yes.

Your book, I understand, "Ventilation and Mining Practices in Coal Mines Liable to Spontaneous Combustion"?-- Yes.

When did that go to press, 1985?-- Unfortunately there never got to be a date on the fly leaf. It must have been about 1985.

Within your book - I have forgotten - I've had several attempts to read it, but is that parameter set out?-- Yes. I can tell you the source of that.

It's Mr Wright, wasn't it?-- Mr Wright, Tapp, Mackenzie and Wilson.

They had written a paper, hadn't they, in 1984?-- Yes.

When before that, can you tell us, did this concept to your knowledge first get into Australian -----?-- It was September 1984.

Do you know how that came about?-- I believe it came about as a result of the possibilities of heatings in the goaf of the Pacific Colliery or Taralba Colliery long wall panels which were also quite gassy, and to the best of my knowledge an

overseas trip was organised to investigate prevention and control of spontaneous combustion in gassy coal mines - gassy long wall mines.

Was this sponsored, to your knowledge, by the Queensland coal industry?-- I couldn't tell you that. I think it was the joint coal board.

The joint coal board is located where?-- New South Wales.

Can I just ask you whether you agree with this proposition: in a known spontaneous gassy seam such as Moura is the principal feature relating to spontaneous combustion the fact that it might occur, can occur at any time?-- You are saying in a coal seam liable to spontaneous combustion, yes. Why else would you call it liable to spontaneous combustion?

Exactly. Of course, there was a 1975 incident at Kianga quite close to Moura?-- Yes.

No 4, I suggest, was considered - the No 4 explosion was considered to have as a possible source, at least for a time, a spontaneous combustion?-- I understand that, but I've got no personal first-hand knowledge of that.

And then, of course, we have the incident at No 2, 5 North, in '86, sealing 5 North West, 1991, and then a spontaneous combustion in 1993, August, at one of the portals of No 4 mine. So what I'm suggesting to you, and I ask you to respond, mine management with that history should have been most sensitive, I suggest, to the incidents or the possibility or likelihood of spontaneous combustion?-- I think that would be reasonable to say that.

I looked through your report very carefully and I couldn't see in it anything which suggested that the explosion that occurred on 7 August 1994 occurred other than within 512 at first instance?-- Mmm.

That's correct, isn't it?-- Yes.

What I want to ask you is: is that conclusion you reached really a matter of certainty?-- That's a hard question, Mr Martin.

Yes, lots of them have been hard here?-- Sorry?

Lots of questions have been hard in this Inquiry. I'm asking you to do your best?-- I think we would have to say that given the evidence that there is, that the weight of evidence indicates that 512 Panel was the site of the initial explosion. There is little evidence to suggest any other possibility.

I just want to touch very, very briefly, I can assure you, on comparison of one panel with another and I want to suggest to you that no two panels can ever be said to be the same, and that literally there is a host of variables which influence matters in relation to a spontaneous combustion development

such as, for instance, regulator adjustments, ventilation changes, alterations to stoppings, diversions of air, short-circuiting of air, increases, decreases and substantial decreases and increases of velocity and air quantity to mention but a few?-- You are talking about the history of the panel in terms of ventilation quantities. There are other factors that come into that, the way that coal is cut and left on the ground, and I think it's self-evident no two panels can be identical. They can be similar, they can't be identical.

Certainly, and I just want to suggest to you that a prudent mine operator should look for the worst and not the best case scenario?-- -----

MR MORRISON: I object to that. The man is not here as an expert in relation to prudent mine operators. The man is here as a scientist. He can speak from a scientific point of view of what one might discern from graphs or trends or figures or data. He is in no way qualified to speak as a mine manager, and my memory tells me he has no experience as a mine manager.

MR MARTIN: I don't want to waste an ounce of time on responding. I will put it another way. If you had been given some of the scenario that Mr MacSporran has given you -----?-- Such as.

Such as? All right, just to remind you - I think it was on -----?-- You are talking about the scenario of smells, trends -----

Yes, and the incidents of 17 June that Mr MacSporran outlined to you, the 24th, 15 July, 5 August, 6 August, the tarry smell, haze and so forth. Do you recall those?-- Yes.

If you as a scientist at SIMTARS had been contacted by a mine operator relaying those sort of symptoms what would your response have been?-- Urge extreme caution.

And investigation by -----?-- And investigation.

By already available means including, I suggest, the gas chromatograph?-- Yes. If it could - it may not show anything.

Yes. Yesterday - and I don't want to take you to the exhibit - you produced a figure, I think it was called figure 4.1 which showed self-heating curves for five different coals; do you recall that?-- Yes.

With varying rates of rise, temperature that is. Can you tell us what coals you were dealing with?-- Off the top of my head I couldn't remember.

Was one of them a Moura coal?-- It may have been. Without going back to the source information which - you know, I just can't pull them out of my head.

Lost in antiquity. I think you said yesterday talking about reports, deputy production reports - I think 3749, 3776 - that

really the rate of production trebled. That's the CO litres per minute?-- Which shifts are we talking about?

Went from 1.1, I think, to 3.5?-- Yeah, the trend towards the end of the panel compared to the initial trend.

I suggest to you that that sort of increase couldn't ever be described in such terms as a subtle increase. It's dramatic, isn't it? It's three-fold?-- It depends on what you are measuring it in relation to. In this case we are measuring it in relation to some guidelines of 10 and 20 lpm carbon monoxide and we have three and a half litres per minute increasing towards 20 lpm. Three and a half litres per minute per week at a time when we were rapidly approaching 20 lpm.

A significant parameter at least in accord with the knowledge then, the 20 lpm as being exercise extreme caution or -----?-- I don't think you have to use 20 litres - it isn't the case of at 19.9 everything is hunky-dory and at 20.1 it's hit the panic stations.

I take your point. I do understand that. In the existing Unor system as at 7 August 1994 would it have been possible with a permanent velocity metre stationed in a panel to cause an analysis and a production of a CO make litres per minute on the Unor Maihak system?-- Technologically I don't see any reason why you wouldn't be able to do it. Mines have been monitoring air velocities for ages and using them for the purposes of calculating air quantities. There would obviously be a problem between the fact that the carbon monoxide would be detected by the tube bundle system, and there is an inevitable delay in that, and the velocity would probably be detected - would have to be detected by some sort of telemetry head which would be giving you an instantaneous reading. There would be some sort of mismatch between the timing of the two events, but I don't think that would take too much for somebody to sort out, and maybe it wouldn't matter.

Certainly, and from that, so far as you understand the system of Unor Maihak, one could have programmed into it a pre-set alarm for a make - CO litres per minute make which exceeded a certain figure?-- If that is what you had wanted to do.

Can you tell the Inquiry what better system could be introduced even now to prevent this lag time?-- Telemetry systems of monitoring carbon monoxide are available, that is, basically taking the analysis equipment and placing it underground. There are some problems with that, obviously the logistical problems of maintaining that sort of equipment underground. I can't give you specific detail of the equipment, but I believe it's available.

Just bear with me for a moment, if you wouldn't mind. In your report, or SIMTARS report, I should say, you deal with limitations of the single monitor point?-- Yes.

And it would have been far preferable to have them elsewhere than where they were, or where it was at No 5 point, more particularly in No 1 return?-- Not knowing specifically where a heating was taking place, then you can always make an argument for more information. There will be a problem with monitoring in a goaf where - if the monitoring point is some distance from the seat of the heating, then the response of that monitoring point to the changes taking place at that heating will be, would you say, damped by the distance between the monitoring point and the heating because the heating is more or less a singularity in a single place in the - and there are obviously problems with the diffusion and mixing of the gases in the goaf.

I have nothing further, Your Worship.

WARDEN: Thank you.

CROSS-EXAMINATION:

MR MORRISON: Mr Humphreys, may I just inquire in relation to that last point whether you might agree that there is an additional problem that might be posed with what has been suggested as a possible course in a report - and I'm not sure it's your report - that is, of having a tube at the sampling point with multiple holes in it so you could draw from near floor level, mid level and top height level?-- That's been proposed, and if there was some sort of layering phenomenon taking place, then it might give you some indication of that. Then you might also find that there is no layering process.

You might also find that the gases being drawn into the top impede the flow of the gases being drawn into the bottom?-- I think you would probably - if you were concerned about layering, it would probably be better to actually have three tubes at three separate heights.

As you say, you can always mount an argument that more points might be better and they may not?-- And in some cases it may not be physically possible to put more points in simply by virtue of access to the back of the panel or something.

It's an area that really has to be governed by practicalities, doesn't it?-- I think that's reasonable.

For instance, you, even as a scientist, would not suggest that people be put at risk in order to put points further in to, say, an unstable goaf?-- Not particularly, no.

Can I just ask you to open your report and I want to examine a few matters, if I may. There are just some matters where I need some clarification from you. At page 10 you mention, under the subject of "Data Handling", the fact that the computer records gas and time data for each sample point on file; the recording rate is about 112 samples per day per point?-- Yes.

Now, I suppose it's a trite point, but indeed that's a system that samples with a very high frequency, isn't it?-- High in relation to what? That's a lot of samples out of a gas - out of a particular tube.

If one is wishing to know what gas is doing at a particular point, then 112 samples per day per point is a lot of data?-- Yes.

Particularly when it's being reviewed every 13 minutes would give you an accurate picture of what's happening down the pit?-- There may be some transients that you might miss.

Can I just ask you about that? You mentioned that yesterday; that, for instance, the impact of CO from a diesel might be seen as a transient spike?-- Yes.

That's not an uncommon feature, is it?-- I don't know. It would depend on the emission of the diesel, the air velocity it was in, how long the diesel was there, maybe what its relative velocity to the air was.

I am speaking more - not so much the source but the fact of a transient spike. You can get transient spikes in data, and in fact you have seen them in this data?-- I really couldn't say that I've seen too many transient spikes in this data.

Well, one that comes to mind is a period for point 16 where the CO was sitting at about the high 6's, low 7's, 6.9, 7.1, in that area, and then for 30 minutes went up to 8.8 or 8 and then dropped back immediately to the low 7's again. That's in Appendix 2.1.7J for point 16 on 3 August?-- Volume 1?

I am sorry, I think it is Volume 1, page 14 of 2.1.7J. You see the point I am indicating, at about 11.09 through to 11.35 on that day for that point. You can flick back a page if you would like to see the trend of CO and indeed flick forward a page if you would like to see the trend of CO. What I am saying -----?-- Yes, there is a couple of higher readings.

And only for a very short duration?-- Half an hour or so.

That could fall into the category of the transient spike that we have been referring to. I am not trying to get you to identify the source of it but its mere appearance?-- Possibly.

Now, that sort of event is not dissimilar to getting what might be called rogue readings every now and then?-- I don't know. It would depend on what the source of the rogue readings were.

But leaving aside source, the fact is that you can get rogue readings; is that right? I think you have in fact identified a couple in terms of your graphing, you have discounted a couple of points as being abnormally high and abnormally low?-- I don't know that you would call them abnormally high or abnormally low. They are part of the general trend, and there may well be reasons why those reversals took place. There would be errors in all.

Well, you could get, depending upon the way in which a deputy reads a Drager tube, an abnormally high reading that doesn't reflect reality?-- Yes, I think we have seen evidence of that.

And, likewise, low?-- Well, I think that, for the general part, Drager tubes are designed, as I say, more likely to read low because of the physical aspects of the Drager tubes; maybe people forgetting how many pumps they count, leakage of the bellows, that sort of thing.

Now, Drager tubes have, by their very design and manufacture, a standard deviation built into them?-- I don't know that it's built in. It is a feature of the Drager tubes.

Yes, "built in" is probably an inapt phrase. There is a standard deviation applicable to them that's part of the product of the way the equipment is designed and manufactured?-- Yes.

And in addition to that, in its use one would have then the subjective deviation depending upon factors that we have discussed?-- Yes.

The consequence of which would mean that there could be quite significant variations according to personal use of the Drager?-- I don't know how significant they would be, but there will be variations from user to user and instance to instance.

Exactly, and one couldn't necessarily predict or even backtrack to find out because it would depend on the number of pumps or whether someone lost count of their pumps and so forth?-- Or whether the bellows was leaking.

The same might be said of the anemometer readings taken by individuals down the pit as well?-- Yes, I think there is a

little bit more accuracy involved in the anemometer. It can be calibrated by being sent away to make sure that it's actually functioning properly, and generally more than one reading is taken with the anemometers to check that - you know, it's no good just taking one reading, obviously a check, take two or three.

But it's a piece of equipment which has to be used in a particular way in order to be efficacious?-- Yes. It's like all pieces of equipment like that; used improperly, you will get improper results.

And with the anemometer it's relatively easy to do that because one is required to traverse a heading at a particular time rate, leaving one side and arriving at the other in almost exactly a minute?-- Well, there is a timer built into it so that - as I understand it, the anemometer has a timer built into it that disconnects the gear mechanism at one minute and you have got to traverse the roadway in a particular - not particular fashion, I don't think you have to get overly fussy, but in a style that gives a representation of the velocity across the roadway.

And you can in fact get abnormal readings if you spend a disproportionate amount of time near the rib as opposed to the middle and also a disproportionate - an abnormal reading if you hold the anemometer in the wrong position in relation to your body, that sort of thing?-- Yes, I think that if you held it too close to your body, you might get something high or low; it's hard to say.

And very hard -----?-- By how much I don't know.

No?-- It would depend on the circumstances.

And it would be very hard to compare one person's anemometer reading with another unless one made the assumption, which may or may not be right, that they all did it the same way at the same point?-- That might be so, but if they were giving consistent readings, then - if they were getting repeat results themselves and they were consistent from shift to shift, then one might have some confidence that they were all right.

Or, alternatively, if one could look at identities and see, for instance, that one deputy always got high velocity while another one always got lower than everybody else, that might suggest that there were variations in the manner in which they were taking the readings; it might also suggest that the velocity was different at those times?-- That might.

Likewise, with the Draggers, if you could discern from looking at the results that one person read frequently higher than everybody else and others read frequently lower than everybody else, that might suggest a problem with the manner in which the data was obtained?-- That might.

Can I ask you to look at page 11 of your report for a moment? You can clarify something for me. There is a section to do

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with location of sampling tubes?-- Yes.

You mention in the last paragraph that point 16 was originally located in the 512 top return on the south-east side of the panel?-- Yes.

It was relocated at about 2 a.m. on 7 August?-- Yes.

Now, from what you know, that time can't be right, can it? The seals were finished about 1.15?-- Yes.

So, can you tell me where you got that time from?-- I'm not sure.

Can you tell me in fact what is the correct time for the relocation?-- I think it was sometime around about the mid-afternoon of the Saturday.

In terms of the analysis of readings, it's immaterial, isn't it, when it was moved?-- How do you mean?

Well, you seem to make a point about when it was moved. Why do you make that point? Is it not immaterial to the analysis of the readings that it was moved at this time or that time or some other time?-- I'm just not following you at the moment.

Well, what does it matter when it was moved, that's what I'm asking? What does it matter? In terms of our analysis of the data it was giving, what does it matter when it was moved?-- It may - it would matter perhaps in relation to the ventilation changes that were made in and around that area if it went into another air split.

So, if it went from inbye to outbye, the panel itself, that may in fact make a difference in the readings it's giving?-- And it may not. If that was the same air split, then it may not make any difference to the concentrations that were being determined.

Would there be any marked difference in the way in which it would perceive the readings from its inbye to outbye position merely by its distance?-- I don't think so.

In your assessment then, is there any impact on the way we should analyse this data stemming from the moving of the point? I am just interested in why the point is made at all if it has no impact. I assume you are saying it does have some impact?-- I think mainly from the point of view of correctly identifying where the tube was and maybe some nomenclature thing that 512 top return basically didn't exist after the completion of sealing, if you know what I mean. It's not really the return for the panel on completion of the sealing.

All right. Well, can I ask you just to have a look over the page then where you are dealing with lag times?-- Yes.

At the end of that first paragraph you mention in a sentence there, "Damage to the tubes is indicated by any reduction in

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the observed concentration of the sample from its known value."?-- Which page are we looking at, Mr Morrison?

2.1.3, page 12, end of that first paragraph under "Lag Times"?-- 2.3 -----

2.1.3 on page 12?-- Yes.

End of that first paragraph. The reduction in the observed concentration there you have mentioned can indicate damage?-- Yes.

But reduction in the observed concentration can also indicate increased lag times, can't it, not just necessarily damage to tubes?-- Could you repeat that again, sorry?

You say damage is indicated by any reduction in the observed concentration?-- Yes.

Increased lag times would indicate the same thing, wouldn't they?-- It would indicate that the line was pinched.

And decreased lag times could also indicate the same thing?-- Sorry, decreased lag times would - sorry, increased lag times would indicate the point was pinched and a decrease in the concentration would indicate the point was leaking.

Now, an increased lag time might also indicate -----?-- Pinched.

Or damage?-- Pinched.

Pinched?-- Unless it was associated with a reduction in the concentration as well.

Now, in relation to point 18, you mentioned that there was a 10 hour lag time discernible on that in terms of the back analysis of data?-- Yes.

Do you ascribe that to a pinching?-- I can't think of any other logical explanation.

If it was merely a pinching, does that mean that the gas becomes diluted?-- No, pinched - I think we have said pinched and leaking.

Pinched and leaking. But there is no way of really knowing about that, is there?-- I think logically it says the tube was pinched and leaking.

If it was pinched and that was the cause of the sample being held up for 10 hours, as it were, what has it been sampling in that intervening 10 hours? What came through was about 23 parts CO as opposed to about 44?-- Yes.

Have the other 21 been leaking out or just dribbling?-- It's been contaminated by air from some other point at the point where the tube is also - is leaking.

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But the 23 parts as a plug came up, didn't it?-- Yes.

So, it's obviously been held up in the system on your analysis for 10 hours, roughly?-- Well, its been travelling the length of the tube and it has taken 10 hours to travel the length of that tube.

Well, if that was so, how would one get such a long time from a pinching? The pinching must be up near the surface then; is that right? If one had pinching down near the sample point, surely you would get a different result?-- I couldn't say, to be truthful. I would expect - yes, the pinch was near the surface.

Because if one is talking about a 23 part plug arrival, then it has been diluted at least at that stage, perhaps-----?-- Somewhere along the----

Either diluted within the tube, or by leakage?-- Well, the only way it is going to be diluted within the tube is by leakage.

Would you not subscribe to the theory that if you introduce a span test into a tube, that it will dilute within the tube itself?-- Stretch.

Mmm. Or would you rather think it would stay pretty much within its integrity?-- I think it would stay pretty much within its integrity.

Okay. I understand that. Now, it is difficult, then, to predict, would you agree, that the - where the pinch was or what the situation was that caused a 10 hour delay on point 18?-- Yes, it would require some investigation to physically examine the tube and find out - in terms of repairing it, obviously, to physically examine it to find out where it might have been damaged.

Because the pump pulls out the air at a constant rate, doesn't it - out of the tube?-- As far as I know, yes. Well, if - obviously if it is pinched, the pump is not going to be able to pull the-----

In which case, in the intervening 10 hours, shouldn't we see some effect on what it was sampling - it not being able to pull the atmosphere through at a constant rate, wouldn't you see some difference in the sampling? Shouldn't we see some fluctuation of the figures?-- Why?

Well, isn't it only sampling the gas within the tube? It is, isn't it?-- Yes, it's - it will be obviously a mix of whatever is entering the tube at the sample point, plus whatever is entering at the point of the leak. It is possible to pinch and have a leak almost at the same place, in my experience.

But if there was a pinch and a leak at the same place near the surface, wouldn't you rather expect that you would be getting readings heavily diluted in that intervening 10 hours?--

Wherever it was pinched, the gas which would be entering that tube in terms of the integrity test would be something near air in terms of carbon monoxide concentration.

I'm wondering how it is, really, that you can say that when the 23 parts turns up that that is necessarily the plug that was introduced by the span test, or is it really just an assumption that it could really be nothing but that?-- I think it is an assumption, and if something else has happened to cause that, then it hasn't shown anywhere else in the system.

No, but we - in truth, we can't say with certainty what caused that, can we? If we can make an assumption that it's the plug, that means there is a 10 hour lag time?-- Mmm.

And the assumption is predicated on there being a pinching at the surface; it is not reflected in any other tube, correct?-- Yes.

And at the point where that pinching might be substantially outbye, tubes, by then, are in a bundle?-- Yes.

So that if you had some event that caused pinching to one tube, it is difficult to see why you couldn't get pinching on the others, though it is not reflected anywhere, is it?-- Yeah, and if it was to the bundle, I would presume that somebody would have picked that up and-----

Done something about it?-- Mmm.

So, the identification of that as being the span gas thing is really simply an assumption that it has no scientific basis and-----?-- I think it is a reasonable assumption.

Reasonable or not, there is no way of testing, is there?-- Not now.

All right?-- Unless - you could test it by having a flow meter or something on that line to see that the flow is actually low, and, you know-----

All right. Well, there is no data to suggest that the flow was low, is there?-- Well, maybe not considering it has been diluted. You would have to do some calculations to see what sort of air flow you would have to have to give you 23 ppm, etc, and a lag time of 10 hours.

In truth, all we know, really, is at a particular time 23-odd parts CO arrived at the surface through the analyser?-- On point 18, yes.

And beyond that, the best assumption is as to what the source of that is?-- Yes, but I think it a reasonable assumption that it was from the span gas checks.

I understand you say that's a reasonable assumption. I'm testing whether there is, in fact, any evidence - empirical evidence to support that, rather than simply a reasonable

assumption. Now, there is no data to support a low flow on point 18, is there? There is in fact a low flow alarm connected to the system?-- Yes.

And there is no low flow alarm registered for that system?-- No, but as I understand it, the low flow alarm does not go off until the flow is very low and-----

Sorry?-- It's all right.

If you wish to qualify something?-- No, it's all right.

Well, can I ask you to turn to page 14 and can you just clarify something for me, please? In table 2.1.5.1, you have got a check of calibration gases?-- Mmm.

I notice in each case the gas used was two to three years passed its expiry date?-- Yes.

Does that have any impact on its veracity or its integrity? It seems to me to be a very long period past what might be called a "use-by date" - two to three years. This is the basis upon which you established the calibration, and I'm wondering whether, in fact, there might be some difficulty with the calibration results because the gas is so long out of date?-- I can't say for certain what the impact of that is. I believe CIG put an expiry date on their cylinders, so that people - because there is some feeling that the - there may be some changes taking place in those cylinders, although I haven't seen anything to support that.

So, in respect of this, then, we just don't know whether that's had some impact that transfers through on the calibration; is that right?-- It may have some impact, but I would think it was very small.

Well, that's an assumption you make?-- I think there would be people who would be much more qualified in gas chemistry to speak about that.

All right. Can I ask you to have a look at page 15, please? You say in the first paragraph there - and you will have to help me with the wording because my photocopy is fairly poor - "A check was made of the calibration gas values stored on the control computer. These are shown in Appendix 2.1.7(0)..."?-- Yes.

"...and correspond well with the calibration gases used."?-- Yes.

"It was noted that the tolerance on calibration was" - can you give me the figure?-- Plus or minus 5 per cent.

And the next words?-- "i.e."

"...an analyser should be..."?-- "...could be in error...".

Can you read the rest of that, please - "...could be in error up to..."?-- "...by up to 5 per cent...".

"...before any corrective alarms on calibration were activated."?-- Yes.

Now, could it be an explanation, for what you say there, is that the computer will alarm if the gas reading on calibration is more than 5 per cent outside what the gas is specified to be?-- That's my understanding of the situation.

Is that really what you are getting at in that paragraph?-- Yes.

So that is, in fact, the explanation. The alarm - the computer will alarm if the gas reading on the calibration is more than 5 per cent outside the-----?-- That's what I understand the tolerance is.

So, the alarm will only go if there is a variation of 5 per cent?-- On the span gas.

And ergo it won't go if it is 4, for instance - it won't alarm?-- I believe not, no.

Can I take you down to table 2.1.5.3 where there are recorded the results of the calibration tests?-- Yes.

Now, can we just note a couple of things? CO seems to have been recording well outside the tolerance; is that right - 83 plus or minus 1.6?-- Yes.

It is coming in at 76.4?-- Yes.

Well, that's a significant calibration difference, isn't it?-- That was - they were the checks, as I understand it, taking place on 16 August, and I can't say whether that should have - with regard to any alarms.

If we look down, likewise CO2 is reading well outside tolerance, isn't it - 3.69 plus or minus .7 per cent and it is in at 3.41?-- No, the plus or minus percentage that you are looking at there is the error on the span gases that we used.

So, it is not .7 per cent of the figure, it is plus or minus .7?-- You are comparing the cylinder value with the computer value. That's the area you have got to be looking at. 3.69 to 3.41.

Yes. What's the plus or minus .7 per cent? Does that mean you could read up to 4.39 and down as low as 2.99?-- Yes.

Is that as you read that?-- I think that - I'd have to say at this point that I was not on site to do these tests.

No, I understand that. I mean, I'm interested in the results that are shown there, though. Is it not .7 per cent of the designated reading - 3.69 plus or minus .7 per cent of that?-- I would think so.

In which case 3.41 is outside the tolerance, isn't it - it is

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a drop of .28, which is greater than .7 per cent of 3.69?-- I'm not sure which tolerance you are talking about, Mr Morrison. You started with a plus or minus 5 per cent earlier-----

Sorry, if I said that, I didn't mean to mislead you. I was drawing your attention to the cylinder reading, 3.69 plus or minus .7 per cent?-- Mmm.

And then the actual computer reading on that cylinder of 3.41, and the computer reading seems to be outside the tolerance set for the span; isn't that right?-- Well, that's within 3.69 plus or minus .7.

All right. Sorry, we seem to be going in circles. What I'm asking you is is the .7 per cent - does that mean you can read the cylinder up to 4.39 and down as low as 2.99, or is it .7 per cent of 3.69. It must be the latter, surely? No?-- No, I think - you know, as I say, other people had inputs to this that are more-----

There may be other people that can talk about this?-- In a better form.

Let's at least extract it as best we can. No matter about the other one, we can't have that with the O2?-- No.

It is reading well outside the tolerance?-- That's right.

Is that reflective of the error which caused you to adjust oxygen?-- No.

It's not. This is something else?-- This is something else.

Okay. Now, we can see the same thing in the next table down, with the CO, can't we?-- Yes.

All right?-- Well, in what respect?

It is reading outside its tolerance, isn't it?-- It is reading outside the cylinder.

All right. So, what's the net result of that table? Isn't it the computer, as it is recording the analyser results, is reading outside the tolerances in some cases-----?-- Outside the tolerance on the cylinders.

Which means, doesn't it, that in respect of some gases, what you see on the computer screen or recorded on your data is, in fact, not a true measurement. There is a - what we call a drift?-- There will always be some - I wouldn't call it a drift - there will always be some degree of error in a measurement check. If you look at the CO, if we take the check to be 83 and it results in 76, we are getting about 90 per cent.

Well-----?-- In actual fact, the computer should be reading higher than that.

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Yes, indeed. In relation to the oxygen, this is not the cause of the adjustment you made?-- No.

That was purely on a comparison of the point 14 results?-- That's right.

All right. Now, can I ask you to go to page 17, please? In relation to the paragraph at the top of the page, you mentioned there the calibration checks being made were using SIMTARS method LP0022?-- Yes.

Now, that's, in fact, not in compliance with AS22903, is it? It is based on it?-- I couldn't tell you.

I see?-- As I say, other people have contributed to this report and done this work and they would be in a better position to tell you on that than I am.

Well, let's move on from that point if you can't help us. It goes on to say: "It is important to note that the analysers in question had sustained gas flows resulting from two underground explosions prior to the calibration check. Such conditions could not be considered to be-----"?-- Sorry.

Sorry?-- Okay.

"Such conditions could not be considered to be normal monitoring and therefore deviation from the point of drift characteristics of the analysers may be expected." Now, isn't the drift electrically generated in this system?-- Again, I would suggest you ask somebody more capable in that area than myself.

You can't help us on that?-- I couldn't, no, not really.

Your Worship, I'm about to move to a different point and I'm mindful of the time.

WARDEN: Thank you. We might have a morning break. Thanks gentlemen. 10 minutes.

THE COURT ADJOURNED AT 10.58 A.M.

THE COURT RESUMED AT 11.17 A.M.

DAVID ROBERT HUMPHREYS, CONTINUING:

MR MORRISON: Mr Humphreys, can I take you to page 19 of your report? I just want to check on something here. You there have a section which discusses the selection system integrity checks?-- Yes.

About point seven on the page?-- Yes.

That paragraph deals in the first sentence with all sample points but then goes on to deal with two sample points, numbers 10 and 12; is that right?-- Yes.

What's the significance of dealing with 10 and 12? Were they non-operational at the time? They were non-operational points as at August 1994. I'm just wondering what the point that you are trying to make here is?-- Just completeness.

Simply there for completeness, no other purpose?-- I'd say that's all it's there for, completeness.

Nothing said in the balance of that paragraph is really anything to do with what we are talking about?-- 10 and 12 as gas monitoring points don't figure and weren't recorded, as far as I know, on the computer. They can have very little relevance.

We can put to one side; there is no significance to it?-- As far as I can tell, yes.

Page 20, please. Under the table you deal with the adjustment of the methane offset?-- Yes.

This is the jump that we see evidenced on the night in question from 4.99 to 10.65?-- Yes.

I think, as I understood your evidence, I think yesterday you said that that has been evidenced on other tubes. You, I think, referred to 401/402 -----?-- Other seals.

After sealings?-- Yes.

This was something common to the whole system, it's an analyser question?-- In so far as I know. I believe - yes, it's an analyser function. It's not a particular tube because all tubes are analysed by the same - the switching sequence directs the gas from tube to tube to tube to the particular methane - that methane analyser, and it's a function the methane analyser, not the tube.

You mention at the -----?-- Or some part of the system associated with the methane analyser.

There is no real way of knowing at the moment whether it's hardware or software or indeed in the computer as opposed to the analyser?-- No, I think we have tended to indicate that. I believe there may have been - I'm not 100 per cent certain - some tests that indicated some - it could have been associated with zero offset function of the second range. That was done later, but I'm not 100 per cent certain on that.

But it's something that would require further analysis in order to discern just why the machine does this?-- Yes. David Cliff took part in some tests, I think between the two sessions of the Inquiry, and I'm not 100 per cent sure what the end result of that was.

But there is no question it's a machine feature, either hardware or software?-- Yes.

Not a tube feature?-- It's not a tube feature and it's not a gas - the impact is to overestimate the methane.

Has any work been done by SIMTARS that you know of which would tell whether that is common to all Maihak systems - or indeed perhaps not all, but other systems?-- Not that I'm aware of.

For all we know this could be an endemic problem?-- I couldn't say. If it was something to do with a common software that Unor Maihak were distributing maybe, if it was something to do with the electronics of processing the signal it may be, or it may just have been something to do with the set up of that particular methane analyser at that particular time.

One is not to know at this point which of those is correct?-- Unless Dr Cliff can provide some more information on the results of the tests that were done in December or January which I believe - Mr Phil Clarke was at it as well.

Whatever those results were they don't seem to be incorporated in this report though?-- No.

Can you turn the page to page 21, please? Under the heading "Alarm Log" there?-- Yes.

You have some features of the alarm log mentioned including, "The acknowledgment is an arbitrary number, generally the operator's lamp number."?-- Yes.

Can you tell me the source of that information?-- I couldn't. I think it's probably something we picked up and evidence here has shown that some people did do that and some people didn't do that, and there is no reason to believe that that was the procedure that was followed.

No reason to believe that that was the procedure or wasn't?-- That that was the procedure followed. Obviously we have had evidence here some people did it and some people didn't.

Can you go to page 22 for me, please?-- Yes.

Under the table you are here discussing the CAMGAS chromatograph detection ranges?-- Yes.

Under that there appears to be, in that paragraph that follows, an acknowledgment that there is difficulty encountered with the gas chromatograph when it's measuring low levels of carbon monoxide, that is to say 10 or under?-- Yes.

Now, at those low levels then, as I understand the way your report reads, you could use an alternative form of equipment, the Siphor II -----?-- Yes, the infrared type detectors.

The Siphor II is an electronic continuous type detector?-- Yes.

The Ecolyzer is another hand-held unit?-- I believe so.

So the next paragraph is the summary of that point, "Such difficulties inhibit the use of the CAMGAS GC as a low level carbon monoxide detector."?-- Yes.

So you don't see it having a role for the purpose of detection of CO below 10 parts?-- That's self-evident from that statement, isn't it?

And that is a view, would you accept, that is currently held in many parts of the industry, that the GC is not really for use at low levels of carbon monoxide?-- No, that is why the development of the infrared type instruments that are used in tube bundle type systems in that they have greater application at the low levels of carbon monoxide that one expects to find in a normal mine atmosphere.

Can you turn the page, please, to 23? At the top of the page you mention there, in the first four or so lines, a point which you mentioned briefly yesterday, that this particular GC had been well serviced and maintained, in fact in excess of the minimum requirements?-- Yes, I don't think we have any dispute with the maintenance.

I'm not suggesting you do. Can you make some comment about whether that's the case at other mines?-- I personally couldn't.

Now, can you look across the page to page 24 then, please?-- Yes.

Under the heading "Moura CAMGAS Service Status"?-- Yes.

You there refer to the fact that, "Selected members of Moura staff" - this is about half-way through that paragraph?-- Yes.

"... were subsequently trained inhouse...", after the installation of the system?-- Yes.

"... and through regular communications with SIMTARS."?-- Yes.

Now, was there any stage where SIMTARS considered that either more people should be trained or that people who are up there should be trained differently from the way they were?-- I don't think I could really comment on that because much of this would have taken place ----

Before your involvement?-- Before my arrival at SIMTARS, and therefore I really don't have the anecdotal background to quote on that. I'm sure that again the people more qualified to comment on that would give you a much better answer than I could.

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Well, there is nothing you know of to suggest that that was the view?-- No.

Can I take you over, please, to page 28?-- Yes.

Now, this is under the heading "Mine Atmosphere Monitoring Prior to Explosion"?-- Yes.

In the third paragraph you make the point that in the period of time immediately before the first explosion, data obtained from the tube bundle system indicated no abnormal conditions at any monitoring point apart from 18, 5 and 16?-- Yes.

Now, you don't mention there, except by perhaps exclusion or inclusion, points 6 and 7. They were in fact exhibiting some higher than normal readings, on one view, at a time pre-explosion, weren't they?-- Which points were they?

6 and 7?-- 5 South bottom return, 5 South top return.

Yes?-- No, they weren't mentioned at that point.

And is that because your view is that pre the first explosion they were exhibiting normal conditions for those points?-- Yes.

And when we say "pre the first explosion", we can determine that by the computer clock allowing for its internal error of seven minutes and the lag time of the point?-- Yes.

Now, if you look down the page, you have a paragraph commencing at about point 8 which starts, "Point 5, 512 seals, located about 20 metres inside the goaf..."?-- Can you start again, please?

Sorry?-- Could you start again, please?

I apologise. It's the third last paragraph which starts, "Point 5, 512 seals..."?-- Yes.

Now, in relation to that you make the point that it showed signs of increasing methane, CO, CO2 and decreasing oxygen?-- Yes.

Associated with the sealing operation completed at about 1 a.m. on the Sunday?-- Yes.

And that trend can be seen in the graph to which you refer?-- Yes.

And that the methane, carbon monoxide and CO2 began to increase linearly with time?-- Yes.

With a corresponding linear decrease in oxygen?-- Yes.

Now, that is an absolutely normal phenomena, isn't it, in terms of the effect of sealing?-- One would expect the methane to increase, carbon monoxide to go up, carbon dioxide to go up and oxygen to go down. The oxygen going down -

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methane being liberated as a seam gas, carbon monoxide being produced as a product of oxidisation either by a heating or by continued ambient temperature oxidisation of the coal, CO₂ perhaps some small component of in-seam gas, and the decrease in oxygen due to oxidisation and displacement by methane.

Now, the next point I want to ask you about is if you look earlier in that paragraph you mention the increasing of those gases and decreasing of O₂ associated with the sealing operation as well. Now, that again is a normal product that one would see in the sealing operation itself, isn't that right?-- Yes.

So, the point you make there is, can we understand, that is a normal feature?-- Yes, the rates of increases in those gases will vary from panel to panel, from mine to mine. The complete structure of those - if you might call it - the complete structure of the gas analyses would vary from, as I say, panel to panel, mine to mine. It would require close examination to determine what was happening.

Now, in the next paragraph you have the statement that it is believed that the last pre-explosion gas sample was recorded at the mine surface at 23.49?-- Yes.

Now, that's computer time?-- I think that throughout the report we have used computer time unless otherwise stated.

And even allowing for the seven minute drift - seven minute error, that is when it arrived at the surface post the explosion, isn't it?-- Yes.

So, it obviously follows from that, that result is not one that could have been seen prior to the explosion?-- No.

All right. Now, can I ask you to turn the page? This is dealing with the same section of Mine Atmosphere Monitoring Prior to Explosion. Now, you mention there in about the middle of the page: "It is possible that the observed carbon monoxide levels were due to contamination of the samples at the surface caused by leakage in the tube bundle solenoid valve bank." Now, what you are there referring to is contamination of results by actual leaking of gas?-- Yes.

Could not the explanation for that be that the system, in its operation, may fail to fully purge the immediately preceding sample rather than leak? See what I am getting at? You might have a very high level of CO, for example, from the point immediately preceding the one that we are looking at, and if that's not fully purged, it may contaminate the subsequent result rather than having a leaking at the solenoid valve bank?-- If the purge time wasn't adequate, I guess that's a possibility.

Has any work been done to see, by tracking point to point, whether it's more likely to be a purging of the system - purging question inherent in the system rather than leakage?-- I can't answer emphatically yes.

Now, in the next paragraph you say, "The final alternative" - this is in discussing the monitoring results - "is that the result observed at point 16 is real..." Now, you are here referring to - the context of this is that you are saying that some samples that last arrived may not be genuine because of damage or leakage or something else?-- Yes.

"...is real and due to some occurrence underground." Now, that is an alternative within the scope of contemplation, isn't it, the jump in the parts on point 16?-- Well, it was considered by us.

"It is impossible to distinguish between a real result and one due to contamination as discussed above." So, you can't tell just from the mere fact of the reading what it is?-- Not particularly.

"If the result is real it must be due to diesel engine exhaust emissions, or some rapidly worsening heating in 510 Panel, and of these a rapidly worsening heating is considered most unlikely."?-- Yes.

So, that leaves you with the only explicable alternative for that reading is the diesel emissions, as you put it in the report?-- Yes, cross-contamination or diesel emissions.

Well, cross-contamination in the sense that we have - the two alternatives are either leakage at the solenoid valve bank or purging?-- Yes.

The only alternative to that is there has been some diesel emission down there near the point, isn't that right?-- Yes.

And that could account for that reading on point 16, could it not? The reason I asked that is you really discount leakage from the panel itself because leakage from the panel itself would give you a mixture of gases?-- You mean leakage out of the 512 seals?

Yes. You discount that because you don't get -----?-- The methane effect.

----- the mixture you would expect?-- Yes.

So, that leaves you with the diesel emissions, doesn't it?-- Yes.

Now, can I ask you to go over to page 36? You are there looking at the various points and how they performed and whether they might have been exhibiting signs of impact from the explosion?-- Yes.

And you refer on page 36 in the middle to the anomaly for point 6 in the 5 South bottom return. You are dealing with that topic?-- Mmm.

And you postulate how it might have happened?-- Yes.

And you again refer to the leakage from the solenoid valve

banks?-- Yes.

Now, you would concede that the purging question should be included in that range of contemplations?-- That's a possibility. I think there were some tests undertaken again in the intervening period between the two sessions that demonstrated the possibility, the definite possibility, of that leakage phenomenon, and there may well be some results from that that would indicate the possibility of this purging problem as well.

But those results aren't incorporated in this report; is that what you are saying?-- That's right.

All right. Well, if we are talking about the parts shown at that point which is being discussed at 150 to 200 ppm, do you see that as more likely leakage as opposed to purging, or can you not express a view?-- Well, I drew the conclusion at the time it was due to leakage.

All right. Can I ask you to go over to page 41, please? You there deal with Mining Method and Ventilation Systems?-- Yes.

Now, in the second paragraph you have this comment: "During extraction, ventilation was by way of three centre intake roadways and two flanking returns."?-- Yes.

That's not quite right, is it? There were two flanking returns on development and then one main return on extraction, isn't that right?-- Well, 512 bottom return was used occasionally during extraction. Probably "flanking returns" is probably a bit of a -----

Incorrect statement, isn't it?-- Maybe.

Well, you then go on to say, "A line of ventilation stoppings with access doors were installed between 512 top return and the supply road." Now, you don't mean to indicate by those words that all those stoppings had doors, do you?-- No.

Because that is certainly not the case, is it?-- Not to my knowledge, no.

Does it have any impact on your analysis as to whether there were all doors or not or some and whether they were open?-- I don't think so.

In the next paragraph, the first sentence reads: "Tube bundle sampling points were installed at both the top and bottom returns up to the start of the sealing operations." Now, can you tell me the source of the information for that?-- That is our understanding of it. I can't be 100 per cent what the source is of it other than the ventilation plans that were supplied to us.

So far as the top return is concerned, your information certainly was that the sampling point was in the top return up to the start of sealing operations?-- Yes.

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Moved outbye at some point around the sealing?-- Sometime during the sealing operations.

Some indeterminate time?-- I don't know that it's indeterminate.

Sorry, so far as your information is concerned you can't say that is really what I am getting at?-- That might be so.

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I mean, obviously if the person who moved it comes and tells us it can be determined, I don't mean to suggest otherwise. Look down at the bottom of that page where you are discussing indicators of spontaneous combustion?-- Yes.

Now, in that paragraph you refer to the fact that the accuracy of an indicator in conditions very close to fresh air is extremely limited?-- Yes.

Now one of those indicators is by use of the Graham's Ratio, isn't it?-- Yes.

And that itself is of very limited use in next to fresh air conditions?-- Not necessarily. It is largely determined by the accuracy of the determination. It has been used in many years as an indicator of the onset of spontaneous combustion in near fresh air. It very much depends on the individual circumstances.

It depends on there being a deficiency in the oxygen in the first place. It must do by its very nature?-- If you had zero deficiency in oxygen - in oxygen deficiency, then you are going to get a very high oxygen deficiency ratio because you are dividing by a very small number.

And in relation to the deficiencies that are very small, there is limited use of the Graham's Ratio; would you agree with that - deficiencies of, say, up to .2?-- They are subject to analytical errors at those sorts of levels, particularly near fresh air.

Well, you say small differences between numbers that are very similar. "In some circumstances small differences between numbers that are very similar are used as quotients in equations and analytical techniques do not have infinite resolution. In addition, interpreting data from an indicator would imply that a single condition caused that value when, in fact, it would be an average value derived from all conditions weighted by the relative amount of that condition existing." Now, what you are there indicating is that small increments in the denominators, or small increments in the ratio figures, can cause large results - large movements?-- Large variations, yes.

That's certainly applicable if we look at, for instance, CO make; if one has a high velocity or large quantity of air, then very small movements can result in large changes?-- No, because in that case what we are talking about is dividing a number by a - a very small number - very small variations in that second number will cause very large variations in the result. In the case of CO make, what we are talking about is multiplying two numbers together, small variations in the multiplication of those two numbers produced small variations in the result.

Fine, but you accept that in relation to, for instance, the Graham's Ratio, very small variations result in large differentials?-- That's as we have gone through this morning.

Now, in that paragraph, you acknowledge the difficulty of dealing with estimates of weighted averages; isn't that right?-- Yes.

And that is a problem which occurs in the balance of the analysis in the report, isn't it, where weighted averages are used, or averages are used?-- I'm not sure I understand what you mean.

Well, I mean, you have taken some adjustments in relation to oxygen, for instance, of an average figure?-- Yes, fair enough.

But the mere taking of an average means that at any particular point you may not, in fact, have the true deficiency?-- That's true enough.

Although I'm just wondering, then, since you acknowledge in this paragraph the difficulties of dealing with estimates based on averages and weighted averages, it doesn't seem to have been reflected in the balance of the report?-- I'm not sure that I follow you.

Well, is it legitimate simply to take, for instance, the average on the O2 - the average drift on the O2 and just apply that across the board?-- Average drift on the O2.

You mention in the other part of the report that the O2 analyser was reading out and you mentioned that?-- The average error.

You took the average of .4 as the figure by which you corrected O2?-- I think we have been conservative in using that .4 to estimate the error in oxygen.

By merely-----?-- And we are not - sorry?

Sorry, keep going?-- No, it's all right.

No, no, no, I don't wish you to stop because I looked down. I'm looking down at some writing?-- No, that's okay.

The mere taking of the average, though, is, in itself, a difficulty because you are not taking the actual value at any particular time. You may happen to, because the actual time may happen to be exactly equal to the average, but at other times it may not?-- Yes, fair enough.

Now, that, I suggest to you, is a difficulty which evades the balance of the analysis in the report, and is not really addressed, and no attempt has been made, for instance, in relation to the oxygen, to take the actual drift; isn't that right?-- Yes, and it is only in a few cases that we have used Graham's Ratio because we felt the errors in oxygen negated the value of the Graham's Ratio that were available here.

All right?-- If you simply calculated Graham's Ratio on a face value - and as the results came out of the computer, they would not necessarily be indicative of the true Graham's

Ratio.

All right. Let me just ask this - about that point, then: I take it from the graphs you have indicated - or produced before - in relation to uncorrected and corrected Graham's, that, in fact, as the computer showed it-----?-- Yes.

----at the time of sealing, the Graham's Ratio would not have indicated a heating?-- I never intended to imply anything else, Mr Morrison.

No, I'm not suggesting you did. I wish to establish that clearly. As the computer showed it, looking at that ratio, that ratio did not indicate a heating, did it?-- No, unless - unless there was some trend associated with that, and I - we have not particularly examined that because of the difficulties in calculating the Graham's Ratio in the situation where we have got an oxygen analyser in some sort of error.

All right. And if one was not aware of the error in the oxygen analyser, then there is no reason to do otherwise than accept what the computer tells you?-- No, that's reasonable, unless you are aware of the deficiencies of calculating Graham's Ratio to that extent and query the accuracy of the oxygen determinations by some means.

Yes, that's what I mean by "unless you are aware of that oxygen deficiency"?-- Yes.

All right. Now, if I can just return to that point to complete it, though? It is the case, isn't it, that in utilising the correction-----?-- Sorry, can you start again? I'm-----

I will?-- I'm doing two things at once.

Same here. It is the case, isn't it, that in relation to the use of the correction of oxygen, that you have not taken the actual drift, but taken an average?-- I would find it difficult to determine the actual drift because-----

Could you not do so by reference to the point 14 recorded values?-- You might be able to.

Well, surely you would, because they would tell you just what point 14 was reading in fresh air conditions?-- Yes.

And can I ask you this question: you recognise in the report the difficulty - or the impact upon the ratios of having a mis-recorded oxygen level?-- Yes.

Now, it follows, does it not, that there is necessarily an impact on the ratios if there is a mis-recorded CO level?-- It will have an impact, but it will not be as critical as the impact of errors in oxygen.

You are here referring to the Graham's Ratio, of course?-- Yes.

I'm including other ratios, because half a dozen or so are mentioned in your report - Jones-Trickett's ratio, the Morris' ratio, and so forth?-- Yes.

Any ratio that depends on a particular gas will depend on the versatility of that ratio, depending on whether there is a drift in the reading of that gas on the analysers?-- Particularly so if it was one related to oxygen deficiency.

And if there was a drift on CO, that would impact, on, for instance, the CO/O₂ ratio as well as the CO/CO₂ ratio?-- Yes.

Well, I take it from what you said that you haven't, in fact, gone to the point 14 recorded values to see whether, in fact, there was a drift on other gases - that is an analyser drift on other gases as well as O₂?-- Analyser error - not particularly. I believe the carbon monoxide was - results on point 14 were quite low. There was an error in methane, if I remember rightly - about .15 per cent - and the CO was very low. CO₂ I can't remember.

That's your understanding of it, but you haven't, in fact, gone, for the purposes of doing this analysis, with these ratios - you haven't, in fact, gone on to take account of the analyser drift for various gases other than O₂?-- No, because you wouldn't normally expect to be seeing carbon monoxide in point 14.

Correct. All right. We will come back to that shortly. Now, can I take you to page 42, and you are here discussing carbon monoxide make in 512 panel?-- Yes.

And you make the point that CO has long been fairly universally recognised as the primary indicator of spontaneous combustion?-- Yes.

Can I just pause to ask you something? You have had some deal of experience in Australia looking at, no doubt, the Graham's Ratio and other ratios and the use of them?-- Yes.

I take it from the tenor of your report that the primary indicators are CO parts per million, CO make and Graham's Ratio?-- Yes.

Not CO/CO₂ ratio?-- I'm not so familiar with it. Dr Cliff has done some work on Bowen Basin gas indicators and he might be able to elucidate more on that than I could.

In terms of its use in the industry?-- Not common.

No comment?-- Not common.

I thought you said you can't comment?-- Not common.

Not common. It is the fact in Australia it is not used, is it?-- For the early detection of spontaneous combustion I haven't heard of it, but it would probably be used in a situation of - perhaps of a sealing to control a heating-----

Yes?-- -----when other people come in to assist a mine operator in understanding what's happening.

In a sense, we are talking about, then, the aftermath of the incident, rather than the onset?-- Yes, yes.

Now, going back to page 42, you mentioned at about point 6 of the page: "By the end of June 1994, the rate of carbon monoxide make had exceeded 10 lpm, and did not again decrease below this figure." You go on: "A make of 10 lpm is indicative of the state of a heating requiring investigation."?-- Yes.

You there refer to Strang and Mackenzie-Wood, to a publication by Mr Wright, and by Mr Cliff?-- Yes.

Now, you have read those publications, of course?-- Yes.

In fact, Mr Cliff's publication merely quotes Mackenzie-Wood, doesn't it?-- It may well do, yes.

So, in fact, it is not a new piece of analysis or research?-- No.

It is really just a multiple citation of the original source?-- Well, you might say that. I think it was indicated to show that there were alternative sources of information for that.

Well, maybe alternative, but not further sources?-- Yes, more extensive.

More extensive reference to the same thing, that's all it is, isn't it?-- Yes.

Now, do you know the source of the information that Mr Mackenzie-Wood had for including that reference in his work?-- I believe that was a personal communication to somebody in Germany.

Do you know what the person - the terms of the personal communication?-- No, I don't.

Do you know if it has ever been published, just what was said and in what context?-- No, I don't - other than in the context of the paper that he published.

That Mackenzie-Wood published?-- Yes.

So, so far as you know, there is no document or piece of literature that elucidates just what it was that was communicated that led to that statement?-- No. I presume he analysed that and decided it was worthy of passing on.

Of mentioning?-- Yes.

But certainly ascribed to some communication with some person in Germany?-- I have had a look at the paper and, as I

understand it, that is the citation for that.

All right. It seems, with respect, an unusual approach for a scientist to use that as a source of reference - reference source?-- Not necessarily.

Is it not? Do you do that sort of thing yourself in your works?-- Personal communications?

Mmm?-- I haven't had requirement to do that. I can't answer for how Mr Mackenzie-Wood would do it, but it is a regular citation in a scientific-----

Scientific sense?-- Yes.

Now, let's just discuss that for a moment. You make the point in here that the levels were in respect of German coals and they may well be different for Australian coals?-- Yes.

You know of no work, I think, which has tried to demonstrate whether they are applicable to Australian coals or not?-- No, I can't say that I do.

I assume, to get in first ahead of you, if I may, that that's no doubt something you think SIMTARS should look into?-- It was something that I felt should have been looked into some time ago.

All right. Now, in relation to German coals, there is also - so far as you're aware, I take it - there is no work comparing the German coals to Bowen Basin coals, for instance?-- Not specifically. There is some work done comparing - I don't know that there is any work done in this line on German coals - in looking at the products of spontaneous combustion for German coals.

All right. Now-----?-- I'm aware of work in the UK and in Australia.

Now, you know something of the method of mining in Germany, don't you?-- Yes.

And I think you are aware that the 10 and 20 figures are applicable to long wall operations?-- Yes.

More particularly, advancing long wall operations?-- I'm not so sure that it is advancing long wall operations. I believe they also operate retreating long walls.

If these figures were referable to advancing long wall as opposed to retreating long wall, that may have an impact on their applicability to Australian conditions, because Australians - Australian mines, I think, don't utilise advancing long walls; is that right?-- That's right, it may have an effect.

Well, there is a difference in the way that ventilation operates between advancing long walls and retreating long walls?-- Yes.

And the possibility or probability, in fact, that on an advancing long wall, the ventilation is going to leak in through the goaf?-- Yes.

Now-----?-- And give possibility to greater spontaneous combustion.

Yes. Now, in relation to the German experience, did you have any understanding that it was, in fact, in relation to - developed in relation to seams where advancing long wall was being operated and seams were caving one on top of the other in that operation?-- Not particularly.

No. That would have an impact also on whether one could apply these empiric figures to these in Australia?-- I'm not sure. I think there is a lot of things that you could say as to how you could apply these empiric figures to any particular situation.

The fact of the matter is, though, that whatever the source of this information and in whatever terms it was communicated, it seems certain to have been in relation to German coals, in relation to an advancing long wall operation?-- I can't comment so much on the advancing long wall operations, but certainly long wall, certainly German.

Do you know of no work that shows, in fact, that those figures are applicable to Australian coals, more particularly Bowen Basin coals?-- I assume they are derived from the experience of German operators who have used these to control their spontaneous combustion incidents in their long wall mines. Based on experience, I don't know that there would be any scientific work, you might say, to prove or disprove.

In terms of its application ability to Australia then you mentioned a couple of times that there was - in the absence of anything else it was appropriate to refer to these figures; do you recall saying something along those lines?-- Yes.

But in fact there is no evidence to show, is there, that these figures are in fact applicable to Australian coals; isn't that right?-- I wouldn't think that the results that we had to apply to Australian coals would vary very much by them. Coal is coal. Heatings are heatings.

But surely, Mr Humphreys, it would be appropriate to know whether the figures were in fact applicable to Australian coals, and isn't it not the fact that there is no work which reveals that?-- Not that has been published as far as I know.

No, and from a scientific point of view, from a scientist's point of view, surely it's more appropriate to look for evidence of application ability rather than assume application ability and look for evidence of debunking, isn't that more appropriate from a scientist's point of view?-- Would you re-state the question, please?

Yes. Surely from a scientific point of view it is more appropriate to - I'll rephrase it, to apply those figures only when there is evidence that they can be legitimately applied rather than simply apply them on an assumption until such time as someone turns up some evidence to debunk them?-- From a scientific point of view, yes. We were dealing in a practical situation.

From a scientist's point of view, from your own point of view, in terms of the publications you might put out knowing that people might adjust their positions underground and how they treat underground operations in reliance on what you say, surely you would want to only publish material that is properly verified?-- From a strictly scientific point of view, yes, but these are not meant to be iron clad guidelines. As I indicated to Mr Martin it is not a case of 9.9 and you are all right and 10 you are in trouble and 10.1 you are in worse trouble. The theory behind it still holds good to allow comparison between similar panels to compare the makes between similar panels without necessarily being slavishly driven by the CO makes.

You referred yesterday in fact to the point you could adopt a certain behaviour provided you weren't blindly accepting or slavishly being addicted to those levels?-- Yes.

It would be incorrect, wouldn't it, in your view, to promulgate those figures as though they had any empirical significance, that is to say at nine you've got a problem, at 20 you've got considerable danger. It's quite wrong to do that?-- I think that they have always been promulgated in a way that suggests just exactly that, that they are guidelines, not boundaries not to be crossed, and as I say, slavishly enforced.

In that sense they are merely another piece of data leaving

aside the veracity of the data, just another piece of data that one might take into account?-- Another indication. When we are talking about carbon monoxide levels there are no set values. If we go back one step back to carbon monoxide monitoring, there are no set values that say you have a heating or you don't have a heating. It is a case of trend analysis, looking at upward increasing trends in carbon monoxide, and I think the CO make concept provides a - shall we say, a firmer ground for that carbon monoxide trend analysis by being able to use those to compare between one panel and another and see how the trends did develop.

Indeed, and in relation to parts per million there is no basis for saying this amount is high and that amount is not. It's only by, again, trend analysis that one can establish it?-- By looking at the backgrounds and the norms for a particular situation.

Which is in fact one of the points you make in the next paragraph "Up to a few hours before sealing the absolute levels of carbon monoxide were very low and did not exceed 9 ppm as recorded by the tube bundle system."?-- Yes, that's very low when - but you've got to put it in the context of in a very high air quantity.

That has an impact then on CO make, doesn't it?-- Yes.

But absolute values being very low again, all one can do - all one should do is make a comparison from time to time, whatever that time selection is?-- Well, that's the idea of the continuous mine air monitoring system, to allow those trends to be detected as soon as possible.

Now, in the next paragraph you go on to refer to -----?-- Which page are we on, sorry?

Page 42, the same one we have been discussing?-- Paragraph?

The last paragraph on the page, half-way through that you have, "Calculations shown in Table 5.3.2"?-- Yes.

Which is, I think, on the next following -----?-- Yes.

----- page, "...indicate a carbon monoxide make of 20.0 L/min."?-- Yes.

"This point has been plotted on Appendix 5.3(A) but not taken into consideration in calculating the line of best fit."?-- No, true.

Why was that?-- Because of to some extent some doubts as to the concentrations being observed at that monitoring point, and there could well have been - could well in the panel have been higher than that because of the impact of the position of the monitoring point in relation to the panel.

Now, at the point that we are discussing, the 20 litres, when was that?-- That was an average for the period of time from sealing to - for 24 hours.

Okay. Now, can you turn the page, please, to page 44?-- Yes.

You included a table here, this is 5.3.2 at the top of the page?-- Yes.

"Calculation of estimated carbon monoxide make in 512 Panel after sealing."?-- Yes.

Now, in one of those tables you - I'm sorry, I should start again. When you use the term "carbon monoxide make" here, it's not in the same sense as we have been using it otherwise?-- No, it's the rate at which carbon monoxide accumulated in the panel.

Now, in (e) you record carbon monoxide at 23:57 (sic) on 7 August?-- Yes.

At 161 ppm?-- Yes.

Now, would you accept the proposition, as has been put by others, that that may not be representative of what's in the panel?-- Yes, that could be true. I would expect it to be higher.

Because in the panel there is no stirring mechanism such as ventilation would cause?-- Yes.

In normal events?-- Mmm.

And there is only one monitor point which is out - just in by the belt road seal?-- Yes.

And therefore the 161 really is not necessarily representative, is it?-- No.

And if it's -----?-- Not of the entire goaf.

And if it's not then that has an obvious impact upon this calculation, doesn't it? This calculation is only valid if that's representative?-- Yes, it will, and as I say, I would have expected that the carbon monoxide concentration would actually tend to be higher as an average over the panel.

Why do you assume that?-- Because if there was a - unless the oxidation taking the panel is only due to ambient temperature oxidation, if there was a heating in the panel then there is a source of carbon monoxide in that panel which will be more than likely remote from the sampling point. Carbon monoxide concentration will tend to be low.

So this calculation then seems to proceed on the basis that the 161 may be representative because there is a heating and therefore we can use it to demonstrate that there is a heating?-- No.

That seems to be the analysis?-- If there is a heating it will be an underestimate.

Well, the only way in which you can sustain 161 then is on the assumption that there is a heating; is that right?-- No, quite the contrary. The only way I would attempt to sustain 161 is if there was not a heating and the oxidation is more evenly distributed through the panel.

But in fact I thought we agreed that 161 is not necessarily representative of the panel, and your answer to that is to say it may be because it may be greater elsewhere because of a heating?-- Yes.

Isn't then the analysis proceeding on the basis that we use 161 because we assume there is a heating and we use it then therefore to calculate that there is a heating. Isn't that the way the analysis seems to proceed?-- No, I don't agree.

Okay, you don't agree. By your answer you obviously took into account the positioning of the monitor point?-- Yes, if it's remote from the potential heating it will tend to underestimate the carbon monoxide present.

But there is no way of knowing just what the ventilation flows or convection flows were inside that panel?-- No.

It's a matter of complete conjecture really, isn't it?-- Not necessarily complete conjecture, but we know we don't have a raging tornado down there. It will be by convection, density effects and the like.

All you can do is draw the conclusion that if there is a heating down there there is some convection effect, but even so you can't pick precisely -----?-- Convection and diffusion effects, the gases will tend to even themselves out over time.

So then are you really suggesting that the 161 is in fact representative?-- It may or may not be representative, Mr Morrison, but I would think that if there was a heating in there it is an underestimate.

Now, in relation to the next paragraph on that page, the one commencing, "As indicated..."?-- Mmm.

This again makes the point that I raised with you before, the last pre-explosion sample could not have been seen by anybody on the surface?-- Definitely not.

And am I right in thinking that it is the one which indicated the jump in CO, the large jump in CO?-- Yes.

So that jump, I think, was from the 160 level to in excess of 1,000?-- Yes.

And that could not have been seen by anybody on the surface prior to the explosion?-- Never meant to imply that and I don't think it is implied in our report, Mr Morrison.

It may not be implied, but I need to have the point clarified, if you just bear with me. Can you go further down on that page to Table 5.3.3?-- Yes.

In that table that you refer to there, the last entry is the carbon monoxide level that we have been discussing and it's greater than 1,000 ppm?-- Mmm, yes.

Now, that's the limit of the machine?-- That's right.

And you can't tell, can you, what the actual level was?-- No.

Now, when you go down to the paragraph immediately under that?-- Yes.

You have worked out a carbon monoxide make in excess of greater than 11,500 lpm?-- Yes.

Is that predicated on that figure of carbon monoxide?-- Yes.

In fact we can't know what the figure is, can we?-- I don't think so, no. Certainly it indicates that some condition has changed in that panel considerably in terms of the detection of it. Some condition has changed considerably in that panel and has manifest itself in the results we see at 23:49.

And that change has manifested itself in the 14 minutes between the last sample and this one?-- It's manifest itself, but not necessarily taken that long to occur because of the

I'm sorry, I will interrupt you but only to say manifested itself at the surface is what I mean?-- That's right, yes.

In that time the relevant entry could not have arrived before the explosion?-- No.

Can we just go down the page a little bit to the comparison of 512 CO make with previous panels?-- Yes.

Now, you refer there in Appendix 5.4(A) to the graphs that you have done making a comparison of those figures?-- Yes.

Of those panels, I should say. Can I take you to those if you can pull them out? Now, the work sheets that are used to plot these are in Appendix 2(A), aren't they?-- I believe so. I will take your word -----

You might need them, in Volume 1?-- A.2 or 2(A)?

I'm sorry, you are correct, A.2, Appendix A.2?-- Yes.

These are the various data sheets for these panels. Can I ask you to look at the one for 5 North?-- Yes.

Page 7 is the relevant section?-- Yes.

Now, on page 7 on 20 March we see that there is a total CO litres per minute of 14.14?-- Yes.

Is that graphed on the graph for 5 North in Appendix 5.4(A)? I'm going to suggest to you it's not?-- No, I have to agree

with you.

And it has some significance, it's 130 days from the start of extraction?-- Yes.

But it's not on the graph. Can you explain why it's not on the graph?-- I cannot.

Can I ask you to look then at the figures for 401/402, I think slightly back in that same appendix, and if we look at those at page 1, that's right at the start of that appendix, we see that for 402/401 on 15 November 1993 - sorry, I'll just - 5 November 1993, I'm sorry. Did I say 15? 5 November 1993, it's the top of page 2, there is a CO litres per minute reading of 6.36?-- Yes.

Is that plotted on the 401/402 graph? I'm going to suggest to you it's not?-- No.

And it's 112 days from the start of extraction and would have some impact on the graph, wouldn't it? Can you explain why it's not there?-- No, I honestly can't.

I see. Well, certainly in respect of those points and the impact they have on it, the graph is misleading, isn't it? It must be, must not it?-- I just cannot understand how that

Can we move on - I'm sorry, do you wish to respond any further? I don't mean to hurry you, I wasn't sure if you were thinking or had stopped?-- I'm just perplexed as to what has happened to those numbers unless the information that was supplied to - sorry, can we just start on 402/401 in - I was thinking that 5/11 was actually the start of that table. I have missed the first -----

Top of the second page, 5/11, 6.36. It's not graphed on the graph and I'm wondering why, and I can help you by saying it's 112 days from the start of extraction. If you can't say why it's not on the graph then that's -----?-- At this stage I can't say why.

Fine, we will move on. Can I ask you to go over the page to page 45 of your report, please? Now, you make the comment there in the paragraphs at the top of the page preceding section 5.5, you refer to the carbon monoxide make for 5 North, 40 litres which was double the previous day's result?-- Yes.

You then go to say, "There is a similar pick-up in the carbon monoxide make observed in 512 Panel just prior to sealing."?-- Yes.

Well, that's not really true, is it? You say 5 North doubled in a day; there is just no such event in 512, is there?-- There was a pick-up between the last result taken on the Friday and the result that Neil Tuffs obtained that Saturday evening.

We are not comparing like with like, are we?-- It's not nearly as severe, but we are talking about trends.

And, in fact, as calculated, Mr Tuffs told us his make was 16.6 or 16.25?-- 25, yes.

So, it's significantly less than the points that we are discussing here, isn't it?-- Yes, but it still indicates a very much worsening trend in the carbon monoxide make at the end of that panel, and had it not been - if it had continued, then we would have expected it to keep going up.

That is not the point I am asking you. You use the words in the report, "There is a similar pick-up", similar being a reference to 5 North being a doubling in one day, 20 to 40?-- No, it's not a doubling.

And the word "similar" is inapt, isn't it? There may be a pick-up, that's the point you are making?-- Okay.

Would you accept what I say?-- Yes.

Now, can I take you down that page to table 5.5.1?-- Yes.

Now, you here set out basic figures for interpretation of Graham's Ratio in five instances, fresh coal and old coal?-- Yes.

Now, can you just explain to me, so that we can understand these figures, what is it in this explanation that tells us when does fresh coal stop being fresh coal and start being old coal?-- Obviously duration of exposure to oxidisation, to air. I cannot put a time on it. I would believe that the - that would be considerable - when I say old coal, it can be many years old.

The context here is to look at not only just Graham's Ratio but its applicability to, say, the sealing time. At that point in time, by the time of sealing in 512, could you even express a view whether a panel contained more old coal as opposed to new coal by whatever definition you use?-- I would believe it contained more new coal than old coal.

Well, am I right in thinking really that the absolute values here are meaningless unless there is some experience or work done in relation to the particular seam to show that they are in fact applicable to that seam in that way?-- And some of that work has been done.

But the expression of these figures here doesn't tell us that, does it?-- No, not particularly.

Almost not universal figures?-- Not particularly.

And in no way can we define from this, and in fact you can't define it for us, it seems, when fresh coal or new coal stops being fresh coal or new coal and becomes old coal, and it seems to matter for the way in which one reads the figures?-- But if one was to see a ratio indicative of a heating in any

circumstances, the plus 1 per cent, I don't think it would - you would have to be concerned whether it was new coal or old coal. One would have to test one's assumption of the presence of that heating.

As against the actual seam in question; is that right?-- Sure enough.

I mean, from your comment then why have this designation new coal/old coal and differing figures that one is supposed to have regard to? It seems meaningless, doesn't it? If, in truth, what you say is that one should simply have regard to, say, a 1 per cent figure, for instance, whether it's new coal or old coal, then why bother with all this stuff?-- Fair enough.

Well, it's not very helpful, is it? I mean, we are here talking about not only this Inquiry but for moving forward as well; it's not particularly helpful, is it?-- No.

Your Worship, I am about to move onto a different point, and I suspect if I can have the extra five minutes in the lunch break, I will do it a bit better than I would if I skipped along now.

WARDEN: Thank you, gentlemen, early finish this afternoon. It's appropriate to take the luncheon adjournment now for one hour. Resume at 1.30.

THE COURT ADJOURNED AT 12.25 P.M. TILL 1.30 P.M.

THE COURT RESUMED AT 1.38 P.M.

MR MORRISON: Mr Humphreys -----?-- Before you go on, Mr Morrison, could I ask you to go back to a couple questions you asked me before?

I wish you wouldn't, but off you go?-- I'm sorry.

You are going to test my memory, aren't you?-- You asked me a question with regard to the possible cross-contamination of carbon monoxide.

Yes?-- You asked me if the possibility of retention of carbon monoxide in the analyser had been considered.

Yes?-- As a possible cause. Having had time over lunch to think about that, those possibilities were discussed, and I have seen that phenomenon before, and in this case it was discussed and discounted as a possibility.

Purging was discounted?-- Yes.

I see. On what basis?-- That the flows that would be required to cause that phenomenon - let's say we have had a high CO result come in at a certain time and the next analysis comes in immediately after that - we are sampling another tube - the flows would have to be very low on the second tube to have caused the retention of that carbon monoxide, and I am talking very low, and we considered at the time that that wasn't the case and I think it was also subject to some testing - I'm not entirely sure on this - to some testing during the time that Dr Cliff went to Moura.

The leakage we are talking about then, if we call it leakage, you are discussing that in the context of CO?-- Well, it would actually affect all of the gases to some extent.

Precisely?-- However, the effect will be greater depending on the difference in concentrations between the tube that's being sampled and the possible source of leakage. So, if we were looking at oxygen, for example, where they might both be near 20 per cent, then the odds are - you will not see any substantial effect, but if we were looking at a tube that was leaking into the solenoid valve bank with a considerable quantity of carbon monoxide - and by that I mean hundreds of parts per million or perhaps thousands of parts per million - then a small amount of leakage in that solenoid valve bank can produce what would normally be regarded as significant quantities - volumes - sorry, I will get it right - significant concentrations of carbon monoxide, but they may not show themselves in the oxygen or the methane or the CO2 because of the relative sensitivity of the carbon monoxide detector being in - basically in parts per million compared to the sensitivity of the methane and CO2 detectors.

Sensitive as they are, though, that question of leakage is something that can potentially affect all the gases, is it not?-- Yes, to some extent. Greater or lesser extent depending on the difference in concentrations between the tubes and the degree of leakage, and I think here what we are talking about is perhaps as little as maybe - maybe even less than 1 per cent.

In respect of what?-- The volume.

The volume?-- Yes. If we were looking at a particular tube that was, say, pinched, so there is a very high pressure being - very high vacuum on that tube, then the - and there was some cross-leakage from another valve which may have some dirt under the seat or something like that, then we may only be talking of a matter of percentage, 1 per cent, say. So that if we had, for example, 1,000 ppm in a line which was leaking into the solenoid valve bank into a sample which had no carbon monoxide and had 1 per cent cross-leakage, that might give us 100 ppm carbon monoxide.

Consistent with what you say, though, if it's leakage, it should really be confined to the leaking tube, shouldn't it, so that we should only pick up the override on the same point of every sequence?-- I think it would be - the probabilities of the leakage effect would be higher on tubes which are

pinched and, therefore, the vacuum that is being pulled on that tube is much higher and the leakage will tend to be higher because there is a high pressure differential between all the other tubes which are connected to the solenoid valve bank and that one. Now, that isn't to say that all the valves in a solenoid valve bank are leaking and causing some cross-contamination. It would be indeterminate without doing substantial testing on the solenoid valve bank.

If we see, in fact, the override effect appearing not just in respect of one sequence each time, that is one point to another point, one could reasonably conclude, couldn't one, that it was something other than a tube leaking?-- I'm not sure what you mean by from one sequence to another.

Well, for instance, if we constantly saw, or routinely saw, that point in the sequence - that point 8 read higher always following a very, very high reading on point 7, just to take a non-real example?-- That could either be retention of the carbon monoxide in the cuvette, that's a possibility, which we discounted.

That's the purging?-- Yes, or it could still be cross-leakage from - did you use the term tube 8?

Well, any two tubes in sequence?-- If tube 8 had a very high concentration of carbon monoxide in it, then it might be - it may - if it reflected itself consistently in tube 9, if there was some high level of CO, then perhaps you might say it was due to retention of CO in the cuvette from point 8 to point 9, but if it went to some other point - let's say the high CO was in tube 8 and somehow it was being seen in tube 3, that was the sequence, then I would suspect it was not - it can't be retention in the cuvette but some sort of cross-leakage.

That, of course, assumes that the leakage is from the same tube all the time, doesn't it?-- Well, if you have got a faulty - a valve which is leaking, then it is not going to remedy itself. It is likely to persist in that faulty condition.

My point was that if you saw that override in more than one set of sequences, in other words, not just to take-----?-- You have got a full cycle.

Not seven/eight each time, seven/eight, seven/eight, but also four/five, and another time six/seven, all according to high readings - a high reading then an override you would have to, on your thesis, conclude that every one of those solenoid valves was leaking in order to account for it?-- Not necessarily. They could be real values.

Yes, I suppose - yes, that's an alternative, but let's assume they are not real values; they are, in fact, an override, because that's the concept we are discussing. If you get it randomly point to point, then on your thesis that has to be leaking valves, correct?-- I'm not sure what you mean particularly by "randomly".

Well, I'll explain it a bit better if I can, all right? The sequence I put to you is this before: you mention that it was considered and rejected - this is the purging - in favour of the leaking valve explanation?-- Yes.

And what I'm suggesting to you is this: now, if you looked at a series of readings - a series of sequences of all points turning through - 1 through to 14 and 18, and so forth, and if on a number of those sequences it came up that there was a high CO, for instance, in seven, then a bumped up reading in eight, you might conclude that that's a leaking valve affecting that turnover?-- If there was a reason - sorry, start again. If the pressure differential generated by the vacuum pumps on the subsequent points was high relative to the vacuum being generated on the contaminating - then, yes, it might continue to contaminate additional points, but it may not be confined to one particular tube, depending upon the state of the valve that's involved and the pressure or the vacuum that is required to draw the flow through that tube, and that would be a function of the length of the tube or the fact that maybe it was in a pinched state.

On your thesis, then, there could be one leaking solenoid valve that can cross-contaminate across sequences, not even to just the next point, but to points several seconds down the line?-- If it was very bad. It is, I guess, hypothetically possible that that is the case, but I think the contamination you tend to get would tend to be - what would you say - trace quantities from the leaking valve.

In order to have this, one has to have a point that is constantly reading high CO, because that's the source of the contaminant?-- Yes, you are going to have to have a point at a concentration which is consistently higher than the values - than the concentrations in the other tubes in which it has

been contaminated. If, for example, both were showing 500 ppm - if all were taken as 500 ppm, then cross-leakage wouldn't affect the results.

But if one had that high contaminant tube - by which I mean it is a tube reading high CO - and, in fact, there was a leaking solenoid valve associated with that tube?-- Yes.

Why would it - as a matter of logic, why would it not contaminate the next point in sequence as opposed to skipping that or a few points and turning up randomly?-- Only if the next point in sequence had some reason for the purge flow rate going through the analyser to be exceedingly low.

So, you would have to have the leading valve and a pinched tube as well? I mean, that's really what it is, isn't it?-- No, in the case of cuvette poisoning, you would have to - you don't even have to have leaking valves. Leaking valves don't come into poisoning from in a sequence, because what will happen is that you will pass a high concentration of gas through on - let's say sample tube No 1, okay - when it changes to-----

2?-- -----2, if the flow rate on 2 is nothing, there is no way of displacing the gas in the cuvette - the infrared detector - and you will always get a contamination on 2. It will be consistent. Number 3 may come on and it has 2 lpm, flushes out the cuvette and the problem disappears.

Yes, that's the purging effect that we have been talking about, isn't it?-- Yes.

Rather than a leaking solenoid valve?-- Yes, that's right, but if there was a leaking valve and we had a tube which was showing excess concentrations of - or somewhere there is an excess concentration of carbon monoxide and that solenoid valve is leaking so that the purge pump could draw a small quantity of that high concentration of gas into the inlet manifold for the purge pump, then the - the tube that is likely to be contaminated - most likely to be contaminated is one which has been pinched.

Yes, well, that's just the point I thought I was trying to make to you, but then again maybe I wasn't making it clearly. In order to have this sequence you refer to really pre-supposes not only a leaking solenoid valve, but also probably a pinched tube?-- Yes.

A pinched tube next in sequence or down the sequence?-- It requires three components. It requires one or more tubes with a-----

A leaking valve?-- May I finish?

Sorry?-- One or more tubes with a high concentration of some gas on it - we will settle on carbon monoxide - one or more - around that valve may leak. It also may require - and is most likely to occur if one of the tubes is pinched and has a low concentration of carbon monoxide in it. In that case it is

possible to get contamination from the high CO tube through its leaking valve to the low CO tube, and that contamination may not be discernible in other tubes which are not pinched because the pressure differentials don't - well, either they have enough flow to dilute the carbon monoxide out or the percentage leakage through that valve diminishes because of the change in the pressure differentials.

Which is why I postulated to you before if you see it turning up in the random sense and not at sequential points it necessarily pre-supposes that there is at least one leaking solenoid valve and more than one pinched tube, isn't that right? If that override occurs on more than one point - not the same point each time, but more the one point - the way you are postulating it requires at least one leaking solenoid valve and more than one pinched tube?-- I don't see how it could come about randomly.

Unless it was by simply an inability to completely purge, notwithstanding that the correct volume is being entered?-- I would have thought that the reason for it not completely purging would be the fact that the tube on that particular sample line was pinched and in incapable of providing a flow necessary to purge the gas analysers.

Let me ask these questions hopefully to finish this point off: do you have any evidence that there were any such pinched tubes?-- Only based on the calculation of the post-explosion lag times. There were no indications of - what would you call them - flow low alarms, but I think, as I understand it, the flow low alarms had to be - the flow in the tubes had to be exceedingly low to-----

Set off the alarm?-- -----set off the alarms, and that was verified during testing between the November session and the commencement of this session, I believe.

Now, you just mentioned that the only indication is the post-explosion rate - post-explosion analysis?-- The analysis that I have done - that has been done in our report is on what the likely lag times were on the tubes.

Now, do you have any - there would have to be physical evidence of a leaking solenoid valve, correct, and if it is leaking, you must be able to detect it?-- You might be able to test.

You don't have any evidence of that, do you?-- Yes, again there was tests done between, as I understand - I wasn't personally involved - Dr Cliff went to Moura and demonstrated that phenomenon on site.

Demonstrated the override phenomenon, or demonstrated the leaking valve?-- The cross-leakage.

Well, the leaking - the leaking solenoid valve is the explanation for that, so you demonstrate the result, but I'm asking if anyone did actually find out that there was, in fact, a leaking solenoid valve by testing physically?-- I

think the way the tests were carried out in Moura was a demonstration of the - of that leakage.

I think I understand what you are saying?-- The tests were designed to demonstrate leakage of the valves.

All right. No doubt we will find out about that. Now, can I - there was some other point you wished to raise. You mentioned you wanted to take me back to a couple of questions. Is that the only one?-- You only asked me to explain a couple of points on the CO make panels, and I said I couldn't explain them. The only explanation I can give you is a typographical error in that the numbers that we used to generate those were keyed in by hand from our - the data supplied from BHP through the inspectorate, and that is the only logical explanation I can give you.

You are there talking about the graphs for 5 North and 401, 402?-- The points that you took me to and you asked me whether that made - I don't know that you have said "invalid", but-----

I said "potentially misleading" because some relevant points are not in there?-- I think that the relevant points are probably in there, but it may well be that it has been typed in as 15.14 instead of 14.14, and obviously the - that could be taken into account in looking at those trends.

You obviously had a chance to look at this over lunchtime. Are you saying that those points are, in fact, in there, but typographically wrongly recorded?-- Could-----

Or is this some supposition of yours?-- I can't confirm exactly that they are typographical errors. I would have to have a look at the work sheets that I used to generate those and just check them out.

Well, if the position is you can't give us an answer now, then fine, you can't give us an answer now?-- That is the best explanation I can give you at this stage.

There are some other matters you wanted to raise?-- No, that's-----

Okay, thanks. Now, before lunch we were talking about, amongst other things, the Graham's Ratio, and what I want to ask you is this: after a panel is sealed, the level of oxygen drops; that's correct, isn't it?-- Yes, it will be displaced by methane and consumed by oxidation, whether it be ambient temperature oxidation or a heating.

Would you agree with the proposition that that drop in oxygen artificially inflates the Graham's Ratio?-- It depends on why that - why that drop has been - has taken place. If the drop is due to displacement by methane or carbon dioxide or some other gas other than nitrogen, then the oxygen deficiency and the Graham's Ratio will not change. That is because the proportion of carbon monoxide and oxygen and nitrogen will remain the same as they are displaced by one of those - one -

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a gas other than those three, and therefore the Graham's Ratio will remain the same.

XXN: MR MORRISON

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WIT: HUMPHREYS D R

Although nitrogen is always taken at its full value, it's never taken at less than its full value?-- How do you mean?

In calculating the formula?-- No, it is not. Nitrogen is taken at the value that is occurring in that goaf, not at 79.03 per cent. In the formula it is meant to indicate the nitrogen in the atmosphere, not in the atmosphere that we are breathing, but in the atmosphere that is being sampled. So long as the ratio of oxygen to nitrogen remains .265:1 the oxygen deficiency will not change, and so long as the CO remains in the same proportions to the oxygen and the nitrogen in the atmosphere, in that particular gas sample the Graham's Ratio will not change.

Are you disagreeing with the proposition then at the end of the day which I thought you agreed with at the start of your explanation, that the drop in oxygen can artificially inflate the Graham's Ratio?-- I wouldn't say artificially inflate. I think that as the oxygen tends to drop the errors in determining the actual oxygen deficiency become less significant and the Graham's Ratio can become - better reflect the true Graham's Ratio given -----

This is post sealing we are talking about?-- Yes.

I see, all right. Well, in essence you disagree with the proposition?-- Would you state the proposition again?

The proposition was that after a panel is sealed and the oxygen levels drop, that drop can artificially inflate the Graham's Ratio. That's the proposition. I thought you agreed with it, but it seems you don't?-- I guess I would have to agree with you. It could artificially inflate it due to the effect of analytical errors at near air samples. It will tend to artificially inflate it to a value which is more near the correct Graham's Ratio, okay? But after - there has been a sufficient increase in the oxygen deficiency so that the errors in oxygen deficiency become insignificant compared to the oxygen deficiency, that is when you will start to get your true Graham's Ratio and you may actually see your - you will see true reflections of the Graham's Ratio.

From what you say then you in fact have increasing utility from the Graham's Ratio after sealing?-- Yes.

And that's infinite in time?-- I couldn't comment on that to be truthful. There are other factors to be taken into account in considering Graham's Ratio as time goes by, and I think I indicated some of those in the early part of questioning from Mr MacSporrán, that in the absence of a seam gas the atmosphere will reach a point where it doesn't change any more. There may not be a heating in there, but we may have a large quantity of CO that has been a result of the heating and is not being displaced by a seam gas and the Graham's Ratio will perhaps stay artificially high.

How does one determine that point?-- Examination of the typical post sealing gas analyses.

Of a typical post sealing gas analysis or -----?-- Well, I'd say in a particular coal mine you would look to see if there was - in that particular case I predicate it by saying that it would have to be caused by the absence of a seam gas displacing the carbon monoxide. Obviously that isn't the case in Moura because we do have substantial quantities of -----

Seam gas?-- Of seam gas.

I understand?-- Other possibilities are that the Graham's Ratio could be affected by other chemical processes that could actually cause the Graham's Ratio to drop artificially because the carbon monoxide in the goaf is being chemisorbed or removed by some other processes other than dilution and that would tend to underestimate the Graham's Ratio. I think that the processes tend to - the processes tend to underestimate the Graham's Ratio except in the case where the Graham's Ratio isn't wrong, but it stayed artificially high indicating a possible state of a heating which really isn't there any more, whereas in the other processes it might be that it's gone artificially low.

To pull all those points together, you would disagree with the proposition then, as I understand it, that after sealing Graham's Ratio is of - I will put it in two ways - less or no utility?-- I would disagree with that.

Thank you?-- Could you - hang on, could you re-state it for me, please?

The proposition I put to you just then was that after sealing Graham's Ratio is, two ways, of less or no utility, of less utility or of no utility?-- I don't agree that it's of no utility. I think you have to look at it in the context of the situation you are dealing with.

Do you mean by that answer to agree with the proposition that after sealing it's of less utility?-- Than what?

Than it was before?-- Not necessarily. I would think that if I saw a Graham's Ratio which after sealing was on the increase, I would have to be asking myself what is it that's causing that increase, and before I could kick Graham's Ratio out and decide it was no good I'd have to come up with some other hypothesis to say why it's no good, because the consequences of getting it wrong are that you may have - you may interpret it as there is not a heating in there when there may well be.

I understand that consequences are potentially serious, aren't they?-- Misleading.

Just as are the consequences of asking people to conduct their behaviour in and under coal mines on the basis that 10 to 20 - 10 litres and 20 litres means something empirical when they don't? It's just as misleading, isn't it?-- No, sir, I don't think so.

Show me the evidence, if you would, that 10 litres and 20

litres mean the same thing for Bowen basin coals as they do for German coals. Is there any such evidence?-- I don't have any such evidence.

You don't know of any such evidence either, do you?-- No, but

In the absence of such evidence would you not agree that it's misleading to ask people to conduct their affairs on the basis that it has some relevance when in fact there is no such evidence?-- There is evidence from German experience, and in the absence of experience in Australian conditions then, if we are going to throw them out then we would have to come up with some hypothesis to replace the use of those and it may well be that they are low compared to being high.

You have no idea whether they are low or high, do you? What you've just said is a matter of absolute speculation on your part; isn't that true? Can I suggest it must be so because you know of no evidence that shows whether or not those figures are applicable to Bowen basin coals? It must follow from that that what you have just said to us is a matter of pure speculation. Would you agree?-- I think it's an exercise on a judgment decision, judgment basis.

Can I ask you to go back finally to page 45 and the next couple of pages of your report? Page 45 is where you pick up the first of a series of ratios which then go on through to the top of page 47?-- Yes.

And in order of their appearance they are the Graham's Ratio?-- Yes.

The Morris' Ratio?-- Yes.

CO/CO2 Ratio?-- Yes.

The Jones-Trickett's Ratio?-- Yes.

Can I ask you this: do you agree that what is disclosed there in relation to each ratio necessarily depends upon the accuracy of the reading for point 5 at 2349 hours? Each of the ratios utilises figures from that reading?-- Yes, that is true.

If that reading is wrong the ratios are out?-- Not necessarily, because there are a number of readings taken before 23:49 on point 5 which, if they happen to be trended, would support the conclusions drawn at 23:49.

These ratios have not been calculated on anything other than the reading at 23:49; is that right?-- No.

Can I ask you this - I'm sorry -----?-- 23:49 is the time when there is a sudden - we are talking about the same when there was a sudden change. There are other ratios in there which were calculated - I apologise for what I said, I thought we were talking about the sample before 23:49 at 23:35. The 23:49 is the 1,000 ppm and 5 per cent, 29 per cent CO2 and

18.17. Yes, I agree with what you are saying. They are purely based on that particular gas sample. There are other ratios indicated which are calculated on the results that were there before 23:49.

I understand what you are saying. Now, in relation to each of these ratios one of the things that is done in this report is that a view is expressed about potential temperatures?-- Yes.

Now, would you agree with this proposition - and I think we can see it reflected at page 46 towards the top, towards the end of the discussion about the Graham's Ratio?-- Yes.

That the temperature analysis is dependent upon - in terms of this report - the use of a .4 reduction in oxygen concentration. That will affect the temperature analysis in each case?-- I think for the purposes of the samples before 23:49 that is the case, but I believe that - I can't be exactly sure without going through all the calculations - that at 23:49 the effect of the .4 per cent error would probably be less significant.

Why is that so?-- Because -----

Because of the drop?-- Because in the case of the CO/CO2 Ratio, for example, it doesn't impact.

Yes, I should have corrected myself. You are quite right. In relation to that ratio it doesn't impact, but it does on the others, doesn't it?-- It may have an effect on the Morris' Ratio. It may have an effect on the Jones-Trickett's Ratio.

And the Graham's?-- And the Graham's, yes. However, the Graham's has on the top line a 1,000 ppm CO, and if there is an error in it it will still be a very large Graham's Ratio.

I understand that. I'm talking about errors in the oxygen rather than -----?-- Yes, if there is an error in the oxygen I would say the Graham's Ratio will be very high and that probably - that goes the same thing goes for Morris' Ratio because it's really a variation on the Graham's Ratio. They will still have very high values.

Well, it may do so, but here I'm discussing the impact upon the assessment that is made of approximate temperatures?-- Yep.

It certainly will have an impact on that?-- Yes.

If, for instance, the adjustment is less than the .4 it will have an impact?-- I think the point to be got from the changes in those ratios in that period of time is that they reflect a change - that the ratios reflect a change in temperature, that something has very dramatically changed in that atmosphere which allows -----

At that time?-- At that time, and it is meant to indicate that that is - what would you say, compatible with an increase in the temperature of a heating, not necessarily exactly to

200 degrees C, but the temperature is rising.

That's what I want to ask you, you see, because in each case where that matters, what I am suggesting to you will have an impact upon the temperature indicated on the ratio, right? I'm leaving out the CO/CO₂, you understand that?-- Mmm.

It will have an impact on it, won't it?-- It may do.

Well, for instance, in relation to the Graham's Ratio, in Appendix 5.5(A) you have a graph which shows at what temperature certain figures are?-- Yeah.

And on that graph for the sort of temperatures you are talking about, 200 degrees, you need a Graham's Ratio of something approaching seven, don't you?-- Yes.

That's fairly clear on the graph. I can show you one with extra lines written in, if you wish?-- So we use 6.2 per cent or something greater than 6.2 per cent to suggest a temperature of a couple of hundred degrees C. I think you will note there is a Graham's Ratio greater than 4 percent which, if we came across, would suggest a temperature in excess of 150 degrees C or thereabouts, and as we don't know what the carbon monoxide levels are and they are greater than that, then the temperature could be inferred to be greater than that which we are inferring from the ----

I understand. I understand what you are saying, but just follow me for a moment, if you would. On that graph in Appendix 5.5(A), for a 200 degree temperature you are talking about a Graham's Ratio of seven?-- Thereabouts, yes.

Now, if in fact the ratio calculated after a .4 percent oxygen adjustment comes out closer to six, then you can't sustain the 200 degree temperature estimation, can you?-- We can sustain it as greater than some temperature.

Yes, but you purport to give specific figures in this report, don't you, a temperature of about 100 degrees C, which suddenly increases to over 200?-- It is predicated by saying "about", and by saying "over about" 200 degrees C.

You can't be definite about the temperature range, can you? It's not really possible?-- No, no.

And we shouldn't read into this report as we read it any more significance about the temperature range other than that it has gone up from something to something; correct?-- The combination of the ratios tend to be self-checking. That is, that taken in combination they all tend to indicate the same thing.

Yes, but ----?-- And therefore to some extent what you might call self-verifying.

Yes, but that doesn't really answer my point. My point was that you, in this report, express particular temperatures even though you preface them with the word "about", but you select

particular values, and what I am suggesting to you is you can not select those values with any accuracy?-- One would also have to take into account the position of the tube and that will influence the ratios that are being seen, and I believe that the temperatures that were - would have been seen on that basis would perhaps be even higher.

Well, you don't mention that in the report, did you?-- I think further back we indicate there is a section on the difficulties of using a single point and reflect that - admittedly it isn't reflected in here particularly, in this section.

You are not suggesting we were supposed to read into that earlier reference about the difficulties of using a single point, the matter that you've just raised. We need to be a little bit more clear than that, surely?-- Perhaps we could have been a little bit more clear in that aspect of this part of the report, but the report was a compilation of people and - was a compilation of a multi-disciplinary group of people

I understand that?-- Working under considerable pressure.

I understand that also?-- That is not to be taken as an excuse for anything.

Please understand me, I don't - I'm not attacking you as though you are the sole author. I know you are not the sole author. What I am just interested in doing is just seeing how we are supposed to understand the report in this section. Would you agree with me that you can be no more than very general in relation to the temperature levels -----?-- At the very minimum what we could get from this part of the report is that there was a situation which some time between 23:35, I think it is, and 23:49 changed dramatically.

That's how we should read this?-- That is the very minimum way you should read that.

At the other extreme we can't read it as saying it was 100 degrees C which went to 200 degrees C, that's the other extreme, isn't it? You are not pretending that sort of precision is my point?-- No, I don't think we can pretend that sort of precision, but there is somewhere between those two extreme views that there is no doubt that there is a condition which has worsened in that goaf - as far as the indications from the tube sampling point is concerned that changed dramatically between 23:35 and 23:49 computer time.

I understand that, and that's -----?-- That is the minimum you can get out of it.

And that's really the essence of this part of the report, that change by a number of ratios shows something, namely, there has been a change and there has been - probably a rise in temperature?-- Yes.

But we can't be specific about the rise in temperature, can we, it's just not possible?-- I think that Dr Cliff might like to -----

Well, Dr Cliff -----?-- He is here right now in this place.

Can you answer me? You can't really do any more than be very general about these things, can you?-- That would be my feeling.

Now, can we move down through the ratios for a moment down to the CO/CO2 ratio?-- Yes.

Now, can you read the part of the report - the third paragraph under the CO/CO2 ratio. You say, "For 512 seals this ratio is relatively constant at about .2."?-- Yes.

Do you see that?-- Yes.

Now, the figures for this are derived from Appendix 5.9(A). Would you like to turn that up? I think you will find it in Volume 2?-- Yes.

Do you see that?-- Yes.

Now, can you find me where it was .2, please?-- I can't actually.

Can I suggest to you it was, if anything, constant at somewhere between .135 and .14?-- Yes. I've discussed this with Dr Cliff and the difference is that the - and it's not in the report - the difference is the CO/CO2 ratio in the Appendix 5.9(A) is based on a straight division of the CO concentration divided by the CO2 concentration at the sample point and that is what is displayed in 5.9(A), okay?

Right?-- In writing the text after these tables were put together, Dr Cliff recognised that in the curves used for determining these ratios for the Moura coal he had used what he would call artificial air which is straight oxygen/nitrogen mixture without any CO2 in it, and that is the CO2 - CO/CO2 ratio which is reported, I believe, in the figure, and the numbers that were reported here were adjusted accordingly to reflect those artificial air values.

So, you are saying the numbers were adjusted for the actual ratio even though the text wasn't corrected?-- Yes.

The text is wrong, isn't it?-- The 5.9(A) - the calculation of those in that part, as I say, is a straight division of the carbon monoxide by the CO2 without taking into account any

effect of the carbon monoxide in the mine atmosphere, and that was reflected in that section.

And without taking into account the possible drift on the analysers for those gases either; correct?-- Not specifically.

Well, not at all in fact?-- No, except to believe that - we believe those analysers were reflecting true values.

Yes, I accept -----?-- Reflecting.

I accept that that was an assumption you made, but if it's not correct, then it has an obvious impact, doesn't it?-- Perhaps.

Now, can we just move on in that sentence? .2 which isn't reflected in -----?-- Could you just re-equate me with where we are, Mr Morrison?

I am sorry, it's the last paragraph of section 5.7 under the section "CO/CO2 Ratio"?-- Okay.

If we continue on the sentence that I am talking about, the .2, which is not in fact reflected in Appendix 5.9(A), is then used to indicate again a temperature?-- Yes.

Now, if in fact the real values are lower than .2, then that statement can't be right, can it, about the temperature?-- One would have to analyse fully the impact of the assumptions made in this, and I'm sure David would be quite happy to cover that. As I say, I've indicated where I don't feel I am competent to cover these issues, and he is available if required.

Let me tell you, Mr Humphreys, I once asked a witness in the witness box to make calculations overnight, only for him to tell me that I could have the canary in the cage but I couldn't make it sing. I am not going to ask you to do that, it's a matter for them. Can we move on then to the next sentence which says, "Just prior to the explosion this ratio is seen to rise to greater than .38."?-- Yes.

Can we look at Appendix 5.9(A) to see if that .38 is shown there?-- No.

How do you account for then the figure appearing in the report if it's not in the data?-- Same reason.

Some other calculation?-- An adjustment for the presence of CO2 in air. The .03 per cent is always in air, and if you take note that the CO/CO2 ratio at 23.49 that's reported in 5.9(A) is .342.

I understand what you are saying. So, there is some analysis of these or some calculation that's not reflected in the report that, nonetheless, has resulted in these figures?-- Yes.

So, you should not read the report at its face value in that respect, should you, not in this section? The reason I ask you is because this goes on in the future, of course, and these sort of reports will be promulgated, and - if you pay attention to them - and it's important to know that you can't read this part of the report at its face value?-- No, I guess that's the case and it would behove us to provide a better explanation as to the adjustments that need to be made to that calculation.

Now, passing then to the Jones-Trickett Ratio, which is the next in sequence on page 46 of the report?-- Yes.

Data for this comes from Appendix 5.9(A); is that right?-- It actually appears to relate to 5.8(A) in the text.

You better check. I think 5.8(A) might be the graph?-- That's true.

And 5.9(A) might be the data, I think. Perhaps you can help me?-- I think there might actually be a typo there referring to Appendix 5.8(A). Sorry, there isn't actually a mention of where the data has been derived from. I see what you are driving at.

Now, if we turn over the page to page 47 while dealing with the Jones-Trickett Ratio, what we see in the last paragraph in the second sentence is this: "After adjusting for low oxygen levels the Jones-Trickett ratio for 512 seals is fairly constant at about .06."?-- Yes.

Can we see that .06 in Appendix 5.9(A)?-- I can, yes.

Now, has that been done on the basis of an adjusted oxygen figure or not? Can I suggest to you it's not adjusted in that appendix?-- It may not be.

It's not, is it?-- I couldn't absolutely confirm that.

Well, if it was adjusted, can I ask you to accept for a moment that the Jones-Trickett Ratio should be about .085, not .06?-- I accept that. I accept that without doing the calculation.

Now, can we know why it is that, on its face, it's said to be the ratio calculated on an adjusted basis but in fact seems not to be?-- I'm sorry, I misunderstood you. Perhaps it is done on an adjusted basis.

I'm suggesting it's not. It says it is but it's not?-- I can't explain that.

And that, of course, in terms of the assessment of what that reflects in terms of temperature, for instance, is an important matter. If the ratio is incorrectly calculated or assessed, then it has an obvious impact on the following assessment, doesn't it?-- Yes.

That's again perhaps highlighted by the fact that one can be no more than seemingly general in relation to this area of

temperature and simply say it's gone from some particular temperature to a higher temperature?-- Yes, fair enough.

Just pausing there for the moment. Do we understand correctly - do I understand correctly that all of these ratios are post sealing ratios?-- Yes.

As calculated?-- Yes.

And all predicated on that 23.49 period?-- Up to 23.49, yes.

Well, in terms of the actual data it is 23.49, isn't it?-- Yes.

Now, if one is talking about temperature, which you do in this report, and can I direct your attention back to page 46 at the end of the Graham's Ratio section, you there discuss average temperature?-- Yes.

Would you agree with this proposition: that the concept of an average temperature in a sealed area doesn't have much meaning in the sense that one doesn't have any and most unlikely to have an average temperature of a sealed area?-- The actual sentence is that the - these results would be indicative of a heating with an average temperature, not the whole goaf.

Well, you are saying the concept of a heating having an average temperature is a sensible one?-- It might be very difficult to decide where the heating stopped, where the normal oxidisation resumed, but at the end of the day, using those as an indicator, it still indicates an increase in temperature. There is an increase in this all of those ratios - there is an increase in those ratios from the time of sealing to 23.35 and 23.35 to 23.49.

I understand what you are saying in relation to that. Can you just tell me something else while we are on page 46? In the area of the Morris Ratio that you used there, is the formula as revealed there the same as that used by Morris and by Mr Mackenzie-Wood in his work or is it a variant of it, or can you not say?-- I cannot say. As I say, much of this has been pulled together by all of us and there may well be others who can better explain that.

Now, can I just ask you another thing? Can I take you to page 47 which commences with conclusions? That's the section I want to take you to, 5.9. Now, in the second paragraph you commence by saying, "All the indication ratios discussed above show the same basic pattern, that a heating did exist in 512 Panel and until about 30 minutes before the explosion was at an average temperature of 100 degrees C."?-- Yes.

Can we just pause and mention a couple of things about that? Now, you would agree with me, wouldn't you, on the basis of our discussion up to this point, that the reference to the average temperature of 100 degrees C is potentially misleading and cannot be that accurate? Particularly isn't that so if the ratios ----?-- It may mislead one into thinking that it's actually lower in temperature than in reality.

Well, it's not susceptible - particularly if the ratios are wrongly calibrated in some way, it's not susceptible of that sort of accuracy, is it?-- I couldn't say.

All right. Now, in fact you don't mean to say in that sentence, as I read it, and as I understand your evidence about the fact that the ratios were all post the sealing - you don't mean to indicate in that that the ratios show that there was a heating prior to sealing, all those ratios are post sealing?-- That is correct.

If we then go down to the next paragraph, from what you have just agreed with me about that, the opening sentence there really can't be sustained, can it, because it says, "It would appear, therefore" - in other words, based upon what you have just said - "It would appear, therefore, that a heating did exist in the panel before sealing but that its conditions worsened dramatically." The part that it's relying on is all post sealing data, isn't it?-- I don't think the heating has suddenly appeared after the heating - after the sealing.

That conclusion can't be sustained on what's gone on in the previous paragraph, can it, because you just agreed with me that the ratios are all post sealing and you did not intend, and we are not to read, that first sentence as meaning that there was a heating prior to sealing?-- I don't - I think it's meant to convey the fact that obviously nobody could have known about these ratios at the time of sealing. We are writing a report trying to explain what happened. We are not trying to write a report to say this is what could have been seen to suggest that - from the post sealing information that anybody could have determined that there was a heating, you know - sorry - nobody at the time of the sealing could have known what these ratios were going to work out to be. However, they were calculated post sealing and they indicate the presence of a heating in that panel after sealing. That was our charge, was to look at the possibility of a heating in that panel.

And that's really what it's directed to, whether at the time of the explosion there was a heating in the panel; that's the central core of it?-- That's right. There would be - there is other evidence for the possibility of a heating being present before sealing.

But not these ratios?-- How can there be? This is post sealing data.

Exactly the point that I am making to you. So, it would, therefore, appear - it would appear, therefore, it is not sustainable on the basis of the ratios, is it? If it's sustainable at all, it's sustainable on some other evidence?-- Beg your pardon?

Sorry, I will make it a bit clearer. I am directing you to the second last paragraph on page 47, to the initial sentence which says, having discussed the post sealing ratios, "It would appear, therefore, that a heating did exist in the panel

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before sealing." Now, I think we have just agreed that is not sustainable on the basis of the ratios that we have discussed because they are all post sealing. If it's sustainable at all, it's on the basis of some other evidence?-- That is the conclusion drawn for this section of the report which covers CO make as well.

XXN: MR MORRISON

WIT: HUMPHREYS D R

That's the point I'm making to you. Please listen to me. It is not sustainable on the basis of what's delivered about the ratios; if it is sustainable at all, it is on the basis of some other evidence?-- In conjunction with the ratios.

All right. Okay. I understand what you are saying. Now, when one is dealing with not only these ratios, but some other matters, we have discussed the deficiency in the reading of the oxygen?-- Yes.

Now, what you have done in this report, and I think we have agreed about this before, is there has been a uniform correction across time?-- Yes.

Do I understand then that that has also not taken into account - quite apart from varying drift in the analyser - it has also not taken into account barometric pressure effects?-- Not in the data I presented so far.

And that, as well, depending upon its impact - that is to say the barometric pressure effects - can have an impact upon the utility of this analysis, can't it?-- Not necessarily.

Well, it may have an impact on whether the figures you used for oxygen are correct or not, might it not, because all you have done is taken a uniform correction across time without reference to the drift in the analysers and without reference to the barometric pressure influence?-- In this particular case, in the data that I've presented this morning, yes.

Now, were you aware in the doing of this analysis that there had been a recalibration of the Unor system on 20 June? It is nowhere reflected in your report and therefore I assume you didn't realise it?-- On 20 June?

Yes, 20 June?-- I think we would have been aware of it from the records obtained, but for the purposes of the data that's in here, it's - it covers the data recovered from the tube bundle systems from 27 July.

So, what do I understand - that you may have been aware of it or can't remember, or you were not aware of it?-- We may have been aware of it from the records examined.

Your Worship, I am going to tender a letter from Mr Walters of Maihak Australia Pty Ltd to Feez Ruthning dated 14 March 1995 with the calibration worksheets for calibration conducted on 20 June 1994. I will pass these up in a moment. We have run into a stapling difficulty. As with all the best laid plans, technology fails us.

WARDEN: Excuse me, you are not asking this witness to identify them if he hasn't seen them. You are just tendering them.

MR MORRISON: I'm just tendering them.

WARDEN: Exhibit 226.

ADMITTED AND MARKED "EXHIBIT 226"

MR MORRISON: Can I ask the witness to have a look at this document, please? Now, Mr Humphreys, this is the - as you can see - the daily averages through to 29 July 1994 from point 14. Now, this is the point that should have been sampling normal air. It was outside the monitor room; do you understand that?-- Yes.

If we look down the figures - and I suppose we need only look at the second last page for present purposes - any page will do - but the second last one will do - around June - thereabouts - you will see that point was, in fact, recording CO?-- Small quantities, yes.

Yes, in small quantities. It was also recording methane?-- Yes.

It was recording CO2?-- Yes.

And O2 as well?-- Some funny O2 figures.

Sorry?-- Some odd O2 figures.

Yes, aren't they. Yes, there is some oddities in there, there is no doubt. Now, in relation to your analysis, I think we have agreed that this data is not data to which you have had regard in terms of ensuring that the figures that you have used in your graphs and analysis are, in fact, reflective of the drift at the analyser for all gases; that's true, isn't it?-- No, couldn't have done.

No. And this shows us, doesn't it - without referring to individual percentages, we can see the impact of those at some other time - that, in fact, there was such a drift in the analyser, because this is supposed to be sampling ordinary air, which routinely, one would hope, would contain no CO?-- Yes.

I tender that document, Your Worship.

WARDEN: Exhibit 227.

ADMITTED AND MARKED "EXHIBIT 227"

WARDEN: How do you want to title it?

MR MORRISON: Point 14 daily averages, 25 October 1993 to 29 July 1994.

WARDEN: Thank you.

XXN: MR MORRISON

WIT: HUMPHREYS D R

MR MORRISON: Can I ask you to look at these, also? May I preface it by saying that you can relax because I won't ask you to do any instant analysis on them. These are graphical representations of what the point 14 data shows. In other words, they graphically represent the drift and, as you flick through them, you can see that they - it reflects what is shown - it is taken directly from that data, it reflects what is shown in that data, namely that there is a drift in respect of each gas in the analyser; would you agree?-- That is at point 14?

Yes?-- I'll accept that this is data reflecting what you have just tabled.

Well, on the acceptance that this is the graphical representation of the data, and that's what it shows, doesn't it?-- Yes.

I tender those four graphs, perhaps as one exhibit is probably sensible - graphs of point 14 data - yes, I should indicate daily averages.

WARDEN: 228.

ADMITTED AND MARKED "EXHIBIT 228"

MR MORRISON: Now, can I just take you back to your report for a moment - page 45?-- Yes.

Can I also ask you to have a look at appendix 5.2(A) of your material? You will see at page 45 the table that we talked about some time earlier - table 5.5.1, "Interpretation of Graham's Ratio" and that little table that we discussed earlier?-- Yes.

Now, I suggested to you - and I think you agreed in the end - that it is not particularly helpful - that table is no longer particularly helpful because of the difficulties of assessing just what's new coal and what's old coal and when does it change, and so forth?-- Yes, it doesn't necessarily negate the usefulness of Graham's Ratio in terms of trends.

Yes, I understand that, but let's just have a look at page 7 of Appendix 5.2(A), and this is one of the publications in December 1992 of Mr Cliff, which sets out in table form, as you will see from the previous page, the results of an analysis about whether particular rules in relation to spontaneous combustion risk management should be modified or indeed eliminated?-- Yes.

If you have a look at the top of page 7 then we can see the existing rule referred to, No 1, "If Graham's Ratio is greater than 1, then there is a heating (new coal)"?-- Yes.

Which is really what's reflected in table 5.5.1, isn't it?-- Yes.

And can we have a look over here at what was said about it - the differences and significances?-- Yes.

Sorry, I should go back. Because it deals with a number of points, No 2 in the existing rule was, "if Graham's Ratio is greater than 2 (old coal)"?-- Yes.

That's again a reflection of 5.5.1?-- Yes.

If we have a look at the comment about that in the SIMTARS publication, the difficulty with it is that old coal versus new coal is unclear. "It should be trended so that there is over history" - I'm not quite sure what that means - "need range for seam, complex calculation." What's the recommendation about 1 and 2? "Delete", isn't it?-- Yes, "Good for progress of heating only".

Not to detect the onset, only to, in some way, cope with the aftermath; is that right?-- I would have thought "good for progress of heating" indicated for the - for the development of a heating - to use it as a trend to see how a heating was - for the purposes of detection and tracking the progress of the incipient heating - the early heating.

How does that sit with the word "delete", then? I mean, if its utility is preserved, as you said, in that state, how can you square that with the word "delete" in relation to the rule?-- The only way I can rationalise that is by saying that the reliance on the ratios for there being a heating can hardly be supported, but that trending those ratios would indicate the onset of a heating or the development of a heating.

All right. Well-----?-- Or the possibility of a heating. If there is a substantial Graham's Ratio, the possibility of a heating in a goaf.

All right. Well, that's your explanation of that - what that means?-- I can't comment as to why it was deleted. I wasn't a party to this. That's the explanation I can give you.

We see that's part of Mr Cliff's report. Mr Cliff is one of the co-authors of the report that's under discussion?-- Yes.

Can I ask you to have a look at Appendix 5.2(A) in your material?-- Yes.

This is, again, a publication involving, amongst others, Mr Cliff - sorry, I should say Dr Cliff. It is Dr Cliff, isn't it?-- Yes, that's right.

Sorry. I truly don't mean to be disrespectful?-- I'm sure he doesn't take it that way.

If we have a look at page 3 of that, we have the main findings and conclusions of the publication that's gone before. "The

current mine fire indicators have significant limitations and are often difficult to interpret." You would agree with that, wouldn't you?-- Yes.

And difficult to interpret not just for scientists like yourself, but very difficult to interpret for people who don't have a scientific background?-- Particularly fires in sealed areas, but not necessarily so much for an incipient heating.

I understand. "Most only indicate the onset of a heating and are only valid in flowing air streams which are not complicated by dilution with air or seam gas." That's the point you were making with Graham's?-- Yes.

"The best current indicator of the onset of a heating was found to be Graham's Ratio."?-- Yes.

"There was found to be no reliable way of monitoring the progress of a heating after sealing."?-- Yes.

And does that not suggest to you that the view of that author, at least, was that the Graham's Ratio was not reliable in the terms of monitoring the progress of a heating after sealing?-- Yes, but it may well still indicate the presence of a heating after sealing - the presence.

I see. Presence, but no more; is that what you say?-- Perhaps, yes. I don't necessarily subscribe to it not tracking the progress of a heating, but certainly at the very minimum it can indicate the presence of a heating.

Well, you don't subscribe to the view there expressed by Dr Cliff; is that right - and if I can refer you to page 1, the rest of the SIMTARS team?-- I'm not saying that. I'm just saying that it certainly would indicate the presence of a heating, but it may not necessarily be possible to use it for tracking the development of a heating - the changes in that heating.

Don't feel inhibited because you are a newcomer to SIMTARS, Mr Humphreys. Take them on. If you disagree, tell them so. Your Worship, I'm moving to another point, it will take more than a few minutes.

WARDEN: Yes, thank you, Mr Morrison. Can we adjourn till 11 a.m. Monday morning, gentlemen?

THE COURT ADJOURNED AT 2.57 P.M. TILL 11 A.M. MONDAY, 20 MARCH 1995

WARDEN'S COURT

MR F W WINDRIDGE, Warden and Coroner
MR R J PARKIN, General Manager, Capricorn Coal Pty Ltd
MR P J NEILSON, District Secretary, United Mine Workers' Union
MR C ELLICOTT, Training and Development Officer, Department of
Mineral Resources, New South Wales
PROF F F ROXBOROUGH, Professor of Mining Engineering, School
of Mines, University of New South Wales

IN THE MATTER OF A CORONIAL INQUIRY IN CONJUNCTION WITH
AN INQUIRY (PURSUANT TO SECTION 74 OF THE COAL MINING
ACT 1925) INTO THE NATURE AND CAUSE OF AN ACCIDENT AT
MOURA UNDERGROUND MINE NO 2 ON SUNDAY-MONDAY, 7-8 AUGUST
1994

GLADSTONE

..DATE 19/03/95

..DAY 46

THE COURT RESUMED AT 11.09 A.M.

DAVID ROBERT HUMPHREYS, CONTINUING:

WARDEN: Thank you, witness, you are on the former oath you took the other day; do you understand that?-- Yes.

At the start of your evidence. You are still regarded as being so bound.

MR MORRISON: Mr Humphreys, can I ask you to open the report at pages 46 and 47, or at least you may wish to have them open at those pages. We were discussing those pages last time and particularly in the context of the impact on the ratios of various - either deficiencies in oxygen or various drifts in the analysers when they recorded values for various gases?-- Yes.

Now, what I want to ask you is this: you mentioned in relation to the CO/CO₂ ratio the reason why the figures recorded in the report differed from the figures in the data. Now, if I remember rightly, essentially it came down to this: that you took into account the presence of CO₂ in the normal air at point 14?-- In all normal air.

In all normal air?-- Yes. The testing -----

I am sorry?-- The testing that was done to generate the curve in the - I will call it the Moura coal - was done, as I say, in an artificial air in the absence -----

Oxygen and nitrogen?-- Yes.

Now, that means, of course, that you had to take that into account in order to reflect a proper ratio?-- Yes.

Was it also taken into account in the other ratios, because they all depend in a sense in the same way, don't they? Would it not impact on the others as well?-- It may do. I can't be certain what that effect is.

Particularly for, for instance, the Graham's where the curve was predicated on a straight O₂/N₂ atmosphere, and I don't mean the curve as recorded, I mean the curve in the data?-- Yes.

On the artificial atmosphere?-- I think it's less significant because the amount of the way that the CO₂, being absent or present, would affect the oxygen deficiency would be quite small.

All right, okay, but the point that I want to come to in relation to that is that in relation to the time of sealing there is a drop in oxygen, isn't there?-- A drop in the Graham's Ratio.

XXN: MR MORRISON

WIT: HUMPHREYS D R

A drop in oxygen; a drop in oxygen levels routinely at sealing?-- Yes.

And that will obviously have an impact on Graham's Ratio as well?-- Not necessarily.

It could do?-- If that is what is causing the changes in Graham's Ratio, that will have an impact, but it doesn't necessarily follow that a drop in oxygen is followed by a change in Graham's Ratio.

But, nonetheless, at the time of sealing we do get a change in the normal oxygen rate, don't we?-- What do you mean by "rate"? The concentration.

Rate is the wrong word, concentration is the right word, you are quite right?-- It's going to be changed either by adsorption of the oxygen due to oxidisation either by ambient temperature oxidisation or by a heating, or it is going to be displaced by a seam gas. Displacement by a seam gas, as we discussed last week, doesn't alter the oxygen deficiency, therefore doesn't alter the Graham's Ratio.

I understand what you are saying about that. Now, the point that I want to come to is this: the standard graphs that you use, I think, in Appendix 5.5(A) - turn that up if you need to, 5.5(A) - are predicated on the use of that artificial atmosphere, aren't they?-- I would think so, yes.

I wish to direct your attention to the Graham's Ratio graph?-- Yes.

Which, I think, is page 1 of 1, 5.5(A). Now, that graph reflects what appears in other SIMTARS documentation when you come to look at the - what might be called the standard graph for various gases. It is not a linear graph, is it, it's a rising graph over time?-- Not over time. This is against temperature.

Against temperature it's a rising graph?-- Yes, as the temperature increases, the graph tends to get steeper.

And the same is reflected in other gases as well, isn't it? If we went to the various SIMTARS documents, we would see the standard curves reflected for other gases so much the same thing?-- Well, Graham's Ratio isn't a gas, it is a ratio, but if we were looking at carbon monoxide against percentage in the gas stream against temperature, then it will show something similar, but obviously you have to do a lot more analyses to see whether they are following the same functions or not.

I accept that, but to a person without your background, for instance, who looked at that graph in 5.5(A) or who looked at those other standard graphs, that person would be forgiven for describing those graphs as having an exponential element, wouldn't they?-- You might think there is some element of exponentiality - if that's the right word - involved in it.

The basic equation - the basic phenomenon driving this is a rate of reaction which tends to increase as an exponential function of temperature.

Now, this 5.5(A) shows us, as the report says, the way the Graham's Ratio graph appears as a function of the ratio and against the increase in temperature, isn't that right?-- That's reasonable, yes.

And if we look at Exhibit - I am sorry, I will just have to find it - if we look at Exhibit 223 - I don't know if you have a copy of that there, but I will have it given to you in a moment - Exhibit 223, you said in evidence, shows us the actual Graham's Ratio graph on 7 August?-- Yes.

In two versions, one with and one without the correction for oxygen error on the analyser?-- Yes.

This graph, on either version, does not reflect the sort of graph in 5.5(A), does it? It is nowhere near the same shape. In fact, one could describe it either as a linear rise, or in fact it might be a little concave?-- We could discuss the shape of the curve for ages, but, yeah - but we are talking about two totally different sorts of graphs. We are talking Graham's Ratio plotted against time and Graham's Ratio plotted against temperature.

This graph certainly does not exhibit the same behaviour, does it?-- It doesn't increase exponentially with time; we have never suggested it did.

No, and doesn't that suggest to you, when you look at that graph, given the rise over time, that the temperature - the conclusion that follows from that is the temperature is not increasing with time either?-- Not necessarily. There are problems associated, as we have gone through, with Graham's Ratio in the location of the sampling point relative to the heating, and it may be that what we are seeing here is as time goes by and the gases from the heating are better able to migrate to the sampling point, that that - this is reflecting more that transport mechanism of gases to and from the heating rather than any increase in - you know, I think that that's more what it reflects, is the transport mechanisms from the seat of the heating to the gas sampling point.

But there is just no way of telling the impact of those transport mechanisms, is there?-- One can certainly say that at the sampling point - should I say at the seat of the heating the Graham's Ratio would be equal to or greater than what's displayed on this graph.

Assuming the seat of the heating is remote from the sampling point?-- If the seat - if we were right on top of the seat of the heating, then you would expect that you reflected that accurately, but -----

But isn't that assumption right? You are making the assumption that the heat of the seating is remote from the sampling point?-- Yes.

Well, if you just make a comparison of the data from the point without knowing the differences down there - and one can't know the differences down there for obvious reasons - then what this graph demonstrates, Exhibit 223, is that behind the 512 seals the temperature did not increase over time, isn't that right?-- I don't think we ever suggested it did.

I am sorry, is that right, though? Let's establish that. It does show - I am correct in what I put to you, aren't I? I mean, it may be that you have never suggested that, that will be - you can put that qualification on, but what I put to you is correct, isn't it?-- It may be that it is reflecting an increase in temperature at the heating, but also the transport mechanisms of the gases to and from the seat of the heating, and, as I said before, this probably better represents the limitations of the transport mechanisms of the gases to and from the heating.

But we are back to those things that we can't know about. I have asked you to comment on what the graph shows us as a comparison to the data point, namely, point 5. If you use the information from point 5 for any reason, then you make a comparison of it from time to time, don't you?-- Yes.

By making a comparison of it from time to time what I have put to you is correct, is it not, that this graph shows that it didn't increase in temperature over time?-- I guess yes, but it does definitely show an increase in trend in Graham's Ratio which, as I have said, is more probably to do with the transport mechanisms and the Graham's Ratio in the goaf is - at the seat of the heating is going to be equal to or greater than this.

That assumes again the seat of the heating is remote from the sampling point, doesn't it?-- Yes.

And that's an assumption that may or may not be valid for all we know. We don't know either way whether it's valid or not, do we?-- I would have thought if we were right on top of the seat of the heating, then we would see Graham's Ratio substantially higher than these and dropping very rapidly after sealing.

Depending on the size of the heating and its temperature and whether it's in a pillar or out of a pillar; all of those things matter, don't they?-- I think that we could reasonably expect Graham's Ratio, on sealing, to drop very rapidly if we were right on top of the heating.

See, all the qualifications you put on from the proposition I put to you are all - they are all assumptions that may or may not be reasonable but, nonetheless, they are assumptions that are dependent upon facts we don't know, isn't that right?-- Yes.

For the simple fact that we don't know what went on behind the seals apart from looking at point 5's data, isn't that right?-- Yes.

And this is the only source of data we have for behind the seals, isn't that right?-- That's right.

So, if we have to make any comparison at all, it has to be from this point's data, isn't that right?-- Yes.

Now, can I ask you another thing in a general area and staying with the same part of the report? Now, we were talking about temperature last time and to some extent we have touched on that again today. The temperatures that are given in the SIMTARS data for Moura coals are all based upon laboratory tests, aren't they?-- Yes.

And those laboratory tests involve taking a sample of coal, treating it in some particular way and then putting it into - or heating it whilst various gases or air or whatever are passed through it?-- Yes.

And as I understand the report, or at least the data, that would involve taking a 100 gram sample as the test sample, 100 grams?-- Yes.

That is, taken from a fresh face, it is stored in water?--
Stored to prevent oxidation.

Stored in water?-- Fair enough. It can be - some samples are stored by freezing, some may be used very rapidly after being - some may be stored in water. I'm not so sure of the water storage. I think the method favoured nowadays is to freeze the samples.

Then, later, the sample is air dried and ground?-- I'm not sure about the air drying.

Not sure about that? Ground, certainly?-- Yes.

Refrigerated?-- Ground before use, refrigerated in its as received state.

And then placed in the oven?-- Mmm.

And then in the oven, the temperature is raised to various levels?-- Yes.

And at various levels, air and water or air and nitrogen are passed through the oven?-- Yes.

And you determine the gas emissions?-- Yes.

Now, in fact, that, no doubt, is a very good test for comparing, on the basis of those tests, one coal's performance with another, but would you agree with this proposition: that you can't translate those results, necessarily, to a panel in real life, can you?-- They would give you indications as to what was happening, but obviously you have some mass temperature distribution involved in the heating, and we are looking basically at some sort of average over that mass temperature distribution and relating them to the laboratory tests.

I understand that it might give you some data, but what I'm suggesting to you is that it is not scientifically sound just to translate those lab results to a panel in a mine and predicate that the panel in the mine will perform the way the lab results suggest. It doesn't necessarily follow; do you agree or not?-- It certainly would be beneficial to look at how large a scale experiments of that type occurred so that you could look at the small scale tests against the larger heatings against what was actually happening in reality.

Part of the problem with the real life situation is that as the coal heats, it produces various reactive products?-- Gaseous products, CO, CO₂.

As the heating continues, if it does continue, you get the reaction not just of the coal, but of those reactive products as well?-- If the temperatures get high enough, I should think.

That's not something you get through the lab tests, is it, because you-----?-- Probably not, because you don't have the

gases, then, perhaps reacting with other coals to be chemisorbed or-----

So, it really is necessary, in order to make that translation that I've talked about, for there to be not only the lab tests, but testing of the actual seam coal in real life, as I might say?-- It would be preferable.

Now, all of that also suggests since - that is, the laboratory test upon which one predicates the temperature effects that you have related in this report - that demonstrates, does it not - or would you agree that the uncertainty or the necessary uncertainty is in relation to ascribing temperatures to performance in real life; isn't that right?-- Complicated by the - as I indicated when we were discussing Graham's Ratio, the problems of transport mechanisms from the gases to and from the seat of the heating to the sampling point.

I understand that. I don't want to go over that again. I'm moving on as it were, but maybe you think I'm not?-- No.

But I am. So, it is a compounding factor in terms of the expression of any sort of temperature, and I think you will agree the point most properly reflected in the approach is the one that we discussed last time, namely that one can say that there has been a change in temperature, but you really cannot say with certainty that it is from X to Y; isn't that so?-- I think that would be reasonable, but you have said it yourself. There is a change in temperature and all of these indicators indicate an increase in temperature.

Now, just pausing with that, then, that really leaves us with the position that at any particular point in time, would you agree, because of all the compounding features we have discussed this morning and last time, one cannot say with certainty that at any particular point in time the temperature was X or Y or Z; one really can only make a comparison between points in time, isn't that right?-- We cannot be sure of the mass temperature distribution in that heating from what we have got here. I don't think anybody has ever suggested that was the case and we have indicated that these are the reflected average temperatures and that those temperatures are increasing.

Now, one of the things I wanted to ask you about was this: you mentioned in relation to a number of the graphs - this is a slightly different point - that you had done a linear regression on some of them, or at least one of them. You showed that, I think, in exhibit - I'm just trying to find it now because you might need it back - Exhibit 158 - one of the graphs attached to 158. Do you need that back to have a look at it?-- I would prefer it, please.

Yes. Now, if you look at Figure 1, you have got a linear regression shown there for the period between - commencement of extraction through to, say, about 15 July?-- Yes.

And you show a different linear regression for the latter part of that graph and it is reflected on figure 2?-- That's

right.

Have you done one which takes the linear regression right through from start to finish?-- No.

Have you ever done that - for this data, I mean? I don't mean in different circumstances?-- No, I haven't.

Would you agree with me if you did, what it is going to do is take that green line straight through?-- It probably would go - it would tend to follow the original green line.

And if we did that, what we would see, wouldn't we, is that the stabilisation or drop - however you wish to refer to it - between the 23rd of July and, say, the 29th, or a little later, is no more in significance or size than was the dip back down around the 11th of June; isn't that right? I think that's right, isn't it?-- Sorry?

You see what I'm saying to you? Do you need me to make it clearer?-- No, I see what you are saying.

If we take that linear regression through, what we see is between 15 July and, say, the 29th is probably about accurate; that there was what you might call a reversal or a correction, no greater in significance or size than what happened on the 11th of June?-- Except for the density of data around that-----

I accept that?-- We have got much greater density of data and it may be more reasonable to put a linear regression through from, say, about the 15th of July through to the 29th and then from the 29th onwards. This heating could have gone through a number of changes.

But if we take the linear regression through from start to finish, you would agree with me what we would end up with is an extension of the existing linear regression line in Figure 1 on Exhibit 158?-- Yes, and you would have to look at the goodness of fit on that to see whether it was valid to do that.

Well, in fact, we can do that, and I would invite you to do so by looking at appendix 5.3(A) of your report, because it seems, even if you didn't do it, someone has there done it?-- I haven't done it on this set of data, which was the question you were asking earlier, and it has been done on the-----

The BHP data?-- Yes.

And as we know, the BHP data doesn't vary significantly at least up to the 15th of July, with the all make data CO - the all data CO make?-- No.

So, if we look at appendix 5.3(A) we have exactly what I've just been talking about, haven't we?-- Yes.

So, in that sense, if one continued the regression from start to finish, what one has, in your own descriptions, would be a

linear rise at a constant rate; isn't that right?-- Looking at 5.3(A), there are obvious reversals in changes in that trend, which may be due to any number of reasons.

Yes, that's so, but what I've just suggested to you is correct, isn't it?-- Which is?

Which is that if we look at 5.3(A), which is applied against the BHP data - and we know that data was very accurate, even on Exhibit 158 up to 15 July, as against the all data CO make?-- Mmm.

What we have in your own description is a linear rise at a constant rate; isn't that right?-- On 5.3(A), yes we have-----

5.3(A) is said on page 42 of the report to be the line of best fit for the carbon monoxide make after the commencement of extraction. Do you stand by that comment?-- For the data used in 5.3(A), yes.

All we have on 158 really is this: that we have a period of where this is a significantly increased number of data points, namely that period of 23 July on; isn't that right?-- However, we-----

Sorry, can we deal with that first? Isn't that right?-- Not necessarily. We do have additional data points from 22 July onwards, yes.

That's what I'm just saying. All we have different on Figure 1 of 158 is that after about the 23rd of July, or 22 July - don't care which - we have a significantly increased number of data points; isn't that right?-- Yes.

Now, that, of itself, does not necessitate altering the start point for the linear regression, does it?-- It may do. It would give one more confidence that a trend such as is displayed in - in 158 would give more confidence that it was real, whereas we are - on figure 5.5(A) we only have a couple of data points at the start and maybe the end of that trend.

Well-----?-- And you look at a data set as a whole.

We have the same number of data points in 5.3(A) at all times up to 23 July?-- Yes.

Or 22 July, as exists on 158, don't we?-- Yes.

Now, in relation to that, if we did the converse exercise and assumed for the moment that we had that multitude of data points from commencement of extraction - in other words, data points of the same frequency from commencement of extraction?-- Yes.

It may well be that the graph would be a significantly different shape, because there would be the highs and lows that you mentioned have occurred in that multiple data system anyway - there would be the reversals?-- It seems unlikely,

because the - it appears from 158 that the - that the speed with which these changes take place required a density of data points that are shown past 22 July.

I'm sorry, maybe I haven't made myself clear. What I'm saying is if we take the converse of what we have been talking about and imagine that we had all that density of data points from right back in time, from the start of extraction time, the shape of the graph may well be different from what we see here; wouldn't you agree with that?-- I think it would look similar to what you have already got. There was no reason to believe that it will look any different.

If that's the case, then, isn't that a prescription for viewing this graph properly as containing an extension of the linear regression that presently exists between 30 April and 15 July in a straight line on from that point - if, in fact, you're proceeding on the basis that those extra data points would show us pretty much what we had anyway, isn't that a prescription for reading it in that fashion?-- I don't believe so. I don't think there is going to be a trend of the sort that we see at the end of 158 buried in that data from 27 April to 22 July that we don't see with the weekly analysis.

I see. Well, I thought you just said that even if we had all that shiftily data for that entire period, your view is that it would give us pretty much the same shape graph?-- Isn't that what I just said?

Well, why does it change then? Why treat them differently? Why not continue the linear regression from the existing point on the 15th of July? Why drop a week and start with a new base point for a linear regression? Did you just think that was an appropriate thing to do or were you asked to do that?-- No, I wasn't asked to do that, because with the additional data that came from that - the deputies' reports - it appeared that there was a change in the trend from the 29th or so of July.

Well, once you got all the additional data points starting, which was on 23 July, why not use 23 July as your baseline point for the linear regression?-- You can use anything you want, but you look for the best fit to describe that set of data.

That is right. I mean by shifting around the start point for the linear regression, we could make-----?-- Trending-----

Sorry, can I finish and then you can answer?

MR CLAIR: Perhaps the witness could finish his last answer, Your Worship.

MR MORRISON: I'm satisfied he had. Did you think you hadn't finished that last answer?-- I'll let you consider it.

Now, if we move the start point for the linear regression around, not only on figure 2, but even on figure 1, we could have all sorts of appearances, couldn't we?-- Yes, you could

draw a straight line between two points, which is a typical engineer's - you know, if you want to get some data, if you want a straight line, pick two points and draw a straight line between it, but I think we have been reasonable in trying to find out what the rates of increase in the CO make have been. We are interested in what the rate of increase in the CO make is at a particular time, and all - but also how that relates to a background increase in that CO make, and if all we are ever going to do is trend the data over the whole life of the panel, then we will never get a change in background - we will never see a change in trends, because we will always be dealing with the same trend.

Well, is your thesis, then, this: that one should look at the trend from the start of extraction - that one should look at it sectionally from time to time?-- That's the basis for detecting heatings using carbon monoxide monitoring, and that is to look for increases in trends of carbon monoxide. I think that what has happened here is that if there has been anything, where a background might have been established with a constant CO make, it does not appear to have occurred, or else it has occurred very late in the life of the panel towards the mid-July.

Why, then, is the linear regression from 30 April through to 15 July an appropriate one? Why would it not be from 30 April to, say, 7 June and then a different one from 7 June through to 11 June and then a different one again from 11 June through to say 25 June? Why did you think it was appropriate to take one linear regression from the start through to the 15th of July? Aren't you doing exactly there what you say shouldn't be done? You are comparing the life of extraction up to that point? Isn't that exactly what you have done?-- It is trying to find the - the trend that best fits the data that is there, and as you can see, there is very little deviation from the CO make graph from that linear regression line.

So if we did exactly the same exercise but used as our finish point 29 July, say, we'd fine the line of best fit to be that exhibited in 5.3(A), wouldn't we?-- Possibly.

Which on any view is a linear increase at a constant rate?-- Yes.

Now, in Exhibit 158, as I understood it you calculated the shift average for the Unor -----?-- Yes.

----- from the daily average. I think that's right, isn't it?-- No, no. Shift - can I get a -----

I think it's on the front page of 158, isn't it?-- I think I said to Mr MacSporran -----

Sorry, you got daily averages from hourly averages?-- Daily averages from hourly averages. The shift averages have been calculated on the basis of point 16 individual results.

I accept that. Now, in doing that did you take into account the 70 minute delay on point 16?-- I believe I did.

Uniformly at 70 minutes?-- I believe so.

I'm sorry, do you know so or do you believe so?-- I have no reason to believe I did otherwise. I built it in and it was - it would have been set and applied, as far as I could tell, universally to that data from about - when the computer was changed and we got that different data set with the individual analyses which weren't available before 27 July. There was a change over in computers.

Forgive me for asking this, but I'm not quite sure if I'm understanding you rightly. Did you actually do it yourself or did you get some number cruncher to do it?-- No, I did it myself.

In relation to that you picked an arbitrary time for the Unor figure, didn't you?-- To display the data on the graphs, arbitrary meant to reflect the approximate mid-point of the shift.

Approximate mid-point of the shift, but not the approximate mid-point of the inspection time, for instance?-- No, didn't know what the - didn't know the exact time of the inspections.

Well, the start and finish time is shown on the shift reports, aren't they?-- Yes.

Did you take that into account in working out this time or did you simply take mid-shaft in each case?-- Only mid-shaft for the data to be displayed, but took into account obviously start and end points of the shifts to calculate the shift averages.

So it could be that we are - in some cases we are a number of hours out from the actual -----?-- I don't think a number of hours.

Well -----?-- Maybe a couple of - a data point or two.

there is no way of knowing, is there? You haven't gone to the deputies themselves to try and work this out?-- No.

Can I ask -----?-- I'd point out that the CO during each of those shifts is not varying greatly, and to use an average for those shifts is quite valid.

You were asked to look at a number of graphs before, that is on the last occasion. One of those was, I think, Exhibit 21, and you might have been given Exhibit 110. Perhaps Exhibit 110 is a good one to have, and 21 as well, if you don't mind. Now, I just want to check a few things here. You describe that - I will just make sure that we are talking about the same one. It's Exhibit 21. Do you have Exhibit 21 there?-- Yes.

If we go through to the graph for 512, have you got that there? You describe that as exhibiting a continuous upward trend; isn't that right?-- Which graph are we looking at, Mr Morrison?

121, the CO make graph, 512. It should bear the date 18 August at the bottom and go up to 6 August on the base line?-- Okay.

You describe that - and I gather you would agree with the description you applied to it - as exhibiting a continuous upward trend; is that so?-- With reversals and with the qualification about the variation in the X axis with regard to dates and the like.

The reversals though are something that occur in, as you've seen, in all CO make graphs?-- Could well be. There could be reasons for them occurring.

Certainly in terms of fitting a linear regression that tends to, if I might use the vernacular, iron out those reversals?-- Yes.

And so if one did as you did in Appendix 5.3(A), if you applied a linear regression to that graph, you end up with a linear constant rate of rise, don't you?-- That's what the linear regression - it helps you to determine what that rate of - the best fit, what that best rate of rise might be.

As we can see from Appendix 5.3(A) the line of best fit for that graph is what I've just described, a linear constant rate of rise?-- Linear regression is just that, a straight line, best fit.

Now, when you were asked about Exhibit 221 - perhaps you better have that. In respect of this one you mention that between 15 and 29 July it exhibited certain features?-- 15 and 29.

And I think you described them that if one looked at that and

the data as recorded at the mine on 5 or 6 August you would think the situation had stabilised. That's what you said in the transcript. I can take you to the particular page if need be?-- No, I will accept your word.

That's an accurate description, isn't it?-- Stabilised by virtue of - reached some point of -----

Some sort of equilibrium?-- Equilibrium, not changing perhaps. Certainly not changing in temperature, but maybe changing in nature somehow.

Neutral in effect over that period might be a better way of describing it?-- Certainly neutral in effect in terms of temperature and the CO make that it is causing.

Now, when you started to give that description I think you might have been cut off a bit in your answer. Looking at that period of the graph as assessed by you that would show to yourself and to someone else perhaps that the situation had stabilised in that period?-- Stabilised but maybe in a state that is still a heating, not necessarily an ambient temperature oxidation state.

We are talking here about 15 July through to -----?-- Yes.

----- at least 29 July?-- Yes.

And in fact 5 August, I think, is a better date, isn't it?-- 5, 6 August.

So that if one looked at the graph at that period of time one could be forgiven for thinking that the situation had stabilised in whatever form that you can predicate. On the various scenarios one would be forgiven for thinking that the situation had stabilised; isn't that right?-- One could be forgiven for believing the temperature wasn't rising, the rates of reaction weren't increasing, that sort of thing, but it could still be a heating which is at a high temperature, perhaps due to some change in ventilation or an effect due to driving off moisture.

If we don't see dramatic ventilation changes over that period we can really exclude them as having any impact?-- Not necessarily.

Well, if the ventilation is much the same over that period then what we see is that there is no dramatic cooling effect or anything like that. That's what I'm getting at?-- Small effects, small changes in ventilation or perhaps some combination of changes in stresses and the ventilation for that time could alter the ventilation regime in the heating and cause it to change, reach a new unstable state and move from a point of equilibrium.

It certainly hasn't exhibited that over the period we are talking about from 15 July through to 5 or 6 August. I think that's the date we were discussing?-- No, sir, I think from about the beginning of August it has changed.

I thought we had just -----?-- I think I might have misunderstood you in that last - I think you mentioned a date and I couldn't hear what you said.

Please tell me if you can't hear me. I was talking about the period from 15 July through to 5 August. In that time isn't it true to say that the situation had stabilised?-- No, I would say that at some time between 15 July and beginning of August, 29th or thereabouts, if there was any stabilisation it's in that period and it's from the period of 29th - 1 August or thereabouts onwards that things have changed.

Let me just take you to page 4,231 and let me read a little passage to you. Mr MacSporran was asking you a sequence of questions about if at this date you had reports of smells and you looked at the graph what would you think and so forth, and then he got to this one: "Well, we will move forward then to the weekend of the sealing, and if you accept for the purposes of this area that there was a report of a strong tarry smell on Friday, 5 August, reports of a haze on the 6th of August and a further report of a stink on Saturday night, 6 August - if you accept those signs as having been detected?", and you said, "Mmm." - now, the question was clearly predicated on 5 and 6 August, there was no doubt in your mind that was the question being asked - "And look at the trend of CO make at the same time, what are you able to say?" Answer, "I think it depends on which trend of CO make you use. On the data as it was recorded at the mine, you would think some situation had maybe stabilised."?-- Yes.

That's exactly the same period I'm just directing your attention to again now. 15 July through to 5 and 6 August. Now, the comment that you gave at 4,231 is the correct one, isn't it?-- That is if you looked at the data that was available at the mine based on the CO make one might think it has stabilised but could draw no comfort from that from the presence of the smells.

Let's go back then?-- But that was - the data in 221 is not the data that was available.

At the mine?-- It was available at the mine, but never used.

Well, let's go back to Exhibit 21?-- It was never calculated.

Let's go back to Exhibit 21, because up to 5 August this was the data at the mine as promulgated. Now, the comment that you made at 4,231 of the transcript is applicable here, isn't it? If one looks at this data, that's Exhibit 21, between 15 July and 5 August you would certainly think the situation had stabilised; isn't that right?-- Looking at the data on Exhibit 21?

Yes?-- Which hasn't been plotted in the CO make graph of 7/8.

CO make graph for 7/8? I'm sorry, you would have to direct me to -----?-- If we look at page 1 of Exhibit 21, and comparing it with a CO make graph at the back of this bundle at 7/8,

there are data points shown on page 1 of Exhibit 21 which aren't shown in the CO make graph of 7 August.

You will just have to follow me for a moment, if you wouldn't mind, and please try and pay attention to what I'm saying. The data that was in fact available at the mine is what is shown on Exhibit 21, that's the graph that bears the legend 18 August 1994 and takes the base line points through to 6 August?-- Yes.

The data that was in fact available at the mine at the time of the explosion ceased at 5 August, that's a Friday?-- Yes.

So that graph ceasing at 5 August. Do you understand what I'm saying now? I'm sorry, do you have that?-- I'm not sure which graph we are talking about, Mr Morrison. The graph I have ceases on 6 August.

Yes, I understand that. I just ask you to listen to what I'm saying?-- Yes.

Have we got the same graph?-- Yes, I believe so.

Now, what I want to say to you is this: the data that was in fact promulgated at the mine, in other words put on view so people could see it?-- Yes.

As at the date of the explosion, was effectively that graph but only to 5 August; do you understand what I am now saying?-- Yes, yes.

Now, looking at that data and turning back to the question we started with, between 15 July and 5 August the comment you made at page 4,231 of the transcript applies. One looking at that data would be forgiven for thinking the situation had stabilised; isn't that right?-- Yes.

Now, would you agree with me that in order to make a valid comparison of CO make from point to point - I don't need direct your attention to any document just at the moment - one needs in fact to have a velocity reading that is simultaneous with the CO parts reading that one is using; isn't that right?-- At least contemporary.

I use the word "simultaneous" deliberately because that is what appears in all the SIMTARS data, Strang and Mackenzie-Wood volumes and the SIMTARS 1989 seminar data, Volume 3 paragraph 2.2. I will take you to them if necessary?-- Fine.

All of that information says that you need - it is essential to have a simultaneous reading of velocity with the points - parts per million in order to have a valid make figure. Now, do you agree with that or not?-- There may be exceptions to that in that you could - with a continuous monitoring system I would see nothing invalid with taking a velocity reading and then checking to see which was the closest CO concentration that - not the concentration, but the determination at that sampling point which married up with the time of your velocity

reading.

In other words, the exception would be in circumstances where you couldn't get a simultaneous reading or you couldn't be sure it was, that you would try to get the simultaneous reading?-- Yes, that would be preferable. I mean to say it is much better to take a reading from the Unor system with a greater accuracy off the infrared detector than it is off the Drager tube readings. The Drager tubes you could regard as being simultaneous, but their level of accuracy - you might sacrifice those simultaneous readings of the Drager tubes for the greater accuracy from the Unor, particularly if the carbon monoxide is not changing rapidly.

Well, if the Drager reading is being taken effectively at the sampling point then they really should match, shouldn't they, all things being equal. That is to say, people doing their job right in terms of pumps and -----?-- All things being equal, yes, but as you've indicated yourself there are problems with those sorts of readings.

What we don't get in Exhibit 158 is what is expressed to be necessary in the SIMTARS volume in 1989 or Strang and Mackenzie-Wood or any number of publications, and that is to say in 158 you don't have the readings in velocity coinciding with the Unor readings, do you?-- Not exactly, no.

We should read 158 subject to that qualification, shouldn't we?-- The CO that was - the CO variations during those - sorry, start again. The CO changes that were occurring during the shifts where they have shown shift averages were not significant.

What about the velocities? Were they changing significantly? I suppose we don't know, do we, within the shift? Only get one velocity reading and a multitude of CO readings?-- They have shown a similarity from shift to shift.

Well, there were some substantial drops from time to time, weren't there?-- Not so much while the deputies were taking readings. There were substantial changes in the total air quantity in the panel more related to the earlier time when the bottom return was being used.

Well, I was thinking of one reading in particular where one deputy got a reading of 1.55 metres per second when everything before that had been 1.7 or 1.8, stretching back a dozen shifts - I haven't counted them?-- Yes.

And that's a substantial drop, isn't it?-- It's a drop.

It's a substantial drop, isn't it?-- It probably didn't affect the ventilation of the panel. It was a drop.

Obviously it seriously affects the CO make, doesn't it, when you get that sort of variation, doesn't it? Have a look down. It's 5 August, Mr Stafford on day shift?-- I think I know the shift you are dealing with.

It's about four from the bottom of 158's data, isn't it?-- It may well be there was a drop in the air quantity through the panel and that has produced an apparent drop in CO make.

Well, are you -----?-- Apparent.

Are you now saying that it may have had an impact on the quantity through the panel? I thought you just said it didn't?-- Well, the velocity was measured and recorded.

I understand that, but when I put that to you you said, "Well, it probably didn't affect the quantity through the panel.", and I am just trying to understand why you said that to me in answer a few minutes ago and say now that it might have done?-- It obviously was the deputy's measurements of the air velocity at that time and, therefore, the quantity was calculated on the basis of that. There could well have been a true drop in velocity associated with that.

Or?-- Or -----

He's got it wrong?-- It's a possibility.

Just like all of these; is that right?-- There is a possibility of errors in all of these readings to a greater or lesser extent.

And we can see the impact of the exercise that you have done as against what was actually done, if we compare 158 with 152. Have you got those two pages of data opened up?-- Yes.

Let me run back up from the entry we have just been discussing which is Mr Stafford, day shift, 5 August, and give you the comparison of what was actually done at the time in terms of simultaneous readings and your exercise. Now, we start at 14.27 for your 16.01?-- Mr Morrison, we are comparing simultaneous determinations made on Drager tubes against ones made on the Unor.

I understand that; I understand that?-- Right.

And if the Drager readings were taken properly and at the sampling point, shouldn't there be a correspondence?-- You are predicating it on the assumption that they were taken

properly.

Yes, and at the sampling point, that's true?-- Yes.

No greater assumptions than you make about the averages in a shift being reflective of the time when the velocity is taken, isn't that right, because you don't know that either?-- We have one Drager tube reading that could be subject to a large number of errors compared to a large number of individual analyses from the Unor systems which will be subject to the same systematic errors one to the other, whereas with the Drager tube readings we have them almost random errors from operator to operator.

And on that assumption, the man who can't take a proper Drager tube reading probably can't take a proper anemometer reading, so your determinations, which are dependent on the same deputies taking the velocity readings, are similarly affected, are they not?-- They may be.

Of course they may?-- But they have shown a consistency in their velocity readings that only occasionally we see deviations from that.

I understand what you are saying, but if we run through, make the comparison in fact, we get significantly different results, don't we? If we run back, say, the first half dozen or so in each case, your figures are 2 lpm above what the deputies actually recorded, isn't that right?-- Yes.

In some cases greater than that, but at least around the two mark, isn't that right?-- I think I have indicated a graph with Mr MacSporran that shows the CO makes based on the Drager tube readings.

And the most staggering one of all is Mr Tuffs' reading, the last one, where you get a difference of 9 lpm between you, or at least eight and a half?-- Yes.

16.6 for him, 25 for you?-- Yes.

At the time he took that reading - that's about 8.30, I think you say in your data?-- I believe that's right.

What was the state of the seals at that point?-- Partially sealed.

What was partially sealed and what wasn't?-- I believe that they only had to do the belt road and top return.

They only had to do the belt road and the top return?-- The two final seals.

At 8.30 the evidence suggests this - or even at 8 o'clock if one takes a slightly earlier time - there is some doubt as to when Mr Tuffs took his reading. I think it's 8 o'clock, not 8.30, but no doubt the evidence will show that. At that time we know the bottom return had been sealed and for some time?-- Yes.

And so had the next heading up?-- Yes.

The belt road was in fact completed, the seal had been completed, and the other two seals were well on the way to completion?-- Okay.

Now, wouldn't that suggest to you that that would dramatically affect two things: firstly, the velocity and, secondly, the parts per million, that state of affairs at that time?-- It may not have affected the velocity that he took. He took three readings to check his results which is one way of seeing that he has got the right velocity. It could - it may or may not have affected the carbon monoxide in the panel.

But it would, wouldn't it? When you are sealing and you cut down velocity -----?-- Okay.

-----cut down the movement of air through the panel, isn't it necessary - doesn't it necessarily follow that the CO parts per million will rise?-- Certainly once the seals were stopped, obviously between some point - as the seals were part way finished there will be some transition from a state where there is no accumulation of the carbon monoxide into a state where there is an accumulation of carbon monoxide in the panel.

If he takes his reading at a time when there is half of one intake and half of one return, doesn't it necessarily follow it's going to have an impact on the CO parts per million?-- It may have an impact on the CO parts per million in the goaf. If that has also caused an increase in the concentration of CO leaving the panel, it will tend to go up, but if he has measured his velocity correctly, then the CO make from that panel should be right, and I can't see how you can have a CO both accumulating in the panel and coming out at a faster rate.

Well, if we add into the equation the fact that the man door - you know where the man door is situated?-- Yes.

Was open or partly open?-- Yes.

And that the regulator on the opposite side between 512 and 5 South was one-third open at that point in time?-- Yes.

And he takes the reading near where the regulator is?-- Yes.

Doesn't that have an obvious impact on the veracity of his reading?-- The regulator is going to change the total air flow through the panel. I can't say whether it should be reduced or high. The door could be providing more air flow. If he has taken his velocity reading at the point where the CO is determined, then that CO make at that point should stand.

Well, one can always do a CO make, no doubt, if one gets two features and that is parts per million and - three features: cross-sectional area, parts per million and air velocity; isn't it?-- Yes.

But it's a question of usefulness of the figures. The features I have been mentioning impact on the use to which you can put that figure?-- Yes.

And the features that I have been mentioning to you would suggest, wouldn't they, or would detract from the usefulness of that figure, wouldn't they?-- Not necessarily.

Would it not detract from the usefulness of that figure as compared with other figures that were not taken (a) in the same ventilation arrangements or (b) with the same quantity of air going through the panel? You are not comparing like with like any more, are you, if you make that comparison?-- Not entirely.

Well, not at all really, are you? You have got significant changes to ventilation. You have got a significant alteration to the panel itself, namely, you are down to part of one intake and part of one return. It's quite a different situation, isn't it?-- It has changed. It may not have affected the determination of the CO make coming out of the panel.

Now, if we stay with 152 for a moment and follow that line up the CO make Drager readings. Now, how are we to understand your evidence about this? Is it to the extent to which they differ from yours they must be wrong? Is that how we are to understand your evidence about the comparison?-- I'm not with you, Mr Morrison.

Well, sorry, when we talked about this before and I asked you about a couple of the readings, you pointed out to me - quite rightly - you pointed out that this is a CO make based on Drager readings with all the deficiencies that apply to those. Do we understand then from your evidence that your view of these matters is that to the extent that they do not coincide with your figures they must have been wrongly taken, or do you not go that far?-- There certainly are differences between the CO makes based on the Drager tube readings and what is determined using the Unor values, and the only explanation I can think of is the difference between the CO concentrations - the different method of determining the CO concentrations.

Well, they are different, aren't they, and is that as far as you are prepared to go?-- At this stage, yes.

Now, in terms of one viewing the graphs that are - that follow from that sort of data, there is obviously, would you agree, a subjective element into how one reads a graph - and I don't here mean simply comparison of figures, I mean when looking at whether a slope is -----?-- Increasing, decreasing.

This description or that description?-- Yes.

So -----?-- Although you can obviously use methods to look at those.

There is obviously, would you agree, a subjective element in

deciding whether a graph shows, for instance, what might be described as an exponential curve?-- Yes, but, however, you can obviously draw quite good exponential curves and see if they fit that general trend to analyse - to see if they fit an exponential curve which may actually be predicated by a long linear ramp.

I understand what you are saying, but is it not the case then that absent that sort of exercise, opinions might quite legitimately differ to whether a graph is exponential or not exponential; two people might reasonably disagree?-- That could be so.

Now, I haven't yet perceived in the literature any references to what is an exponential curve in the graphs. We have various graphs depicted that might bear that description, but there seems to have been no definition of what an exponential curve is. Does that accord with your memory of the literature?-- In general literature?

Well, literature on CO make?-- I don't think anybody has ever mentioned exponential curves in regard to CO make.

That's not the question I asked. In your assessment of the literature on CO make, can you recall any definition of what an exponential curve is - literature that deals with that question?-- I don't think anybody has even, as I say, associated exponential curves with CO make.

Well -----?-- Apart from what I have heard in here.

Yes, exactly, exactly. You haven't done that yourself, but then you are not in the position of a mine operator, are you? You are not, are you?-- No, I'm not in the position of a mine operator, and I have never linked - I don't think the two are necessarily linked.

But people's perceptions are different, aren't they? We just agreed on that, people's perception are different. What is one man's exponential curve might be your some other curve. Isn't it obvious?-- I think we have had people define what they regarded as being an exponential curve and that is one in which the rate - the slope of the curve is increasing all the time and that is - that's - that is a curved curve, it is not a straight line.

But in relation to those graphs that show a change in the rate, it is very much a subjective matter as to whether one assesses it as being either exponential or ascribing a description to the change in rate?-- I think it would be very difficult when we were looking at a developing set of data to decide early in that set of data whether we were dealing with a linear curve or an exponential curve. It would be very difficult to tell them apart.

If one looked at the data then going back to, say, Exhibit 21, that is, the 512 graph as it existed in the mine - we discussed this earlier - and the comparison with Appendix 5.3(A) shows it - that the legitimate description of that is

it shows an upward trend but the line of best fit is a linear and constant rate?-- Yes.

And that is an apt description for that graph, is it not? Is it not? It's the one I think you gave to it -----?-- Yes.

----- on a previous day. It's an apt description, isn't it?-- Yes, in so far as that linear regression is concerned.

Now, you mentioned in relation to the graph for 512 - and I will just check to see which version of it you were being shown at the time - you were looking at the comparative graphs, I think, on that page in the SIMTARS data?-- Yes.

And you said in relation to that that when you looked at them, that 512 tended to indicate that above 10 lpm was due to the possible onset of a heating. Can you recall that evidence?-- Yes.

Possible onset of a heating. Now, what does that mean? It's just one of a number of possibilities, isn't it?-- Yes, yes, one of which is a possible onset of a heating.

You are, by no means, indicating or seeking to indicate by that that it was?-- It may have been.

You are not meaning to indicate or seeking to indicate here that it was, are you?-- I don't think at that early stage that one could have determined for certain that it was without the full set of data.

And the full set of data you are talking about is the data generated by the sort of analysis that SIMTARS have done for this report: various ratios, the make, the regressions, the whole bit, isn't that right?-- Well, certainly the full set of data that we have compiled would be an aid in determining that and in the back analysis, and that is what our purpose has been.

I understand the purpose behind the report, and I will come back to that shortly, if I may. I don't mean to cut you off. Do you wish to add something?-- No.

Now, the question that you were asked at that time was this, in looking at this - you were asked what the significance was of the fact that you had been referred to, namely, that the CO make in 512 Panel had gone up about 5 lpm above other non-heating panels?-- Yes.

And you were asked, "What's the significance of that?", and you said, "If we accept that the other panels had similar amounts of loose coal in them and they were similar mining method, which I believe they were, then one would have to say that perhaps 512 by 15 lpm had exceeded the background level that one would expect for that sort of panel."?-- Yes.

Now, you make the express assumption there that the mining methods in the other panels, which are 401/402, 511 and 403, were similar to that in 512?-- Yes.

to the extent that they are not, that has an obvious impact on your answer?-- Sorry, say that again?

To the extent that they are not similar, it has an obvious impact on your answer?-- It may. They are all bord and pillar places, aren't they? They are all bord and pillar places?

Yes?-- They have had similar extraction - "similar" extraction-----

I don't know what you mean by "similar". You just put some inverted commas around that and-----?-- They are stripped off pillars and taken bottoms.

What else do you understand about them? Is the rate of extraction the same?-- No, I believe that 512 is the best rate of extraction that they had achieved in recent years.

You understood, and tell me from what source, that there were similar amounts of loose coal in them. What was the source for that?-- I don't know. Did I say they had similar amounts of loose coal?

No, I'm sorry, you didn't actually say that, but what you said was that if we accept that they had-----?-- They had loose coal amongst them - around them - they would have had possibly similar rib spall characteristics because of the stresses that were being generated due to the secondary workings.

Now, can you just tell me what's the source of the information about the loose coal comparison?-- I've heard said here that people believe that 512 left more loose coal than other panels. I think that would be very difficult for anybody to assess.

Well, of all the witnesses that have touched on this subject, of which I think there are about a dozen - and I can go through them, if you like, but I'm not sure it is necessary for your purposes?-- No.

15 of them, and only two suggested that there was any similarity between 512 and the other panels. All the rest said there was a lot more loose coal in 512 than the others. Someone went so far as to estimate it by percentages or quantities, or in one case tonnages, so that assumption may not be right; isn't that right?-- That might be so, and - but, again, more loose coal may actually contribute to making the situation worse in 512 from a heating point of view.

Well, that's a different question. What it might do is increase the CO make?-- Particularly if you had a heating.

Sorry, would you just answer my question? It might increase the CO make?-- Yes, that's a possibility.

I would ask you, please, to try not to jump too far ahead of me as I ask these questions, and answer them. In relation to that, if you are wrong on the method of mining and wrong about the assumption of loose coal, then the comment must fall away, musn't it?-- Not necessarily.

Well, the comment was, on those two assumptions - on those two assumptions - you mention no other - one would have to say perhaps 512 by 15 litres had exceeded the background level that one would expect for that panel. If those two assumptions are not right, then that comment cannot stand, can it? They are the only two assumptions that you based that comment on?-- I would still say that they are similar enough to be able to draw comparisons.

Well, 5 North was a board and pillar panel with stripped ribs and pillars?-- To a greater extent.

Hang on a second, you are introducing a new assumption. You didn't mention that one before. 401/402, they stripped them to a greater extent, too, and in three different sequences over a longer period of time. You didn't mention that as a qualifying assumption; why do you mention it in relation to 5 North?-- Because of the nature of the roof falls that took place in 5 North.

The nature of the roof falls?-- Roof falls. Obviously 5 North had more substantial caved areas and perhaps-----

We are not talking about 5 North-west here. We are talking about 5 North?-- Right.

You are not thinking of 5 North-west, are you?-- No. As I understood it, 5 North had substantial fallen areas of ground.

I see. And in no way similar to the other panels; is that what you are saying?-- I can't be certain.

I see. All right. Well, let's explore that avenue further. Let's look at the similarities between 5 North and all of these other panels, then, on the assumptions that you ran us through before. One was its similar method in terms of board and pillar mining, isn't it - that's the first point you identified?-- 5 North.

Yes. Are we not certain about that?-- I can't be certain.

Well, let's look at another feature. Did they take strips off ribs and pillars in 5 North?-- I believe they did.

Right. So, that was the second feature you mentioned. The third feature was that you would have some rib crush or spall - almost certainly would have had that in 5 North on your estimation, wouldn't they?-- Yes.

And it is not much longer in time than 401/402, is it - in fact, it is a little shorter, so it can't be duration of extraction that makes it different, can it?-- Certainly not

at the time we are talking about for 512.

401/402 went on quite a deal longer - well, a number of days longer - let's not debate it. It is shown on the figures. So, what makes 5 North different? Solely the roof conditions, is that what you are saying? The falls?-- Yes, there is substantially more areas caved.

Have you examined just when they occurred in the life of 5 North?-- No.

So, if we can go to 5.4(A) in your data, which is the comparative graphs - you have probably got it already - tells me about 5 North, and then if we look at that period up to, say, 50 days, from the start of extraction-----?-- Yes.

-----what's the difference between 5 North and the other panels up to that point? Now, don't tell me the different CO make - you know I'm not referring to that - the difference in conditions in that first 5 days - what was different in 5 North?-- I can't honestly say.

All right. What was different between day 50 and day 75, say? Same thing? Can't say?-- Apart from CO make-----

No. Well, with 5 North, don't we have a panel that went up to 17 and a half parts, passed over 20 and then sat at about 17 for quite some months?-- Yes, and ultimately was sealed under duress after a heating.

When in the life of the graph did that heating start, do you know, in 5 North? Can you say? You can't say, can you?-- Not emphatically.

No. And as we know, the relevant smell only persisted for about three weeks prior to the sealing, so even if we took that at, say, 21 days and worked back, we are still close to day 150-----?-- Yes.

-----before the smell arrived and then persisted. So, in terms of physical features, we have had a panel sitting at 17 for months, but no physical features being exhibited on a heating. Now, doesn't that suggest that maybe - maybe - 17 wasn't a problem for 5 North?-- It may also have been that the heating had reached the state of equilibrium due to the nature of the goaf that was changed by some feature around about day 150. I don't know.

There is just no way of knowing, is there?-- Except that of the other non-heating panels, none of those exceeded 10 lpm for any - certainly in the time-frame that we are talking about in 512 - did not exceed 10 lpm.

Mmm. But what does that tell you? Simply that they are different, that's all, isn't it?-- Well, and that they-----

Unless you can tell me when the heating started in 5 North, doesn't that simply mean that they are different? That's all it means - they are different; isn't that right?-- To

5 North?

Yes, they are just different; isn't that right?-- Not necessarily.

Well, let's look at that first 50 days again. If there was no heating in that first 50 days, what do you draw from that CO make graph? It's gone up close to 20?-- Yes.

It has arisen from 10 to 20 over a period of seven weeks. If there was no heating in that time, what do we draw from that?-- That there may have been a heating at that time.

Sorry, if there is no heating at that time, what do we draw from the CO make? Simply that it is between 10 and 20, don't we - that's all you draw?-- Yes.

Isn't that right? Then if we look at the period between day 50 - let's just take day 100, the next seven weeks?-- Yes.

If there is no actual heating in 5 North in that time, all we draw from the level of CO make is that it is about 17 - that's all you can draw from it; isn't that right?-- Yes. If you assume there is no heating in there.

Unless you know all you can draw from these empirical figures are that they are at the levels they are, that's all you can draw from them; isn't that right?-- Unless you have some other means to back them up.

You see, you keep referring to 5 North as the sort of heating panel or the others as the non-heating panels, but in relation to 5 North, in terms of the signs - I deliberately leave CO make alone for a minute for this reason - in relation to the signs we have, obviously that happened right at the end, but the smell was only of about a three week duration and constant. That's all we know. In relation to the CO make, it took off in the last day, but up to that point had been running at around 17 plus lpm for months?-- With a-----

Surely - sorry?-- With a ramp from about day 140 or thereabouts.

140 to about 150?-- With a reversal. That could have been the onset of the heating with a change in ventilation causing then a drop in the CO make.

That's right. From looking at the graph, we just don't know where the heating started, do we?-- No.

And without knowing that - without knowing that - you can't really ascribe anything to this beyond the fact that it existed at certain levels of CO make for a certain period of time?-- Yes.

And, therefore, there is a comparison that can be made between 5 North and the other panels, isn't there, because you don't know that it was a heating panel at any particular point, except the end. It is the only time you know there is a

heating there; isn't that right?-- Certainly in the case of 5 North from the contemporary reports. That does not mean to say that the signs - that the heating was not present some time before.

No, but we don't know when it was - came on, do we? We just don't know it; isn't that right?-- But the intention - this CO make graph for 5 North was not developed before the heating. It wasn't used as an analytical tool.

That's not the question I'm directing your attention to?-- Okay.

We just don't know when the heating came on, do we?-- No.

See, you exclude 5 North from its comparisons on the basis that it was a heating panel, and you include all the others on the basis that they were non-heating panels, but the truth of the matter is that we just don't know when the heating in 5 North started, beyond the fact that it was there in the short time we are looking at; isn't that right?-- It is reasonable to say that the heating developed over a period of time. It just didn't materialise that day. It took some time to develop. It may well be that if we had had - the trend might have shown itself from about day 140 or thereabouts.

Well, what I'm suggesting to you is that it is incorrect to exclude it from the comparisons, certainly in its early days, merely because at the end there was a heating there; now, what do you say to that?-- I don't know.

All right. If we look at, say, the comparison between 512 and 401/402, leaving aside the spike that occurred on the data shown there, 6 August, it reached levels comparable to 401/402 but in a much shorter time-frame; that's the comparison to be made there - 401/402 ended up hitting roughly something about over 13; is that right?-- Yes.

And in the period that we are talking about - that stabilisation period through to 5 August - then we are talking about figures of 14 for 512; isn't that right?-- Yes.

So, they have reached comparable figures, haven't they, over their life of extraction?-- 402 took a reversal just before sealing.

Yes, that's right. But, over the life of their extraction, they have reached comparable figures?-- Yes.

It is simply that 512 was over a shorter period of time because it was extracted over a shorter period of time; isn't that right?-- It may be.

Well, it is so that it was extracted over a shorter period of time; we can see that much from the graph?-- I can't-----

And it is so on the face of the graph that over the life of their extraction, they reached comparable levels of CO make, didn't they?-- But the trend on the graph is much steeper for

512, 402/401.

One question at a time. Is it not the case that over the life of their extraction they reached comparable levels?-- Comparable, yes - if we compared approximately 12 and a half to 13 as a peak for 401/402 compared to 15, maybe 16 on 512.

Well, not 15 - the stabilisation period I drew your attention to through to 5 August, it certainly wasn't 15, was it, on that data? It only crosses 15 when you get that spike at the end?-- Yes, on the data that is shown on 5.4(A).

Of course it is steeper, but that's because it reached the comparable level in roughly half the time, isn't it - or was only - in terms of extraction duration, it was only half the time?-- I can't comment on the production rates out of 402/401.

Well, am I wrong in saying that on the face of the graph, duration of extraction was only half the time for 512 than it was of 401/402?-- Yes, 402/401, as I understand it, was substantially a larger panel.

You would expect, wouldn't you, that if you were exposing coal at a faster rate in panel X as opposed to panel Y, that you might get increased CO production and likewise increased CO make assuming ventilation is similar?-- Yes, and it would be difficult to determine how much higher that would be in a given set of circumstances.

Yes, very hard. Now, in relation to - that sort of comparison, then, or rather that sort of problem, we come to the - one of the points that you made the last day, and that is in relation to the 512 panel. You, in the context of looking at these graphs, made some comments about the levels that it had reached - and I'll just read you some passages or at least direct your attention to page 4204 and 4205. If you like, I can have them put in front of you so you can read them, but I will attempt to paraphrase them as fairly as I can. You were being asked about the levels of 10 and 20 and directing your attention - Mr MacSporran had directed your attention to 15 July. You can pick that date up on any of the graphs that you have with you, and you offered this comment - it was volunteered by you - the question was: "You would have concerns, you say, at that level, which is about the 15th of July?" - in other words, the level of CO make as at 15 July. Mr MacSporran was saying to you that you would have concerns at that level. Your answer was, "Yes, I think so, but I'd modify that by saying that given the nature of the 512 panel and the fact that we are looking for some sort of - that we could expect that as coal was being left - loose coal was being left in the panel, it is very - it is probably quite difficult to tell what proportion of all this is due to loose coal being left in the panel and what proportion might be the on - indications" - I think you meant to say "onset" - "the indications of the onset of spontaneous combustion." Would you like to have this in front of you?-- No.

Do you recall that answer?-- Yes.

Now, what you were saying there in answer to the question about the concerns was it was a qualifying feature of them that you could not tell - or it was quite difficult to tell at that point just what percentage of the CO make was due to loose coal and what percentage might be the onset of spon com?-- Yes.

That's in essence - and you stand by that, don't you? Was that something that's very difficult - that's something that's very difficult to tell?-- Yes.

Now, you went on to say that it would be difficult to determine - and you were asked, "Wouldn't it be very difficult to determine?", and your answer was, "Just from the CO make, I think, yes, unless we blindly accept that 10 litres and 20 lpm and say that that point there, or here...if we just slavishly stuck to the 10 lpm." The point you were making there was that absent some slavish addiction to those parameters that is a very difficult thing to ascertain; isn't that right? That's the point that you were making?-- Yes.

Now at 4,205 you were asked this question: "Is there any way currently it's possible to establish whether such a trend is due to loose coal as opposed to the onset of a heating from the CO make data" - sorry, I'll read that again because I probably put the emphasis on the wrong word - on the wrong syllable. "Is there any way it's possible to establish whether such a trend is due to loose coal as opposed to the onset of a heating from the CO make data I'm talking about?" In other words, Mr MacSporran was talking about - put your attention on to CO make data and tell me is there any way to establish whether it's due to loose coal or spon com, and it's in that context you said you might make a comparison with other panels looking at similar mining method, similar seam or same seam and hopefully in the same mine. Do you recall that answer?-- Yes.

Now, that is - those two passages reflect in fact your evidence on that topic, don't they? Namely absent some addiction to 10 and 20, at any particular point in time it is very difficult to determine whether a particular CO make is emanating from loose coal left in the panel as opposed to the onset of spon com; isn't that right?-- Yes, apart from looking at the trends and that as well.

Are you talking about trends of CO make or trends in other features?-- Trends in CO make and other features.

Now, at 4,221, this is the next day, so it's last Thursday, you came back in the morning and you were asked this question again, as it were. It's the same sort of question as I've just read to you from page 4,205. "How would you go about establishing that such a rate of increase" - that is to say the rate of increase in 512 Panel in the CO make - "How would you go about establishing that such a rate of increase was not due to spontaneous combustion inside the panel? Would that be possible firstly?" Your answer to that was - this question is

slightly different. You were asked originally could you tell if it's one or the other and you said no, and you stand by that question. Now you are being asked could you tell if it was not due to spon com and your answer was, "I said yesterday that I didn't think it was possible to prove that it was due to oxidation of loose coal." As we now see that wasn't an accurate comment on your previous evidence, was it, because what you had said the previous day was you couldn't tell what was due to loose coal and what was due to spon com, it's very difficult to tell that. That's what in fact you said?-- Yes.

What you ascribe to yourself here at 4,221 was, "I said yesterday that I didn't think it was possible to prove that it was due to oxidation of loose coal." That's a different thing, isn't it?-- Ambient temperature, oxidation of loose coal, yes.

It's a different point from the one you had mentioned the previous day, isn't it?-- Yes, slightly.

"...but it may well be possible to show the corollary, the opposite of that, that it was due to spon com.", and then you went on to list the Graham's ratio, other ratios, physical inspection and so forth as being ways in which you could do that?-- Yes.

But you don't mean to suggest, do you, that you can in fact easily tell what is due to loose coal and what's due to spon com, can you? All that you are prepared to say, I think, putting the direct connotation on what you've said, is that an analysis of certain features might show that it is spon com. Absent that analysis it's very difficult to tell. Isn't that the truth of it?-- Having those features present, the Graham's Ratio or those other ratios, would confirm the analysis indicated by the CO make. Using the CO make as the first tool to decide whether there was - to be the first warning tool of a heating.

Isn't that the point that I've just made to you? Absent the analysis that you went on to refer to, namely the ratios, physical inspection and so forth, absent that it's difficult to tell, and that's the effect of what you were saying the previous day. Isn't that right?-- Absent those other indicators -----

It is difficult to tell, isn't it?-- Unless we stick to the guidelines that we have -----

Unless we blindly accept 10 and 20; isn't that right?-- Yes.

About which we know nothing beyond the fact that someone in Germany said it to Mr Mackenzie-Wood in circumstances we don't know about. That's all we know about it; isn't that right?-- I think there may be other evidence on that. I'm not here - I can't support that.

You can't support the 10 and 20, can you, as applicable to Australian coal? I think we agreed on that the previous day. There is just no evidence that it is applicable, is there?--

I can't say.

Now, if I can continue on with this line for the moment, you were pressed again with the negatives and spon com was the next one you were asked to - or you volunteered at page 4,223 when you had turned then from CO make to Graham's Ratio. The comment you made was that given certain ratios you would be concerned - you couldn't exclude spontaneous combustion as a possibility. Is that the way that you were meaning to indicate the use of Graham's Ratio proceeds?-- That - given an indication from Graham's Ratio that would be an indicator of spontaneous combustion.

Now, you are talking about the use of it to exclude spontaneous combustion. "Well, what would that tell you" - you are there talking about oxygen deficiencies in terms of the levels of Graham's Ratio that were calculated - "What would that tell you in terms of whether you could exclude the prospect that all of the signs related to spontaneous combustion as opposed to something else?" Answer, "I would be concerned that you couldn't exclude spontaneous combustion as a possibility.", but that's not the way you that were predicating the use of Graham's Ratio, is it? You were saying you use it to see if in fact there is a spontaneous combustion, you don't use it to exclude it, isn't that right, or is it the same thing in your mind?-- It's a case of using all of the signs in a - in completeness, as a package, so to speak.

Well, let me just ask this: if you had available to you a Graham's Ratio that on the normal indicators suggested there was no spontaneous combustion you could legitimately have regard to it as excluding spontaneous combustion, couldn't you?-- Assuming it's accurately calculated and there were no other indications such as a high CO or rate of increase in CO, CO make or CO parts per million. You have to use them in - as a suite of tools, not in isolation.

Now, let's just examine that. Do I understand you correctly to be suggesting that effectively, using the term "suite of tools", that in order to make the sort of analysis that we are discussing here all of them have to be used one against the other or one in conjunction with the other, the suite of tools that you have just referred to?-- One would be the precursor you use to check the others.

So if the CO make didn't raise alarms in your head it's quite predictable that you wouldn't necessarily go to check against Graham's Ratio or anything else?-- Or if I had a Graham's Ratio that was causing me some alarm I would be having a close look at that CO make.

Or conversely if you had a Graham's Ratio that was not exhibiting any problem you might not go to the others either?-- I think you end up with a pile of negative indicators that give you cause to believe that you don't have a heating, but any of the indicators that give you cause to believe you do have a heating you have to check it out.

Yes, exactly. Now, if I can continue, at 4,223 you were taken back to - the whole context of this conversation with Mr MacSporran was the fact that the oxygen readings had been wrong and the impact that had on the Graham's, and you said at the bottom of 4,223: "...I would make the point that because this oxygen concentration has such an impact then it might prove that any trending that one could do on Graham's Ratio is also damped down, if you know what I mean. The trends would be very small, whereas if a more truly representative value of Graham's Ratio could be calculated the trends which also impact on the analysis of Graham's Ratio might also have been much more obvious, but that's why we haven't particularly referred to Graham's Ratio from the tube bundle system." Now, the point of that answer was to make, as it were, three points. Firstly, the misreading of oxygen on the machinery itself would dampen any trends that were to be seen in Graham's Ratio?-- Yes.

Secondly, that had it been done correctly it may, but not necessarily would have shown more obvious trends?-- We can't be absolutely certain, but there is an indication of higher Graham's Ratio - obviously the error on the oxygen is to decrease the Graham's Ratio, and there were Graham's Ratios to be of concern - that would have been of concern.

Had they been -----?-- Had they been calculated -----

Had the machine appropriately read oxygen. You will have to - I think that's a yes answer for the girls' purposes?-- Yes, sorry.

Now, the third point that you were making was because of that dampening effect, that's why the report doesn't centre on the utility of Graham's Ratio from the tube bundle system?-- That's right.

And that's the reason why you went on with this comment at 4,224, that the approach should be more - would be more conservative. In other words your approach to analysing the data has to be more conservative now you know about the dampening effect of the O2 deficiency?-- Yes.

Now, you seem to acknowledge at page 4,224 something that I thought we covered last time, namely you acknowledge that there is scope for divergent views about the utility of Graham's Ratio after a sealing. Do you understand what I'm getting at?-- Yes.

Is that so? People do legitimately differ on the utility of the Graham's Ratio after a sealing?-- Particularly after a long period has passed, probably not so much in that first period of time.

Well, in fact there is literature which suggests that Graham's Ratio is not helpful after a sealing, isn't there?-- One would have to look at the reasons why that is said, and I have indicated some reasons myself why that might be so.

I will take you to some of that literature shortly, but it is

an area where people do differ and they have divergent views not only as to utility, but also the period of utility?-- I would think so, yes. It's almost inevitable, isn't it?

Inevitable that you get disagreement?-- Well, yes, because

I'm sorry -----?-- Yes, it's almost inevitable that people will disagree on an indicator as to what its true meaning is.

Now, you were asked to make some assumptions by Mr MacSporran in relation to the passage of evidence that I took you to before and they were at a certain point - I will find them again for you in a moment - as at 15 July assume that there was a report of this smell, the tar smell, you recall that, and the report of a benzene smell, you recall that?-- Yes.

Now, on those assumptions only of that information, and looking at the graph, you expressed some view that you might have a concern that would need investigation as to whether there might be the onset of a heating?-- Yes.

That's without - I don't think I am unfairly paraphrasing it, am I?-- No, I don't think so.

Relevant to that assessment there are other factors to be taken into account. One of them you mentioned, assuming the veracity of the report of the smell?-- Yes.

And you expressly raised that as being one thing that immediately sprang to your mind, "Am I too assume that it is correctly reported and existing?" Now, it would matter whether that was true or not, wouldn't it, obviously?-- If somebody is lying, well -----

Or mistaken?-- Or mistaken.

We don't have to go to the extreme of lying, just mistaken will do. Someone mistakes chemical roof bolt smell for benzene smells and the like. That matters in that assessment, doesn't it?-- I find it hard to believe that anybody could mistake chemical roof bolts for fire stink.

Well, you might, but there is some evidence that somebody has, and it would matter also as to whether the smells persisted, wouldn't it?-- One would be more concerned about reports of smells that persisted than otherwise, but it doesn't necessarily follow that absence of those smells following on the reports of those smells means that the situation has changed sufficiently to eliminate those smells. It could be due to ventilation changes.

Let me take you back to the assumptions you were asked to make. One was the tar smell on 17 June. Now if I can ask you to assume that that was never repeated at any stage - I ask you to assume something else in relation to the benzene smell, that it was identified and people did check it out and it wasn't repeated either?-- Mmm.

Over the ensuing - let's just take a month, don't need to take much more than that - over the next month on the shifts where people went to the same spot, not repeated at all, that would affect the way in which you read those signs, wouldn't it?-- Lack of confirmation of those smells doesn't necessarily prove a confirmation of a lack of those smells, if you know what I mean.

You mean lack of confirmation doesn't prove they never existed in the first place?-- That they never existed.

But their non-repetition is a matter to be taken into account, isn't it?-- Yes, if you got one instance and it wasn't repeated and the guy wasn't certain, you would have to take that into account, especially if no other signs came along to back that up.

I am about to move on to a slightly different point.

WARDEN: Thank you, gentlemen. We will take the lunch adjournment. 2.15.

THE COURT ADJOURNED AT 12.58 P.M. UNTIL 2.15 P.M.

THE COURT RESUMED AT 2.17 P.M.

DAVID ROBERT HUMPHREYS, CONTINUING:

MR MORRISON: Mr Humphreys, can I ask you something now about a general matter? Would you agree with this statement: that establishing a particular normal value for a colliery or panel return in terms of CO make is of prime importance?-- I would think that the primary - of prime importance is detecting those changes away from some increasing - sorry, I will start afresh. I think the prime thing would be to look for increases in CO or CO - CO parts per million or CO make. If a background level has been established for a panel, it is important to all in deciding when those deviations have occurred. If that hasn't occurred, then I would be concerned about some - if a background level hasn't occurred, and that is that the rate of increase in CO parts per million or in CO litres per minute has never stabilised at zero so that we are getting a constant value of make or CO, I would be concerned to see continuing upward trends in CO or CO make.

Well, do you regard it as desirable or necessary then to establish a background CO make for a panel or district?-- Obviously it's very desirable to establish that because it gives you a platform from which to work. I think it would be obviously easier for panels with a longer life because there was that chance of stabilising at some background level, but for short panels that may not - if a heating develops in those short panels, then it may not develop a background level and you may get a heating on top of that initial wave of CO and never establish a background level.

The background level can be established in part at least by the CO make level developed on first workings?-- Well, if you were talking about an instance in this case such as 512, it would be difficult to say that - that was going to be a starting point for where your CO is likely to increase from. That point - having developed the panel and knowing that you are going to form loose coal, it would only be the starting point from which you are going to develop CO make.

That's right, it's the base figure upon which one might then add another figure to represent background levels?-- Yes, you might say that.

And if one was developing a panel with a new method of mining or a novel approach to the method of mining, then it would be desirable to develop a background CO make but a little harder to do so?-- Yes. Unless you had a panel of similar - that you were content was similar enough and had not had a heating in it and had established a background, then yes.

And if one had a similar panel in terms of size and duration and so forth but the mining method to be adopted in the new panel was one which would expose more new coal at a faster rate, then that is a factor that might legitimately be taken into account in assessing background CO make?-- You would

XXN: MR MORRISON

WIT: HUMPHREYS D R

have to balance your judgment on what contribution that additional coal, loose coal, and mining method might make to that CO level, and it may not be simply a case of the amount of loose coal. It may depend on the geomechanics of the situation as well.

I understand that there might be a number of elements in the analysis that took place, but it is a legitimate feature to take into account, isn't it, that one was going to expose more new coal at a greater rate than in a previous panel? How one precisely quantifies it and identifies is quite another matter, but in terms of legitimacy it's quite right to take it into account, isn't it?-- Yes, but you have to be prepared to test that when you start seeing levels higher than perhaps similar panels or, shall we say, dissimilar but not so dissimilar to be totally different, say between a bord and pillar place and a longwall, but, say, between similar - between bord and pillar places maybe with rib stripping as opposed to the method that's being used in 512. You would have to be concerned if you saw something - some CO make levels occurring in that panel that were above those of - we can agree to differ - similar panels.

Well, the distinction you just drew a minute ago in what you have said leads me to think that you would not draw a comparison between a longwall panel and a bord and pillar panel for this purpose. You just made that distinction yourself, I think?-- Yes.

And that's so, isn't it? It would be an incorrect approach, or at least one susceptible of much greater error than otherwise, to try and adopt CO make parameters from a longwall panel to a developing bord and pillar panel; is that not so?-- Certainly I'd pay more attention to what was happening locally in trying to establish those background levels than, as I said, slavishly sticking to 10 or 20 litres.

Well, you apprehended rightly the point of my question. That's precisely the point, 10 to 20 is something developed in relation to advancing long walls in Germany, isn't it?-- As I understand it, yes.

And by your own statement a minute ago, it is inappropriate just to apply those to bord and pillar, isn't it?-- Not necessarily.

Well, you drew the distinction a minute ago that in looking at background CO make levels you wouldn't look at longwall to the new panel, you would look for bord and pillar to the new panel?-- If I had the information available on the site.

All right. Now, can I ask you this: you make reference in your report to, amongst other things, the article by Mr Wright?-- Yes.

Now, you know that article obviously?-- Yes.

That deals with a lot of information in relation to retreating longwalls?-- Yes, I believe so.

And, may I suggest, solely the retreating longwalls?-- Yes.

And there are no conclusions in that document that do not relate only to longwalls?-- Would you rephrase the question, please?

Yes, there are no - well, I put it that way and I can give you a converse. There is no conclusions in the document that do not relate only to longwalls? It's a double negative. If it's hard to follow, I will put it a different way. The conclusions relate only to longwalls?-- In so far as that report is concerned.

Now, can I ask you to have a look at another document, please, which is - it will be in your Volume 2, Appendix 5.2(A). I took you to this document the other day. Do you have that?-- Yes.

At pages 6 and 7 of that appendix the first couple of pages of the article to which I directed your attention on Thursday, and if you recall I asked you to look at, at that stage, only one point in this scenario, namely, the Graham's Ratio which appears in table 2 on page 7?-- Yes.

Now, this is, as we see, a table which has been developed and commented upon in relation to risk management of spontaneous combustion. Now, can we look down that table - that's table 2 - and can we see items 6, 7 and 8 under the heading "Existing Rule"? 6 is, "If CO make exceeds 10 lpm investigate."?-- Yes.

7 is, "If CO make 15 lpm initiate control."?-- Yes.

And 8 is, "If CO make 20 lpm initiate control."?-- Yes.

No distinction there between 7 and 8, is there, apart from the figure, in terms of the rule?-- No.

Now, if we look over then to the next column in the middle, 6, 7 and 8 are dealt with together and differences and significance of differences are outlined there, and the first question postulated in relation to 6, 7 and 8: "Are air flows valid? Must consider background CO make.", and then some dot points: "Easy to do; if done correctly and CO background known; overseas results, but appear valid." Do you see that?-- Yes.

And then required changes, 6 and 7 and 8 suggest a modification of the rule that is expressed in 6, 7 and 8?-- Yes.

"Modify rule to 'If CO make trend'" - goes up I take the arrow to mean, or is going up - "'over a range set for the specific pit (based on background CO), then heating is present'." You see those words?-- Yes.

Now, that article is clearly suggesting, is it not, a departure from any strict adherence to 10 and 20 and something

a little closer to perhaps what you were postulating in your evidence on Thursday, namely, that one needs to look at a rise and assess the significance of the rise without slavish addiction to 10 and 20, isn't that right? In its terms it abandons 10 and 20, doesn't it? It recommends a change which does not embody the figures?-- As it appears there.

You would agree with that, wouldn't you, that's what it shows?-- That is the way it reads in this article.

Now, those tables are taken from a Minerisk analysis called The Review of Diagnostic Techniques for Detection and Monitoring of Mine Fires?-- Yes.

I don't know that that document appears in the volumes?-- I don't believe it does.

You don't believe it does, but let me read you the team comprising the reviewers who determined upon that review. You tell me if this accords with your memory?-- I have no memory of it.

Well, let me do it anyway and tell me if you know some of these people. For SIMTARS Dr David Cliff and Mr Stewart Bell, for ACIRL Mr Terry O'Beirne and Mr Zoltan Nemes-Nemeth, for the Department of Resource Industries Mr Brian Lyne and Mr Barry Biggam, for the United Mine Workers, etc, Mr Bill Allison and for Southern Mines Rescue Mr Paul Mackenzie-Wood. They were the reviewers. Would you just like to check that or accept my word for it?-- I'll accept your word for it.

Now, if what I say to you is correct, then would that not strengthen what I say to you: the very person who has put in his book the 10 and 20 on which so much time has been spent here is part of the review team that recommends that that 10 and 20 be deleted in the rule, isn't that so?-- Who are you referring to?

Mr Mackenzie-Wood?-- I can't speak for Mr Mackenzie-Wood.

Not to detract, of course, from Mr Bill Allison, Mr Brian Lyne, Mr Barry Biggam and the rest, but it reinforces what I say, isn't it? The review suggests a dumping of the 10 and 20, doesn't it?-- Without reading the whole article in context, they certainly seem to suggest that what one is looking for is trends over a range for a particular coal seam. I take a range to indicate levels of CO make, be they 10 and 20 or 15 and 25 or 5 and 15.

Whatever is applicable to the pit or the seam?-- It would appear so.

Now, can we notice something else from that table in terms in the second column of existing rules? There is no rule identified by this review group that suggests that haze is an indicator of spontaneous combustion; do you see that?-- Yes.

And, likewise, there is no rule identified by this reviewing group to suggest that a shimmy of some kind is an indicator of

spontaneous combustion?-- However, we are talking here about the development - the early stages of the development of a heating, not the late stages of a heating.

Well, 13 and 14 deal with that same problem, don't they? Sweating is identified and fire stink is identified but not haze or shimmy; correct?-- Yes. I can't say why they haven't included those.

Well, no doubt for good reason. I have nothing further, Your Worship.

RE-EXAMINATION:

MR CLAIR: Thank you, Your Worship. Mr Humphreys, I want to ask you, first of all, about one of the graphs that you were referred to in the course of your evidence, Exhibit 218. Do you still have that exhibit there?-- I have got a few here, Mr Clair.

If you can just check on the table while perhaps a check can be made -----?-- No, I don't have 218, I don't believe. Yes.

It's a point that may have been implicit in what you said about it but perhaps didn't come through. It at least left a question hanging in my mind. It may have done in others. You were asked some questions about the differences in presentation of the graphs there. Those three graphs plotted being respectively, as I understand it, the 40 cubic metre per second graph on the bottom?-- Yes.

The 20 cubic metre per second in the middle and then the 15 cubic metre per second above?-- Yes.

Now, I think you did make the point by way of reference to those graphs that in a panel with the higher quantity of air, the higher velocity, then you get the lower readings progressively of parts per million giving you, in effect, the same litres per minute make?-- That's right, yes.

And it would appear, would it not, that you also get in the case of the higher velocity panel a much flatter curve. Is that a correct way to state it?-- Well, that is what I explained to Mr MacSporran, that the slope of these curves will also be flattened. By slope I mean the way that it moves upward from the bottom left to the top right. So that the panel with a greater air flow will have a lower sensitivity, if you like, to changes in carbon monoxide concentration. They will - or changes in make. They will manifest themselves in a much smaller change in carbon monoxide concentration.

Obviously we can't, in these circumstances, talk about the actual slope of a graph because the actual slope simply depends on how one plots the X axis or the Y axis

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respectively; is that right?-- No, we could talk about actual slopes because we can talk about, in the case of this graph, parts per million per week.

Yes?-- Or in the case of a CO make litres per minute per week, and - but obviously, yes, you can change the representation of this graph by changing the scaling factors but numerically it doesn't change the slope of the graphs, it changes the visual presentation of the graph.

Yes, I am talking about the visual presentation, and one can't simply talk about whether it's a 45 degree slope or anything else?-- Well, if you change the axes, you could plot these at 45 degrees or 15 or 60 degrees.

But perhaps with an eye to the future, is it true to say that in dealing with a high velocity panel, then it's necessary to be conscious of the fact that there will be - it will be more difficult to readily discern a rapid change or significant change in litres per minute make?-- Yes.

By way of reference to a graph plotted in this way?-- Unless it is plotted in - with appropriate axes. For example, I think at 45 cubic metres a second a 1 part per minute - 1 ppm increase in carbon monoxide is equivalent to 2.4 lpm, whereas it's equivalent to, I think, 4.8 at 20 cubic metres a second.

At 20 or 15?-- At 20.

At 20. Yes, okay. Now, again, if one is dealing with a high velocity panel, is there a danger that the mere fact that it is a higher velocity panel may well lead to any smell, for instance, being more readily masked?-- I would think that that would be the case; that the rate at which those products which are causing the smell would be - assuming they are the same, then obviously if we have just diluted them amongst 40 cubic metres per second compared to 20 or 15 cubic metres per second, then they would be - in the returns where this is occurring, where all this is accumulated, then, yes, it would be masked, and that is why perhaps people have reportedly detected smells in areas of low velocity because there is the possibility of air concentration in those low velocity areas.

When you say that, you are referring to the evidence in this case or are you speaking generally?-- Well, in this case and generally.

Okay. Again, if one is to look at the discernment of a haze of some kind as a possible indicator of spontaneous combustion, a haze may well be more difficult to detect in a higher velocity panel?-- I would expect it to be more easily broken up in a higher velocity airway simply just by virtue of turbulence, whereas it's more likely to accumulate and form in a roadway which has a low velocity in it; much as, I guess, almost the same way it's unlikely you will get a fog if there is a gale blowing compared to if it's still. Never mind the meteorological conditions.

Then, with a view to what measures one might take positively to investigate a question of existence of spontaneous combustion, it has been suggested in some of the literature that we have seen here, at least in one part of the literature that we have seen here, that if there are some signs which raise a question of spontaneous combustion, one step that might be taken would be to slow down or reduce the air quantity in the panel - slow down the velocity, at least temporarily, in order to help detect, for instance, a smell or a haze?-- I think it is being suggested - in theory, I don't know of any situations where that's actually been applied, but in theory you can see from these graphs that if we were physically capable of slowing the air flow down, then we might actually get a better determination of the CO make from the panel. Whether, in actual fact, it was physically possible without contaminating the air flow with excess methane in the case of this particular panel, I couldn't say. I think-----

Such a step could have its dangers, you would say?-- Yes, yes.

So, it would have to be done under quite controlled circumstances?-- You would also have to be careful about interpreting the information that you obtained to know that the panel had re-established some sort of equilibrium. If you just simply dropped the air flow and immediately took an air flow reading and the CO, I think you would get an apparently low carbon monoxide make, or an apparently low CO concentration. The CO concentration would reflect what is in the air there, but you would get an apparently low make at that time.

Now, you may still have some of these other exhibits that I wish to refer you to. Do you have Exhibit 221 there?-- Yes, I do.

Now, you were asked some questions in respect of Exhibit 221 earlier today?-- Yes.

Just so that I can be clear about this, up to 23 July, at least, Exhibit 221 represents what we have seen on the other graphs that were tendered here as graphs that were posted at the mine - that is, showing the weekly ventilation survey results?-- The source of information up to - I think it is 22 July - is the BHP spread sheet that shows that information.

Except that the presentation of that phase has been corrected by sorting ought the X axis, to put it simply?-- Yes, that is getting the date format sorted out.

You have got Exhibit 110 there?-- Yes.

That's the one that - the front page of that is the one that's been referred to as having different jumps, as it were, along equal spaces along the bottom axis - or X axis?-- Yes.

Now, in relation to 221, beyond 23 July what is plotted there represents the readings that were taken-----?-- These-----

-----by the deputies and reported in deputies' reports; is that so?-- It represents a CO make based on the reported values of the deputies' anemometer readings for the particular shifts and the CO taken from the Unor. I can't - sorry, taken from the Unor system as reported in Exhibit 152.

And, in turn, what you have taken there were the middle of the shift levels?-- No, they are the ones on the BHP Exhibit 152. I can't be exactly sure when they are.

Oh, Exhibit 152?-- We are looking at Exhibit 221, aren't we?

Yes, 221. You have taken there - you should still have Exhibit 152 there?-- Yes.

The page is the one that I think is the-----?-- Is the CO make 512 panel, table two from the back.

You have simply taken the Maihak figures from there; is that right?-- Yes.

Not the Drager figures?-- No.

But the Maihak figures from there?-- The Maihak figures.

And plotted them there to give the points on 221?-- Once the make has been calculated, yes, based on the velocities in this document and the CO Maihak readings in this document.

Now, in relation to the other exhibit that you were being asked questions about - 158 - have you got that? That's the double one?-- Yes.

What you have plotted in the latter portion of that graph - that is, from 23 July forward-----?-- Yes.

-----was-----?-- Is essentially the same as 221, but my interpretation of the CO values on the Unor system were based on taking a shift average.

A shift average?-- Except for the last point on the 6th of the 8th, which was taken as a point value.

Now, the shift average - how did you take that shift average?-- It was taken from the data obtained from the tube bundle computer installed after about 27 July, or on about 27 July - so, the data set that is in volume 1 - and took a statistical average between certain times on each of the dates to represent the shift average for each of those shifts. So, it is based on the Unor individual analyses as reported in volume 1 for 512 top return.

In that case it is the shift average as opposed to the ones that were reported by BHP in Exhibit 152?-- Yes.

Now, did you take some figure in relation to that which represented a point of time in the middle of the shift?-- Yes, I used that for the purposes of simply plotting where these points were on the X axis.

I see, on the X axis?-- Yes, I had to assign some time to it. With it being shift by shift, I used the approximate mid-point of the shift to say - well, for example, night shift was plotted at 02:00 hours, day shift at 10:00 hours and afternoon shift at 18:00 hours, being the approximate mid-point of the shift.

So, what you were attempting to do was to take a shift average and a middle of the shift point in time to give you, as it were, the nearest thing to an accurate representation of the CO make at that point in time during the shift?-- Yes.

And was that the only way that you could actually - or at least not the only way, but the most accurate way in which you could see yourself proceeding?-- Not-----

To produce that?-- Not specifically knowing when the velocity readings were taken by the deputies, I felt that was the most accurate way. It could have been done a little more elaborately by, say, taking the minimum and the maximum average for the shift and doing a more complex graph, but there wasn't much distinction between the minimum and the maximum for each of those shifts; so, average it was.

Now, Mr Morrison did ask you some questions directed to seeking your opinions as to whether, in the end result, using an anemometer reading that came from some time on the shift to plot CO make for what turns out to be a mid-shift reading could be regarded as a reliable indication of CO; make do you remember that?-- Yes.

And I think you expressed the view that what you were attempting to do was at least to take what you considered to represent, as best you could, the CO make for that shift?-- That was the intention.

Okay. Now, I want to ask you some questions then about another system that was adopted, and I'll ask you to look at Exhibit 109, which I suspect you don't have there in front of you at the moment?-- No, I don't.

Could the witness see Exhibit 109, please, Your Worship? Just while that's being obtained, Mr Morrison established when he was questioning you that the ideal way to calculate a CO make - perhaps the only way to calculate it accurately is to use an anemometer reading that's taken at the same time as the CO parts per million reading that's being used to calculate the make?-- Yes.

Remember him asking you that?-- Yes, that's been promulgated in the literature.

Can you turn to the third page of that, actually? I don't know whether you have been here and listening to all of the evidence, Mr Humphreys. I would imagine there would be some times when you haven't been present in Court?-- I have heard most of it.

But if you would look at that document there, you will see that it shows the calculation of the CO make in 512 for the period commencing 28 February?-- Yes.

And on from there. You might recall that evidence was given that what was done in order to calculate the CO make was that the anemometer reading from the ventilation officer's weekly ventilation survey, or report, was taken, and that was multiplied by the weekly average, generally - the weekly average on the Unor for CO make in parts per million?-- Yes.

For the particular point?-- Yes.

Do you remember that?-- Yes, I've heard that.

Well, then, first of all, can I ask you whether you have any comment on that method - that is, taking a weekly average of the Unor reading over the week prior to the date - the date on which the CO make is - or with reference to which the CO make has been calculated?-- It seems almost the complete antithesis of taking a simultaneous reading of CO with velocity, and would produce - could produce large errors in CO make if, obviously, the carbon monoxide concentration happens to have varied through the week due to whatever reasons, and it was partly to look at that - it was why the comparison graph in Exhibit 158 was drawn up - to compare the results between the CO makes as published by - as calculated by this method compared to ones done on a - perhaps a tighter regime, either on a daily basis or a shift by shift basis.

If you had a situation where the CO make was rising throughout the week prior to the day on which - or with reference to which the CO make was calculated - the day on which the anemometer reading was taken - and, in particular, if the CO make was rising more rapidly towards the end of that week, what would be the effect of taking the weekly average of calculating-----?-- It is going to over-estimate the CO make at the beginning of the week, underestimate the CO make at the end of the week, and it could be either in the middle of the week.

When you say that it will "over-estimate it at the beginning of the week", assuming that a graph is being plotted from whatever point was taken on the previous Friday, is that going to lead to any over-estimation at the beginning of the week, or is it simply going to flatten out that segment of the curve for the whole of the week?-- I think the gist of it is that if we are doing a determination on Friday and we take the average for the week, what you will have on Friday afternoon, or on the Friday - if the CO is climbing through the week, we will have an underestimate of the CO concentration at the time when the velocity reading was taken - we'll have an underestimate.

Now, I want to take you to some particular figures on that Exhibit 109, because there was evidence given that if there was a significant difference between the CO in parts per million and the CO on the Unor system - that's the weekly average on the Unor system - then the CO in parts per million

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would be used, but-----?-- Of the - sorry?

Sorry, the CO from the Drager tube - when I say CO in parts per million, the CO from the Drager would be used as opposed to the Unor average?-- Okay.

That doesn't appear to have occurred in respect of a couple of those readings there, and I'll take you to them. If you look at the portion referable to 11 June 1994 - do you see that, first of all?-- Yes.

You will see that the CO - it is headed up "CO in parts per million" - that refers to the Drager reading, you see?-- Yes.

It is the fourth column from the end. You will see there is a CO of 5?-- Yes.

And Drager CO of 5 on the Maihak?-- Yes.

And then a parts per million of 10.46 for that vent station 46?-- Yes.

Calculates through or adds through to a total CO make of 11.61-----?-- Yes.

-----for the 11th of June. Now, that's a point that's plotted, is it not, on the graphs, and in particular it ends up on your graph, Exhibit 221; is that right - for 11 June - sorry - yes, 11 June?-- Yes.

Now, if you look at the next segment of that table, which is referable to 16 June?-- Yes.

What you find is that there is a CO in parts per million from the Drager of 5?-- Yes.

And a CO average from the Unor of 3.6?-- Yes.

For vent station 46?-- That's right.

And that calculates through to 6.63, and when combined with vent station 59, gives a total CO make of 7.32?-- Yes.

Now, we have been told that, in fact, on that occasion it was the weekly average from the Unor that was used - that's 3.6; do you see that?-- Yes, without checking the calculations, I will accept that.

Now, if, in fact, - if, in fact, the Drager reading had been used on that occasion, then there would have been a significantly higher CO make calculated for that Friday; is that right?-- Yes.

For the 16th?-- Well, it would have been higher probably in the order, I guess, of 2 or 3 lpm, but that is just a sheer guess at this stage.

I don't have my calculator here with me today, unfortunately?-- Neither do I. Mine's done a runner as well.

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You say that's perhaps borne out by other figures - that appear in other columns there, but - or in respect of other dates - but you say it could be somewhere between 2 and 3 lpm higher?-- Well, we are looking at 1.4 ppm the difference - probably about 2 lpm.

And if you look to your graph, you will see in 221, which reflects the BHP graphs-----?-- Yes.

In fact, if that were the case, it would significantly affect the direction of the graph between 11 June and the 16th of June?-- Yes.

In effect, it would take a good bit of the valley out of that graph; is that right?-- Yes.

And then if you look at the next line on the graph, the 24th of June, you will see that, again, the Drager reading is 5.5 for vent station 46 and the Maihak is 4.5?-- Yes.

And if, again, on 24 June a Drager reading calculation was made, that would alter the point on the graph that's reflected in your graph 221; is that right?-- Yes.

So that, in effect, while there would be a dip between 11 June and the 16th, then there would be a rise to a point somewhere higher than that one that's shown on your graph as the 24th of June?-- Yes. That is what's illustrated in 158.

158. So that, in effect, it tends to take a good bit of the kink out of that graph that's in 221; is that right?-- Yes.

In 158, you have represented-----?-- Would you care for me to project that?

Yes, okay. You have got a smaller copy of that. The Drager tube readings are represented in 158 by which one?-- The Drager tube readings aren't represented in here, but the orange line represents - sorry, that line there - it is not very clear - is the data as given in this table.

That's the orange one - CO make?-- That's the orange one here, and the blue is actually based on the Unor results taken at that stage, and it shows taking that kink out that we have been talking about here - that that point there is on the date that we are talking about, which is on the 16th of June - it shows the same effect that you are talking about here with the Drager tube readings.

Yes, but there is no line on that graph that actually represents the Drager tube readings?-- No, no.

Okay?-- I didn't mean to suggest that.

Okay. Now, your Exhibit 158, in effect - at least to some extent - shows then the difficulties created by using the weekly average; is that so?-- I believe so. It very much depends on the rate at which the CO is increasing during the

week.

Well, now, on that graph that you have got in 221 there - or, in fact, on any version of the graph - and I would ask you to keep there that other document which I referred you to - that's Exhibit 109 - what you have is a situation where the - going back to 28 February - that's the second page of 109 there?-- Yes.

Have you got that? Top of the second page?-- I point out that-----

Rather than the third page?-- -----28 February and 25 March aren't displayed on 221 because that's during the development phase.

Okay?-- It begins on 27 April.

Okay. Now, perhaps we can confine ourselves to the figures. If you look at the second page of that Exhibit 109 which gives you right through to 15 July - bottom of the page - go right to the front. That's it. You have gone in the wrong direction. Go to the front and then go to the second page?-- Yes.

And then the front page goes on from 15 July to some extent; is that right?-- From - it starts on the 22nd.

Now, whether you look at the graph or look at the figures - and perhaps I need to refer you to the figures to select the starting point of 1.24 on 28 February - what you have is a panel that appears to have started out with something less than 2 lpm make during development, or at least towards the end of development?-- Yes.

The 25th of March is 1.68, 27 April is 1.44; do you see that?-- Yes.

Now, so we are starting out somewhere less than 2 lpm, and then the CO make increases at what would appear to be a rate somewhere initially around 2 lpm per week or perhaps a little bit less for a time?-- Something in that order.

Now, there has been a suggestion that - there has been evidence, I should say, that at the beginning of the panel extraction phase at least there were some discussions between Mr Morieson and Mr Abrahamse about what might be expected by way of a litre per minute make during the extraction phase in 512, and it was on one version agreed that from the starting point of around 2 lpm it might be expected that there be 1 lpm per week increase through to around 12 lpm, and on another suggestion through to about 14 or 15 lpm, I think it was?-- Yes.

First of all can I ask you this: is there any research that you would be aware of that would enable that kind of estimate to be made at the beginning of an extraction phase in a panel such as 512? How does one arrive at those kinds of figures?-- I don't know. I think it would be a guess.

A guess. Is there -----?-- Maybe based on some previous experience, but -----

Can I ask you this: is there a rational background against which one could make a guess like that?-- Only experience of - in similar circumstances.

Is there anything recorded in the literature or in papers or information available from a place like SIMTARS that enables a mining engineer or ventilation officer in those circumstances to make some kind of sensible estimate as to what sort of litre per minute make they might expect from their extraction panel?-- I think we would be very cautious from a standing start, so to speak, of saying that you could expect to have this and not have any troubles and we would be very cautious about giving anybody an increase in litres per minute per week that they could anticipate to not be a problem for the life of the panel.

Given that, as you've said earlier in your evidence, each panel might be expected to be different?-- Yes.

Is there any research that can be undertaken to try to establish some point of reference to enable predictions to be made about CO make in a panel during extraction?-- Comparison on an almost qualitative basis between panels. By qualitative I mean it would be almost impossible to quantify the amount of loose coal or rib fracturing that has taken place in a panel, but one would have to rely on the judgment of people - I guess eyeballing these characteristics and say, yes, more loose coal or less loose coal, or yes, more rib fracturing and broken coal, or no, less rib fracturing and loose coal. It would be a very qualitative assessment.

Is the mining engineer who is on the spot at a particular mine in the position to make that particular assessment or does he need to turn to some outside source for help?-- He might be

if he has a sufficiently long experience in that particular mine, and understood the nature of how carbon monoxide is produced by ambient temperature oxidation and the factors that control it. He might.

If in terms of a practical situation you were asked as a reference to an expert, as it were, what view you would express about a panel such as 512 with this sort of increase in CO make, what steps would you take in order to give some reliable answer? I'm really trying to ascertain what practical steps one takes, you see?-- I think you would - the best I could suggest at this stage would be to monitor this panel closely, keeping - being aware at all times that the CO make that we are looking at could have origins either from increased loose coal or from a spontaneous heating because it is impossible to tell the two apart, but keeping aware that you have to keep in mind that the very conditions that favour the formation of carbon monoxide due to loose coal also favour the conditions of the development of a heating, and you would have to be very careful to ensure that you didn't sort of have a heating on your hands and not realise it as such, that it was actually - that you continued to believe that it was just increased exposed coal.

When you say monitor it very closely, what sorts of things would be looking for?-- I'd be keeping an eye on that - I would think that what would happen in a panel such as this - you would expect that the CO make would reach some limitation, and because as you cut the coal, make loose coal and it begins to oxidise, the rate of oxidation and the rate of production from the new bit of coal as it ages rapidly falls away. So to build up a background level you have to be continually sort of relinquish the new supply of coal, new loose coal, and it will hit a maximum level probably a function of the rate of production and will probably be quite unstable in that depending on the production rate.

Assuming that your production rate stays the same -----?-- Constant, then I would expect it to go up, reach some background level and essentially stabilise.

And stay there?-- Without - assuming there is no development of a heating, but as I say, the conditions that favour the development of a heating are also those that favour the production of a lot of carbon monoxide due to ambient temperature oxidation, lots of loose coal either in the form of broken ribs or loose coal on the floor. So you would have to be careful that you weren't seeing a trend that was the onset of a heating and you didn't believe it was a continuation of the CO make increase due to exposed coal.

I want to focus for a moment about the background level that would be established as the coal is mined and therefore exposed. Supposing you just have the one continuous miner working in a panel and that it is in effect mining at the same rate?-- Yes.

Initially in the early stages of the extraction phase it would seem you would have a fair bit of - given what we have heard

about the mining method here, a fair bit of loose coal produced and in turn producing CO; is that right?-- Yes.

Assuming mining continues at the same rate do I understand you to say that that coal that's been exposed, already exposed as a result of mining, slows down in its oxidation?-- Yes.

And in effect it simply becomes part of that background?-- The contribution of that coal for the background becomes progressively less.

Progressively less?-- And to maintain a background you have to be continually renewing new coal.

So as that new coal is mined and therefore there is more loose coal left around in the panel, that in effect produces the background CO?-- Yes.

But the coal that was left lying about earlier in the panel -----?-- Is contributing nothing.

Contributes nothing in time?-- Or very, very little.

Then as the extraction phase progressed there really should be some kind of equilibrium reached; is that right?-- Yes. Given that you assume a constant rate of exposure of loose coal and all that, you could probably do some mathematical work to show it, but you don't know how you would prove that - how you would come to an answer that, "Hey, this panel is going to have that background level."

You don't know just what the background is, but what you are saying is -----?-- You could demonstrate the theory.

You will reach the point where there will be a background level established?-- Yes.

And then at that stage the CO make should remain constant?-- Given a constant rate of exposing new coal surfaces.

Once one has established what the background is, then any rise, any increase in CO make above that, would seem to have some other explanation?-- Yes.

But the big problem is determining what the background CO make is in a panel?-- Yes.

Is there anything in terms of the amount of time that's involved which is relevant to establishing a background? Has there been any research done on that?-- I know, as I've said to you, that the rate at which, say, carbon monoxide is produced by oxidation of coal after it's been exposed drops very rapidly, and probably within even a matter of days is very low compared to the initial rate, but how that manifests itself in terms of the establishment of a background level in a panel I don't know.

That would depend on a whole variety of factors; is that so?-- Mainly probably on the rate at which the rate of oxidation

decreases with time after exposure, and the production rate.

Just on this point of establishing backgrounds, is it the case also that there needs to be a background established in order to attach significance to the Graham's Ratio in any given situation or are there -----?-- It's preferable. I think the Graham's Ratio - it's probably easier to transfer it from one particular - from one panel to another, because I think it's probably much less subject to variability in mining method, whereas a CO make will be likely dependent to some extent on mining method. Because we are talking about here the ratio of how much carbon monoxide is produced for a given amount of oxygen consumed, if we are dealing at ambient temperatures that ratio will be small and probably consistent for all panels in which there isn't a heating, okay? So if we are only dealing with ambient temperature oxidation we have a low Graham's Ratio. If we are dealing with something above ambient temperature oxidation we will be dealing with a higher Graham's Ratio.

Has there been work done within Australia to establish a set of parameters for the Graham's Ratio for Australian coal?-- I think the work of Dr Cliff would go towards that, and confirms the levels that are generally quoted, that below about half a per cent we can safely assume we are dealing with ambient temperature oxidation, but again that ratio varies probably more from mine to mine or region of mining to region of mining rather than from panel to panel.

Do you have your report there in front of you?-- Yes.

Can you look at page 54, bottom of the page there?-- Yes.

Two line paragraph. You say, "The conclusion drawn from a consideration of ignition sources in 512 sealed area is that spontaneous combustion is far more likely as an ignition source than any other."?-- Yes.

You have already considered all the other sources before. Do you hold with that opinion there?-- Yes.

There is nothing that's been asked of you or been pointed out to you that in any way affects your opinion about spontaneous combustion in 512 being -----?-- No.

----- more likely as an ignition source?-- No.

Can I ask you to go over to page 57? In paragraph 8.2 you talk about the possible sequence of events leading to the first explosion?-- Yes.

You go on in there, and I will in a moment take you to some of the sections where you look at the travel of pressure et cetera, but can I ask you this: can you explain as best you can, in what I will describe as layman's terms, without necessarily reference to the chemical processes involved, what would happen in a panel such as 512 after sealing if in fact at the time of sealing there was some area of spontaneous combustion behind the seals? What process would occur? I

appreciate there would be a number of variations according to the size of the heating and the rate of production of methane and the rest, but can you explain as best you can?-- Well, the first two things that would start to happen is that the seam gas would begin to accumulate in the panel and there would be, as a result of that, displacement of oxygen and nitrogen out of the panel, and there would be consumption of oxygen by continued ambient temperature oxidation of coal and by the heating, assuming there was a heating in there. There would also be production of other gases such as carbon monoxide and assuming - carbon monoxide, carbon dioxide possibly as a result of the heating or from the seam gas. Some seam gases contain carbon dioxide and there may be other gases produced due to the presence of a heating that we talked about, hydrogen and the other indicator gases.

Ethylene?-- Ethylene. You would get - in the absence of a heating you would get all of those same - self-same processes taking place. We would have the seam gas being given off. We would have displacement of oxygen by the seam gas. We would have consumption of oxygen by the ambient temperature oxidation and we would have carbon monoxide as well as a result of that ambient temperature oxidation and perhaps some carbon dioxide. We would see less of the hydrogen/ethane type gases, but because the heating is basically a singularity in there then the gases would be - the gases associated with a heating would be concentrated around that spot of the heating and would be less - would not necessarily be evenly distributed throughout the panel. Therefore at a monitoring point the indications of a heating would be those perhaps consistent with seeing an increasing trend in Graham's Ratio, for example. Obviously you are going to see an increase of carbon monoxide and the other gases at that monitoring point and a decrease of oxygen, but in the absence of ambient temperature - in the absence of a heating the Graham's Ratio I would not expect to rise above that associated with ambient temperature oxidation, and obviously you get other ratios which would show the same sort of pattern of behaviour.

You've been asked a lot of questions about the monitoring, I'm not so much interested in that, I'm really interested in the course of events behind the seals after sealing when there is an area of spontaneous combustion?-- Yes.

What's its progress? The mixture of gases in the panel obviously moves towards an explosive range?-- Moves towards an explosive range because if - it depends on the nature of the seam gas, and I'm not talking specifically about Moura because there are a huge range of seam gases available. Collinsville has largely CO₂, methane - sorry, largely CO₂ seam gas and some seams don't have. In this specific case we have largely methane as a seam gas.

The gases move towards the explosive range?-- Yes.

That's one thing that we know happens particularly at Moura, there is even a basis on which it seems some estimate has been made in the past of how long it might take to move into - for the gases to move into the explosive range. Now, what is

happening with the heating during that time? Obviously it needs fuel?-- It has ample fuel because it's in coal which is - you know, if it's a pillar heating it has all of the pillar to consume, if it wants.

Doesn't it need oxygen though?-- It needs oxygen, so what you are getting is a competing action of the heating consuming oxygen while at the same time the thermal conditions may be that it's getting hotter and therefore the rate of reaction is going up. So what you have is the oxygen levels in the panel decreasing which tend to decrease of rate of oxidation, while at the same time the temperature of the heating is getting higher which tends to increase the rate of oxidation. So you've got almost a fight between the two, and at some stage, assuming nothing else happens, then eventually the displacement of the oxygen and the consumption - the displacement of the oxygen by the methane and the consumption by the other processes, ambient temperature oxidation and the heating itself, will decrease the oxygen concentrations and the rate of oxidation will start to decrease as a function of oxygen concentration.

Well, assuming the gases didn't move into the explosive range, is it the case then that the heating would simply run out of oxygen?-- It may be that the heating might not be - yes, that would be the case, assuming that something didn't curtail the process, and it may be that the heating isn't hot enough to ignite the gases in any case and you could have a situation of -----

We will come to that in a moment. So one result might be - if one is to seal a panel in which there is a heating, one result might be that the heating simply runs out of oxygen and it's extinguished; is that right?-- A normal method of dealing with heatings is to exclude air and bring it under control that way.

Is there any way of predicting how long it's going to take before the oxygen becomes unavailable and the heating is extinguished?-- Probably not beforehand, but by keeping track of what the atmosphere in the goaf - in the sealed area is doing you can trend from that to decide what is happening, but probably beforehand the accuracy of the information you have probably just isn't good enough.

Now, let's assume though that the gases move into the explosive range and that the heating is - still has oxygen available to it and it's still, in effect, as it was or even hotter than it was at the time of sealing. How hot does it need to be before the gases can be ignited? Has there been any research on this?-- I believe the minimum temperatures for the ignition of methane are in the order of 500 degrees C. So I would expect similar sorts of temperatures to that, but I really cannot be emphatic about that because I don't know what the - it would very much probably depend on the physical conditions surrounding the heating. It might be that - I just can't be emphatic about that, but certainly I think the temperature of a heating could get significantly high to cause methane to ignite, or we could have gone to the state of open

fire which might cause ignition.

Does there need to be flame in order to ignite a mixture of methane, an explosive mixture of methane?-- I don't know for certain. I would think probably not, that if the coal was hot enough it would probably be hot enough in itself.

You say 500 degrees Centigrade or above may be sufficient?-- But I'm no expert.

Just to give some idea -----?-- In that area.

To give some idea of what 500 degrees Centigrade is, at what point would the coal actually burst into flame, what temperature?-- Actually coal can, given adequate oxygen, burst into flame at 200, 300 degrees C, maybe a little lower, but that - you've got to have adequate oxygen available to do that and more often than not these heatings will be oxygen starved if anything.

So the position is then, if a panel in which there is a heating is sealed then it may be that there will still be a heating there at the time the panel moves into the explosive range and the heating may be sufficiently hot to ignite the gases. That's the basic situation; is that right?-- Yes.

That being the case then, I gather from what you say that the steps that need to be taken to avoid that sort of danger are close monitoring of the position behind the seals; is that so? I suppose the first steps to be taken would be to perhaps look to whether there is any way to extinguish the heating before sealing, but putting that to one side, if one sealed then the only steps that can be taken really to avoid the consequences of an explosion are close monitoring of the position behind the seals?-- In the absence of flooding or inertisation then it's a case of, I guess, deciding whether you believe or not there is a heating there.

And if you do?-- Well, you have decided there is and you would have to take due caution to avoid the consequences of that explosion.

And if there is -----?-- That potential explosion.

If there is a question in the air as to whether or not there is a heating, I gather from what you have said in your evidence that a way in which that might be confirmed or eliminated as a possibility is again to closely monitor the position which is occurring behind the seals?-- Yes, because the characteristics like Graham's Ratio will be an indication - would tend to confirm, hopefully confirm, one's suspicions about the presence of a heating before sealing.

Now, can I just briefly go to some areas of your report here? You deal with the question of the pressure during and after the first explosion in your paragraph 8.2.1?-- Yes.

And you make reference to the fact, in the second last paragraph in that section, that since pressures from gas explosions can cause catastrophic failure of 300 millimetres reinforced concrete walls, it is unlikely that the stoppings used in 512 Panel remained intact after the initial explosion. In saying that, were you having regard in particular to the fact that they were newly installed stoppings?-- Not particularly. Explosion pressures and the like - as I have indicated, I'm not an expert in that area, but certainly I think that from what little I do know, the strength of the stoppings - the pressures generated certainly would be capable of destroying those stoppings.

Now, you say you are not an expert in explosions and forces. That's the next thing I wanted to take you to briefly. The information in 8.2.2 about the pressure wave and the effect that that might be expected to have on people working in 5 South, that information is, from your point of view at least, information you have gained from the MSHA report; is that so?-- Largely through working with Dr Golledge.

Through working with Dr Golledge?-- Yes, and I think that - you know, as I indicated earlier, a lot of people have contributed in parts in tying all of this together and so it's - some of it will be MSHA and some of it will be Dr Golledge and reading of the literature.

8.2.4 on page 58, you say at the end of your first paragraph, "It is more than likely that the post explosion atmosphere moving in the direction of 5 South Panel contained a lethal concentration of carbon monoxide" - that is in excess of 1,000 ppm - "with an oxygen concentration possibly less than 5 per cent."?-- Yes.

Is that right?-- Yes.

And you go on to say, "Persons in the vicinity of 512 Panel or between 512 Panel and 4 South Panel may have experienced a higher concentration of both carbon monoxide and carbon dioxide and a lower concentration of oxygen than in 5 South.";

is that right?-- Yes.

Now, that information there is based on your own examination of what occurred or is that based in part on what's contained in other reports?-- I think it's mainly based on what is contained in this report, from the gas chromatography data and the interpretation of the tube bundle data.

Pardon me a moment, Your Worship. I have got no further questions.

WARDEN: Thank you, we will take a 10 minute break, please.

THE COURT ADJOURNED AT 3.35 P.M.

THE COURT RESUMED AT 3.52 P.M.

DAVID ROBERT HUMPHREYS, CONTINUING:

EXAMINATION:

MR PARKIN: Mr Humphreys, could you look at Exhibit 158, please?-- Yes.

I think you can observe from that that if you look - if you go down to the 15/7 -----?-- We are looking at the table, are we?

Yes, the table on the front there. You can observe that the ventilation quantity in 512 drops from 57 cubic metres down to 37 from the 15th to the 23rd. Can you see that?-- From 57 to 39, 37.7, yes.

In your view, what would that drop in quantity have on the impact of a potential heating?-- I'm not sure that it would have a great deal of impact. We can see from the velocities that it's - that the change in air quantity has largely been due to changes in the bottom return. See, we had .95 metres per second velocity at 15 July. It would obviously change the - it might change some air flow patterns in the bottom half of the panel, but as most of the change came from closing the regulator in the 512 top returns, it may not have - sorry, closing the regulator in the 512 bottom returns, it may not have a big influence on the air flow patterns in the lower half of the panel.

Well, closing the bottom return would change the ventilation course, wouldn't it?-- Oh, yes, obviously.

And, I mean, that could have some impact if there was a potential heating near the vicinity of the bottom return or in that area?-- It's hard to say, Mr Parkin. It could have caused some change - minor pressure changes at the seat of the heating and in - I think that what we are dealing with here in a case of the development of a heating is quite small pressure changes could possibly have quite large changes to - could cause quite large changes in the state of equilibrium of a heating. We are talking basically about a state of equilibrium, and anything that comes along to change that state could cause it to increase the rate at which it began to develop or actually trigger it - trigger it - but I can't - you know, there is no guarantees from this data that you could say that that was the trigger point.

Thank you. I've just got a few points for clarification, basically from the cross-examination of Mr Morrison, and these points are pre the explosion?-- Yes.

I just want to clarify them with you. We did know that the rate of CO make in 512 was greater than any other panel. Is that still correct?-- The rate at which it increased?

Yes?-- It certainly appears from the comparison graphs, apart from maybe the early stages of 5 North panel.

Mmm. And we did know that from the 17th - well, from June to the time of the explosion, we did know that there were some 11 different reports of tarry/benzeney type smells and hazes, and I guess people don't invent smells, do they?-- Well, I would hope, considering the seriousness with which these incidents - the reports of this type should be dealt with, I would hope that they don't make them up.

After sealing, we did know that approximately after 22 hours the CO make had increased from something like 12 ppm to approximately 150?-- The CO concentrations, yes.

Which is a very rapid increase?-- Compared with 401/402, but I couldn't say compared to other panels in the mine.

Well, I guess what you indicate - and you correct me if I am wrong - but you did say that it took five to six days for similar build-ups in 401/402?-- I believe that was about the time - five or six days.

So, one could assume, then, that the build-up in 22 hours from 12 to 150 is fairly rapid?-- Yes, I think I indicated 6 ppm per hour in 512 as an average, or thereabouts, and only about 1 ppm per hour in 401/402.

Taking into account the comments that have been made regarding the Graham's Ratio, we did know at 10 p.m. on the 7th of the 8th that, in the best case scenario, the ratio was approximately .7?-- Yes.

And the worst case was 1?-- More or less, yes.

Well, regardless about the comments of either before or after sealing, with those kind of readings, one would assume that you would take some caution over that kind of situation?-- I think it would be a confirmation, if one wanted it, that there was a - the possibility of a heating.

Now, we are not going into the business of litres per minute, but is it still your view that between 10 and 20 lpm of CO make you have got the likelihood of a major problem - or it needs to be investigated?-- I've given that considerable thought, and I - I think in the absence of any other guidelines - I - I still would believe they have some guiding principle behind them. As I've indicated, they are not hard and fast rules to be slavishly followed, but the principle is that we are looking for trends, and the guidelines provide a means of determining when one should take some precautionary

action, and the onset - increasing trends would require some precautionary action.

Well, we did know that the manager had reported rightly in the mine record book prior to the incident. I guess the question I'm asking you is really if you put all these points together that I just mentioned to you, you know, what conclusions do you draw from those?-- That's a very difficult question, Mr Parkin. I can't answer why the manager might not have taken - might not have considered that.

No, let me rephrase that question. What I meant was from your point of view, as a scientist, what conclusions do you draw from that information; not what the manager would draw. I mean, this information was all available prior to the explosion?-- Yes, for the most part.

Well, what conclusions would you draw with your experience from a scientific point of view?-- Given that the trends were increasing very - were increasing rapidly at the time when 19 litres might have been drawn, I would draw the conclusion that there was an indication of a heating in the panel at that time - not just simply on the 19 litres, mind you, but the fact that it was also trending upwards rapidly at that time.

At least it would sound a reason for caution with all those parameters mentioned?-- Yes, if it has got to 19 lpm over that time, there must be some trend over the life of that panel, and we have been talking about increases in the rate of CO make all the way through this, and it is self-evident. If you have got to 19 litres, there must be some trend upwards.

And to add to that, if you say you have got a rapid build-up of CO and that Graham's Ratio is an area that would cause you some concern-----?-- Well, after sealing.

So, from your point of view, your evidence suggests that there was a potential heating in 512 panel?-- Well, that's what we have concluded in our report and I don't see any reason to change that conclusion.

Thank you.

EXAMINATION:

MR NEILSON: Mr Humphreys, Mr Morrison asked you some questions regarding whether the German theory, which has since been espoused by Mackenzie-Wood - and that is the reference to both 10 and 20 litres of make - as to whether or not Australian coals had been tested against that theory?-- Yes.

And you indicated that - either you knew, or you did not know?-- I'm not sure whether they have been tested against that. That would be my state of knowledge.

XN: PANEL

WIT: HUMPHREYS D R

Well, can I ask you: do you see any good reason why they should - why they should have?-- I don't see any particular reason why they shouldn't respond in a similar fashion.

I guess my question is: do you see any reason why Australian coals should be tested against the criteria - against a theory?-- I see very good reasons for firming up those ideas. It gives one more confidence that they are valid guidelines, Mr Neilson. I see very good reasons for continuing the sort of work that David Cliff has been doing in looking at the indicators, so that we can better look at the shortcomings in all of these indicators that we are dealing with.

Are the indicators that we are referring to the 10 and 20 litres - they refer to a phenomenon, don't they - a phenomenon called spontaneous combustion?-- Yes.

Given that we can eliminate any racial discrimination, is there any difference between a German coal that's liable to spontaneous combustion or an Australian coal that's liable to spontaneous combustion, or a coal in any other country in the world?-- It is by accident of geography that it is German or Australian and I don't really see anything that makes German coals behave particularly differently when they spontaneously heat to Australian coals. We have used a lot of information from Britain and Europe and the US in developing our total knowledge of spontaneous combustion performance, and I really can't see that there should be any reason - the factors that will probably more - have a bearing to play will be those of mining conditions rather than nature of coal - by mining conditions I mean mining method.

So, I mean, any slight variations or any variations that you might find by putting Australian coals to a test against the German factor - I mean, it is true to say, isn't it, that even in Australia we have coals of varying qualities-----?-- Various responses to spontaneous heating. Work is being done on looking at that to confirm the sorts of results derived by Chamberlain in the 1970's to see how they refer to Australian coals, and there are some differences, but they are not so sufficient to mean that we throw out all our theories on early detection of spon com, just simply because we are comparing Australian coals with British coals.

I mean, it is even possible in the one seam to have varying inherent seam gases, isn't it?-- Yes, yes. By that I mean you are taking a composition of carbon dioxide and methane in the same seam gas and varying across that seam.

Even in the same mine you can have varying seam gases?-- Yes.

Can I take you to Exhibit 158?-- Yes.

To Figure 1?-- Yes.

Now, you were asked some questions by Mr Morrison in relation to - from the 23rd - or 22nd and 23rd of the July onwards?-- Yes.

In respect of the linear digression - I take it the green line?-- Linear regression.

Sorry, what did I say?-- "Digression".

Sorry, linear regression, and the question that Mr Morrison asked was: why, to get a true representation, would you not follow that through, but take another example from the 22nd of July when daily plottings became available?-- Yes.

I think you - in your answer you said that by collating more data points on the graph, it would give you a more accurate assessment of what really was happening, and I put some emphasis on the word "really"?-- Yes.

Because, I mean, that's, in fact, what was necessary to happen - or - sorry, an obvious result from plotting more frequent points on the graph, isn't it?-- That's right, obviously the more data you have, the more confident you can be of the interpretation you are placing upon that data, but-----

So, isn't it true to say that once that - sorry, were you finished?-- It's okay.

Is it true to say that once you went to the trouble of collecting all of that extra data, that it is only common sense, then, that you would treat it in a manner that would really tell you what was happening? Rather than just look for some linear regression, you would really need to look and see if that was telling you something different, wouldn't you?-- You mean in terms of having more data to look at than-----

Exactly?-- Then logic says you look at the data set which provides you with the most information.

Okay, well, if we could go to that-----?-- I can't speak for why it wasn't done in this case.

If we go to that graph, then, and following on from that line of questioning, if we take the linear regression from 30 April through to the - I think it is only plotted to about the 15th of July, is it?-- Yes, I think that the - yes, that's the data set that formed up the linear regression.

Okay. Now, can I ask you in terms of what you understand - not what other people understand, but what you understand - what does that tell you was happening between 30 April and 15 July?-- It suggests to me that the CO make was increasing in a very regular fashion with some minor reversals around about the 11th of June - but minor.

It also shows that the CO make went through the 10 lpm mark?-- Yes, yeah.

And continued to increase?-- Yes.

Okay. Well, if we can put that aside for one moment? If we can go now to 23 July?-- Yes.

Between then and the 7th of August, admittedly, given that we now have a lot more data on a more regular basis, and, you know, we are putting a lot more into a short space-----?-- Yes.

-----what does that tell you, on 23 July - does it tell you something different was happening, and it was happening prior to - sorry, between 30 April and 15 July?-- Between the 23rd of - oh, what period of time are we now looking at? From the 23rd to the end, or-----

I'm asking you what you believe was happening between 30 April and 15 July?-- Yes.

I'm now asking you is it between 23 July or 6 and 7 August - is it telling you a different story?-- Towards the end it indicates a - an increase in the rate of carbon monoxide production - an increase in the rate at which it increases over and above the original trend between the 30th of April and the 15th of July. I think the slope on that linear regression - the second linear regression from 29 July is about 3 lpm per week, and on the previous one is 1 lpm per week, so the trend in the - in that last week or so is not necessarily a continuation of that same trend.

Okay. Well, given that one of the main purposes - or probably the sole purpose of looking at CO make in a panel is to determine whether or not you have an incident of spontaneous combustion?-- Yes.

So, in terms of spontaneous combustion, can you please tell us what all of that means to you?-- I would interpret that as indicating that something has begun to react more rapidly than has been seen before in this panel, whether that front ramp is due to ambient temperature oxidation or not. Whatever is happening in that latter half, there is - it is reacting - it is occurring more rapidly, and that would be consistent with the onset of a heating or a - possibly the later stages of a heating.

Okay. So, in terms of Mackenzie-Wood's theory - espoused from the German experience?-- Yes.

That, in terms of carbon monoxide make, if you - if you get a make of 10 lpm, then there is - there is area for concern?-- Yes.

If it goes on and exceeds 20, then you have got a potentially dangerous situation?-- Yes.

Given that both of those things have occurred?-- Yes.

And of course we all know what the end result was, that there was in fact an explosion, Mackenzie-Wood's theory can't be too far away from the mark, can it?-- In this particular case it appears not.

Thank you.

EXAMINATION:

PROF ROXBOROUGH: Mr Humphreys, while you've got Exhibit 221 and 158 in front of you I would like to ask you some further questions about it. That's the CO make graphs?-- Yes.

This trend that you are seeking to establish from 23 July to 6 August is extremely important, and whether that data complies with the general background trend from 30 April or not is an important question and it's one that needs to be fully addressed. You were asked extensive questions on this by Mr Morrison, and further questions from Mr Clair, and since Mr Neilson. The thing that concerns me about it is that after 23 July when the frequency of measurements was increased to a data point per shift?-- Yes.

You've got 36 data points?-- Yes.

And of those 36 data points 34 of them lie below the trend that is extrapolated from 30 April to 23 July?-- Yes.

Now, my question is can the conclusion that there has been a rapid increase in CO make over the last two weeks be justified on that basis?-- It may well be that from 15 or so of July that whatever chemical reactions are taking place at about 15 July do not continue to increase in their rate be it for whatever reason. Be it because of a ventilation regime which has - the heating has - if there is a heating at that point, the heating has reached a point at which it is - it has reached a new state of equilibrium balanced between the oxygen availability to the heating and the rate at which heat can be dissipated from the heating, and that at some stage later on that changed and the availability of oxygen to the heating could easily have changed and allowed the reaction to begin to accelerate again. I cannot be - none of us can be absolutely certain of what it is that would trigger that. It could be a change in porosity of the zone around the heating brought on by additional rib spall, or some degradation of the material actually involved in the heating itself could have caused a change in the material properties at that point, and it is possible that a heating has - you might say, stalled for a period of time and then begun to increase and stabilise at an elevated temperature during that period of time from 15 July to 1 August and then begun to increase in temperature after that, after 1 August.

I can see the superficial attraction of looking at the data set from 23 July to 6 August and to establish a trend on that data which is different from the previous data where we are only basing our regression on weekly data points?-- Yes.

And really you can't treat them as separate sets of data which is what you have done, can you? You have got significantly different density of data over the last two weeks. If you had had a similar density of data throughout the graphs you might have come to a similar conclusion, for example, had there been a rapid onset between 3 June and 11 June, because over that area - over that period, that one weekly period, we have had a 3.3 lpm increase?-- Yes, that might be so, sir.

So that the sort of perturbations that you've got here within that last two weeks is very difficult, is it not, to establish a firm trend there?-- It's very difficult to establish a firm trend there and deny that it might not have occurred somewhere along the line from 30 April to 15 July.

And it's very difficult to say that this data that we are looking at over that two week period is not entirely consistent with the general linear trend? I mean I think even an expert statistician might have some difficulty in coming to that conclusion?-- That might be so in terms of a statistically meaningful result.

Thank you. Can I take you to table 7.2.1 of your report which is on page 52? This table 7.2.1 is an outcome of a Fault Tree Analysis done after the explosion?-- Yes.

And shows the estimated probability of an explosive mixture, and secondly an ignition source, probability of an ignition source at various places in the mine?-- Yes.

And this shows the chances of an explosion in panel 512 as being 10 to the minus two, which from my reading of it means a one chance in a hundred that it occurred in panel 512?-- Yes.

That's a very low probability, isn't it?-- I think the probabilities were more meant to indicate a ranking, Professor Roxborough, rather than an absolute value.

But one thing for certain - one thing that was known at this time was an explosion had occurred?-- Yes.

I was just wondering if there were 100 places in the mine where it could have occurred. I probably doubt it. The other point with regard to that graph, it might be of academic interest but it's nevertheless worth mentioning, it might have been intended, but on the probability of ignition source you have 5 South as having a higher probability than 512. Is that a typographical error or was that intended? You show 5 South to have a probability of up to five times 10 to the minus two?-- I couldn't -----

Which is up to five times higher probability than 512?-- It's less than. It certainly follows through on the calculations, but it was - the reason why 10 to the minus two was applied to

the probability of the ignition source in 512 was because the data on it is much more - is quite indirect in the way of these indicators and we felt that we couldn't put a higher probability on that as being the ignition source. We knew that we had the explosive mixture at that point, but we couldn't put a higher probability on the ignition source being in there than that, whereas we knew in 5 South we had human activity and the like, and based on the criterion that was set by Mr Danaher they were the levels that we settled on, and it was on the ranking of the combination of explosive mixture and ignition source that the final rankings were achieved.

So you are not claiming any significance in absolute terms on those probabilities?-- I don't think so, no.

Accepting that there was an explosion in 512 and assuming that it was caused by a heating, is it possible to say where in the panel this is most likely to have occurred in your estimation?-- Only perhaps based on the evidence that we have had of smells, which from Mr McCamley's report, if it's to be believed, was - he detected that, if I may, somewhere approximately here, if I remember rightly, due to a -----

You are indicating in No 2 heading?-- I can't remember -----

----- around about 7 or 8 cross-cut?-- Yes, I can't remember exactly where it was, but somewhere in this district he claims to have detected a smell due to a warmer layer of air travelling back up this roadway, then that would suggest to me that it was somewhere inbye of there.

Actually I wasn't meaning you to be precise or to predict where it was, but just on the balance of probabilities where it was more likely to be. Towards the back of the panel, the middle of the panel or the front of the panel?-- Well, on that basis I would suspect somewhere in this lower part of the panel, let's say 9, 10, 11, 12 cut-throughs being inbye of the point where Mr McCamley detected the smell in the outflowing higher layer, if his report is to be believed, and I think there might be other reports that might support that one.

Just one further point with regard to the 10 and 20 lpm criterion and their relevance to Australia, I think most people would appreciate there could possibly be differences between - not necessarily based on the coal, but on geometries?-- Yes.

Do you think it is reasonable to postulate that smaller panels might have lower limits than 10 and 20?-- Yes, and I think the nature of the type of panel might have an influence too in that if a panel was perhaps more subject to rib heatings than, say, heatings in large areas of loose coal be it from a stook or a broken pillar or what have you, then I think that the levels would have to be lower for a rib type heating because they are likely to be small, intense heatings rather than the small - rather than the large, less intense heating associated with a large volume of coal under the same set of conditions of permeability and oxygen flow through them.

I think it's true also that most of the long wall faces in Germany, but I stand to be corrected, are retreating long walls, not advancing?-- Could be so.

Thank you.

EXAMINATION:

MR ELLICOTT: Can you tell me if the SIMTARS people have reached a conclusion as to when the error in the oxygen analyser was introduced and how?-- No, we didn't. We had the data from about 27 - full set of data from 27 July of 1994 and it appeared to be present for that period of time to a greater or lesser extent. It varied through the day. We - so I can't really say when that error may have been present or absent except to say that we believe it was there for most of that period.

Can you turn to page 18 of your report, please?-- Yes.

There is a heading, "Channel 4 - Oxygen Monitor" approximately half-way down the page?-- Yes.

The sentence starting in the fourth last line of that first paragraph says, "The span point drift of 11 per cent of full scale must have occurred at some stage post explosion since levels approaching 20.9 per cent were being measured for oxygen levels at various points throughout the mine prior to the explosion."?-- Yes.

That indicates to me that the problem came after the explosion, or is that a separate problem?-- I think we are talking in this case about the very large deviation in the oxygen detector that was observed after the second explosion. The comment on 20.9 is to indicate that levels in the order of 20.9, but possibly including the small error that we are talking about here that affects Graham's Ratio were observed prior to - sorry, prior to the second explosion, and obviously data was available from the pump room for the period prior to the first explosion and which we have based the assessment of the small error in oxygen detector. I would say that probably

I think I understand that?-- I think probably the point is also "...prior to the explosion..." - no, that's - it obviously comes from an examination of the data after the second explosion, 20.5, 20.9.

Okay. I'm also a little troubled about the distinction between there being some purging problem in the Maihak system as opposed to, I guess you call it cross channel leakage?-- Yes.

By virtue of a leaking solenoid?-- Yes.

I understood you to eventually, in response to Mr Morrison, indicate that there would be three conditions required for that to occur and - that is cross channel leakage. One was what might be called a source line must have a relatively high concentration of gas in it?-- Yes.

Another was that the solenoid for that source line must be leaking?-- Yes.

And the other condition was that there must be a destination line that must be at a lower absolute pressure than the source line?-- Yes.

I think the point of contention was potential leakage into point 14 and then contamination of that point by CO?-- I think it was with regard to, I think, point 16 which showed -----

Well, point 16 is one but there also appeared to be some CO contamination in the pump room?-- It showed levels of CO in the pump room of plus or minus about .2 ppm if I remember rightly.

And that's all?-- As far as I can remember.

What I was curious about is how there could be leakage into

point 14 given that that should never be at an absolute pressure lower than the other lines that have a considerable load on them?-- I honestly - I believe when I was talking to Mr Morrison we were talking about other points, underground points, rather than pump point 14.

Did you have the same difficulty as me with leakage into point 14?-- I can't remember that we were talking about leakage into point 14.

Well, we are now?-- With such a short run it would be at a - in terms of pressure below atmospheric it's always going to be at a higher pressure or a lower vacuum than almost any other point that's being sampled, and I think it's probably an unlikely possibly that you would get this sort of cross-leakage on a solenoid valve bank into point 14. There are some CO values on point 14 which appear after the first and second explosion but they are probably more due to actual atmospheric pollutants from the mine as a result of ejection of gases from the mine.

Thanks. In your evidence I think you indicated that your understanding of ambient temperature oxidation was such as to indicate that it would really only have a half-life, if you could call it that, of the order of days?-- Days or a few weeks. I can't be absolutely certain on that.

So, it could be as long as a few weeks depending on the coal?-- No, I should think it's down to days, but I would want to check that out properly, and particularly for the specific coal.

But if the ambient temperature oxidation half-life is much less than the panel life, wouldn't you expect that there would be some equilibrium reached?-- Yes.

Given a fairly constant rate of production?-- Yes, and that was the point I was trying to make.

And really for there to be a monotonically increasing CO make, either the rate of production from the panel is continually increasing -----?-- Yes.

----- or there may well be some process other than ambient temperature oxidation?-- Yes.

Nothing further, thanks.

FURTHER RE-EXAMINATION:

MR CLAIR: Sorry, Your Worship. Just one question, Mr Humphreys, and I will preface it with a plea of guilty to not being up with modern maths, but can I take you to that table on page 52, table 7.2.1?-- Yes.

And perhaps if we can start with the column headed "Probability of Ignition Source"?-- Yes.

512 goaf, 10 to the minus 2?-- Yes.

Can we talk about that in some other terms? I will confess to the odd bet on the Melbourne Cup. What are the odds?-- Well, the 10 to the minus 2 is one part in 100, 10 to the 2 is 100, 10 to the 3 is 1,000, 10 to the 4 is 10,000.

We get a new feature in the second line there?-- Less than.

Less than 5 by?-- The sort of -----

----- 10 to the minus 2, so what are we talking about there?-- That's like a caret mark on the side, less than.

I understand that, but what's the significance of 5 by? Does that mean one in 500?-- Yes, sorry.

500 to 1?-- No, 5 chances in 100.

Less than -----?-- Less than 5 in 100.

So that that's a higher probability than the first?-- The values put there with a less than, it was - yes, 5 by 10 to the minus 2 is greater than 10 -----

Can I put this to you: it allows for a higher probability?-- Yes.

Than the first?-- Yes.

And then when you move to the column "Probability of Explosion", does that involve a combination of the probabilities in columns - in the two columns that precede it?-- Yes, they are a straight multiplication. So, if we take 520, it's 10 to the minus 4 and less than 5 by 10 to the minus 3 giving a value of less than 5 by 10 to the minus seven, minus seven being the addition of minus three and minus four.

Hence then the rankings in the final column -----?-- Yeah.

----- being on the basis of the probability of explosion?-- Probability of explosion. I think that - under Mr Danaher's guidance there were criterion set down for what levels to use for the probabilities depending on whether they were known to exist, had been known to exist in the past, had been thought to exist in the past, may have existed in the past, etc.

FRXN: MR CLAIR

WIT: HUMPHREYS D R

Thank you?-- Thought unlikely.

Thank you, Your Worship.

MR MACSPORRAN: I have nothing.

MR MARTIN: No.

MR MORRISON: I do have a couple of points, Your Worship.

WARDEN: By leave.

FURTHER CROSS-EXAMINATION:

MR MORRISON: Mr Humphreys, Mr Clair was asking you, not just then but earlier, about production of CO and CO make on the assumption that there is a constant rate of production. Do you recall that line of questioning?-- Yes.

And you answered those questions. I don't want to go back to those, but if in fact the rate of production in 512 itself increased over the life of the panel, then would you not expect the CO make might be expected to increase?-- There may be some increase in the background level depending on what the proportional increase in production was.

All right. Well, we can see from document 168 of the Inspectorate's documents, which I will just hand to you now, if I may, open - hopefully everyone's copies is the same - open at the fourth page. You will see these are the production figures for 512?-- Yes.

I think you will confirm for me that on a tonnage basis from April on it was ever increasing. Leave aside August, because only a couple of days of August were worked, very, very low shifts. I am sure if we work it out on the shift basis the comment will be the same?-- There is about a 10 per cent increase from May to even August.

In terms of tonnage as produced, it's ever increasing, isn't it, every month produces more?-- Are we talking about a production rate, tonnes per shift or total amount of coal produced.

Well, you can deal with both. The first, when the total amount of coal goes up?-- Obviously you continue to produce more coal, you can't unproduce it.

But they are monthly figures, aren't they?-- Yes.

They are not cumulative figures, they are monthly figures, discrete months?-- Okay, yes.

So, no-one is unproducing coal?-- No, no.

FXXN: MR MORRISON

WIT: HUMPHREYS D R

What I have just said is right, isn't it?-- I am sorry, I misunderstood you.

What I have just said is right, isn't it, every month it's going up?-- Every month the production rate appears to increase.

All right, you can hand that document back. I will tender that separately. In fact, I will extract that page - I don't think we need the whole thing - and I will give it a title now, if I may. I will call it, "Production analysis of 512 section by months, part of document 168." I will give it to the clerk, and if I can get it back later on I will do various copies for everybody.

WARDEN: Exhibit 229.

ADMITTED AND MARKED "EXHIBIT 229"

MR MORRISON: Now, Mr Ellicott was asking you about leaking solenoid valves and purging and so forth. In fact, point 14 - to this extent I am with you, Mr Humphreys: I didn't think I was talking about point 14?-- I'm glad we agree on one thing.

But can I ask you to just have a look at this document which shows the samples as they entered the analysers. I am just going to mark it for you. Now, part of this data, but not all of it, appears in your own report in Appendix 2.1.7I?-- Yes.

What I am showing you here is - 2.1.7I?-- Yes.

What I am showing you here is the sequence of points as they entered the analysers, and I have highlighted point 14 for you which we can see is that there is in terms of CO, which is the one I have highlighted, very, very low amounts of CO but, nonetheless, CO for point 14 until such time as we hit the explosion time?-- Yes.

In which case from readings of .4, .6, .5, thereabouts, it jumps then to 13.5 on point 14?-- Yes.

Now, that's the most significant jump, and thereafter it is significantly higher again, isn't it?-- Yes.

So, that would suggest, wouldn't it, that the problem that was being discussed earlier manifested itself heavily here after the explosion on point 14 in a way which hadn't been reflected beforehand in terms of CO recording on point 14?-- Yes, it's possible.

And it seems really when you look at those figures, especially the early ones at .4, .5, .6, hardly seems to be a leakage problem at those levels given the levels being recorded by the

200395 D.46 Turn 13 mkg (Warden's Crt)

points immediately sampled before it in sequence; is that so?-- Yes.

And also given that point 14's source is outside the pump room, not inside?-- Yes.

And is more likely then to be the purging problem, isn't it?-- Or it could be the - certainly the 13.5 at 23:41 could also be atmospheric contaminants from the explosion at the pump room.

23.41. All right, okay, that's a possibility, thank you. Now, I mentioned 2.1.7I. Maybe you need to get that out. Volume 1. Sorry, I just might - it will be on your data list - you may not need it - on the list I have given you?-- This list, okay.

If we go down point 14, post explosion, the first CO reading it gets post explosion, which is the one you have just referred to, is 13.5?-- Yes.

Let's jump down point 14's, it goes to 50.9, 93.5?-- Yes.

85.5?-- Yes.

And down through the line to, say, 96.8. Now, at 96.8, that's 1.32 in the morning, is two hours after the explosion?-- Yes.

Still recording 100 ppm?-- Yes.

Not atmospherically, surely. Two hours after the explosion 100 ppm, atmospherically outside the pump room, most unlikely I would suggest?-- A possibility, but -----

Most unlikely. Well-----?-- I seem to remember looking at this data and seeing it gradually cleared through the night, despite the fact that CO levels on the points tended to stay up.

Let me just have a look down. I don't know how far those sheets take you?-- It goes to 227 on the 8th.

All right. I might have to give you some additional sheets then. I'll just make sure I've got all the ones I need. The next three sheets on that sequence, then. Now, I want to ask you this: can you move down the point to where the CO on point 14 starts to drop? Now, my reckoning is that it is going to be about 3.25 to 3.43 a.m. on the 8th. I don't think it is going to be on your data in the SIMTARS volume - or it might be, actually - yes, the point 14 data is there, but then I want to - I just ask you to refer it to the other data and see if it doesn't go down at the same time as the immediately preceding point starts to go down?-- Can I draw on this?

Sure, sure. Do you need a highlighter?-- That might be best. Yes.

It goes down as the-----?-- Appears to, yes.

Which would further suggest, wouldn't it, the purging question that I'm talking about, rather than leakage questions - it seems to - well, while you ponder that, what it certainly rules out is atmospheric products?-- It appears to. There may be some combination of the two.

Yeah, okay. I tender those pages, which I think would be titled "Sequence of samples" - I'll try and give you a start time and a finish time - "Sequence of samples into the analysers commencing point 1, 7 August, 22:51, and ending point 6, 8 August, 06:10". I don't have copies in a multiple form. If we can organise that subsequently, I would appreciate that.

WARDEN: Exhibit 230.

ADMITTED AND MARKED "EXHIBIT 230"

MR MORRISON: That's all I have, Your Worship.

WARDEN: Thank you, gentlemen. It is too late to start another witness today. Can we have an early start tomorrow morning - 9 a.m.? We'll try and make up some time. Thank you. I formally excuse the witness.

WITNESS EXCUSED

THE COURT ADJOURNED AT 4.49 P.M. TILL 9 A.M. THE FOLLOWING DAY

FXXN: MR MORRISON

WIT: HUMPHREYS D R

WARDEN'S COURT

MR F W WINDRIDGE, Warden and Coroner
MR R J PARKIN, General Manager, Capricorn Coal Pty Ltd
MR P J NEILSON, District Secretary, United Mine Workers' Union
MR C ELLICOTT, Training and Development Officer, Department of
Mineral Resources, New South Wales
PROF F F ROXBOROUGH, Professor of Mining Engineering, School
of Mines, University of New South Wales

IN THE MATTER OF A CORONIAL INQUIRY IN CONJUNCTION WITH
AN INQUIRY (PURSUANT TO SECTION 74 OF THE COAL MINING
ACT 1925) INTO THE NATURE AND CAUSE OF AN ACCIDENT AT
MOURA UNDERGROUND MINE NO 2 ON SUNDAY-MONDAY, 7-8 AUGUST
1994

GLADSTONE

..DATE 21/03/95

..DAY 47

THE COURT RESUMED AT 9.06 A.M.

MR CLAIR: Your Worship, Mr Humphreys raised a matter in respect of his evidence yesterday afternoon which involves some figures which he wished to correct for the record and they are matters that should be corrected, so I just recall him very briefly for that purpose - Mr David Humphreys.

DAVID ROBERT HUMPHREYS, RECALLED AND FURTHER RE-EXAMINED:

WARDEN: You are on the former oath you took yesterday; do you understand that?-- Yes.

MR CLAIR: Mr Humphreys, yesterday afternoon when I was questioning you, I asked you some questions about the graph which was Exhibit 218. Do you recall the three graphs plotted?-- Yes.

Representing the three different quantities of air?-- Yes, I remember that.

And at one point in your evidence you were asked about the difference between the high velocity panel and the lower velocity panels and you said - and I'm referring to page 4341 of the transcript at line 24, you said: "For example, I think at 45 cubic metres a second a 1 part per minute increase in carbon monoxide is equivalent to 2.4 lpm, whereas it's equivalent to, I think, 4.8 at 20 cubic metres a second."?-- That's right.

You didn't at that point have any figures in front of you as such. When you said "I think", did you think correctly, or not?-- Reflecting on it overnight, I realised that I had given - the second number was incorrect - the 4.8 lpm for each part per million was wrong. It should actually only have been 1.2 lpm per part per million.

And in the first part of your answer when you said "I think at 45 cubic metres per second at 1 ppm", did you intend to refer to 40 cubic metres per second?-- Yes, I don't understand why it came out as 45.

I have nothing further.

WARDEN: Anything further? No. Thank you, Mr Humphreys. You are excused.

WITNESS EXCUSED

FRXN: MR CLAIR

WIT: HUMPHREYS D R

MR CLAIR: Your Worship, I call Clete Robert Stephan.

CLETE ROBERT STEPHAN, SWORN AND EXAMINED:

MR CLAIR: Your full name is Clete Robert Stephan; is that right?-- Yes.

The pronunciation of that surname - am I pronouncing that correctly?-- Yes, you are.

Mr Stephan, you are a Principal Mining Engineer with the United States Department of Labour in the Mine Safety and Health Administration; is that so?-- Yes.

And together with some other persons who work within that administration, have you prepared a report in relation to an investigation of the accident, which is the subject of this Inquiry?-- Yes.

Could the witness see Exhibit 6, please, Your Worship? While that's being obtained, you prepared that report at the behest of the Chief Inspector of Mines, Mr Lyne, who made the request on behalf of the Department of Minerals and Energy in this State; is that so?-- Yes.

The report in front of you is the report that you prepared; is that so?-- Yes, it is.

Thank you, Mr Stephan. Your Worship, I leave Mr MacSporran to take Mr Stephan through his evidence.

EXAMINATION:

MR MacSPORRAN: Mr Stephan, have you prepared a resume which deals with your qualifications and background and experience?-- Yes, I have.

Would you look at this document, please? Your Worship, I have copies of this for the panel and the parties. Mr Stephan, is that a copy of your full resume?-- Yes, it is.

I tender that, Your Worship.

WARDEN: Exhibit 231.

ADMITTED AND MARKED "EXHIBIT 231"

MR MacSPORRAN: Could I take you briefly to some parts of it? I think towards the end at page 13 you detail your formal qualifications; is that so?-- My education.

Education qualifications, and that is you obtained a Bachelor of Science in Civil Engineering in 1976?-- Yes.

Is that so?-- Yes.

And that was from Pittsburgh - University of Pittsburgh?-- Yes.

Your employment history is detailed on the front page of the document; is that so?-- Yes.

And that traces your employment history with the Mine Safety and Health Administration in Pittsburgh; is that so?-- Yes, it does.

And that employment started as a mining engineer in the Industrial Safety Division in April 1977?-- That is correct.

So that was soon after you graduated, was it, from Pittsburgh University?-- That's correct.

Then in 1982, in December, you were the senior mining engineer in the same division of MSHA?-- Yes.

In July 1990, you became the Principal Mining Engineer in that same division at MSHA?-- Yes.

Then in September 1992 you became the Acting Chief in the Mine Materials/Hazards Evaluation Branch, Industrial Safety Division?-- Yes.

And then, finally, since August 1993 you have been the Principal Mining Engineer for the Ventilation Division with the same organisation, MSHA?-- Yes.

Is MSHA a Federal body in the United States, or is it a State body?-- It's Federal.

You outline on that first page of your resume your professional licences held and certifications as well as your profession membership; is that so?-- Yes.

Then between pages 2 and 3 you indicate publications where you have been involved; is that so?-- That's true.

And there are a number of those dealing with reports for the Industrial Safety Division of MSHA?-- Yes.

And you have set those out separately on pages 2 and 3 - there are 23 of those in total?-- Right.

Then on page 3 you go to the articles which have been prepared by you in the circumstances you outline there on page 3?-- Yes.

And there are, what, 17 of those?-- Yes.

And then you detail, starting on page 3 and continuing, your experience in actual investigations of explosions in a variety of localities; is that so?-- Yes.

And predominantly is it the case that those investigations involve underground mines?-- Yes.

I won't go through them all, but you indicate your experience in that respect starts in 1977. Again, I take it that was soon after you commenced employment with MSHA?-- Yes.

And obviously goes right through until this year, 1995?-- Yes.

As part of your experience you have included the work that you and your colleagues at MSHA have done in respect of the Moura matter we are concerned with here?-- Yes.

I think you have listed that, in fact, as number 38 in a list of 40 concluding on page 7 of your resume?-- Yes.

You then go on to detail the occasions upon which you have given evidence in Courts; is that so?-- Yes.

And that experience commences in 1982 when you gave evidence to MSHA's special investigator relating to an explosion that occurred at the American Gilsonite plant in Utah?-- Yes.

And then you detail through the remaining pages of the resume, up to page 9, the 10 occasions where you have given evidence in various capacities?-- Yes.

They have included civil suits, criminal proceedings and investigative hearings, things like that?-- Yes.

And you have given evidence in those capacities as an expert; is that so?-- Yes.

You then detail on pages 9 through to 13 training, or aspects of training you have been involved in over the years starting in 1981?-- Yes.

And that process has been ongoing through to 1993, which is detailed on page 13; is that so?-- Yes.

And your involvement in training has ranged over a significant area of relevant programs; is that so?-- Yes.

And then finally, on pages 13, 14 and 15, you actually outline additional training you have received since graduating from the university of Pittsburgh?-- Yes.

Again, that starts fairly early in your career in 1977 when you first took up employment at MSHA; is that so?-- Yes.

That continues through, as your resume indicates, to last

year, 1994, where there was a course conducted by MSHA and the US Department of Labour in Systems Improvements; is that so?-- Yes.

So, your training has been an ongoing process since your graduation - since shortly after your graduation in 1977?-- Yes.

Now, with respect to the matter we are concerned with here, you have identified Exhibit 6 as being the report that was produced initially as a result of contact between MSHA personnel and the inspectorate in Brisbane, Queensland?-- Yes.

And, indeed, soon after the incident, did the systems secretary of MSHA contact the Department of Minerals and Energy in Australia to offer technical assistance with the aspects concerning the explosions that occurred at Moura No 2?-- Yes.

Was there then contact made between the Department here and MSHA in terms of furnishing data for MSHA's use to evaluate and express an opinion in relation to-----?-- Yes.

How was that exchange of information initially carried out, can you tell us?-- Some of the information that we received from the Chief Inspector came via mail - the regular mailing service and other information came through computer - E-Mail.

And was there, as your report indicates, following that initial furnishing of material, video conferencing to discuss various aspects of the data that had been forwarded to MSHA?-- Yes.

In addition to the report, Exhibit 6, were you requested at MSHA to provide further evaluation upon the receipt of further information and in respect of certain areas concerning this event?-- Yes.

And in response to that, did you forward a further - if I can put it this way - supplementary report after the request made of you?-- Yes.

If you look at this document, please? There are copies for the panel, Your Worship. Mr Stephan, is that the supplementary material that was forwarded, as the material suggests, soon after 31 January this year?-- Yes.

And in brief summary and I'll come back to it, does that relate to an estimation of the size of the explosion firstly?-- Yes, it does.

512 Panel gas make?-- Yes.

Some details on page 3 with respect to experience in the United States where there have been mines that have incurred - or experienced multiple explosions as a result of incidents?-- Yes.

And then on pages 4 and 5 a section detailing with justification to re-enter the mine?-- Yes.

So we will come back to that shortly, but that's the scope, if you like, of this additional material to supplement the report which is Exhibit 6?-- Yes.

I tender that if Your Worship pleases. Perhaps it could become part of Exhibit 6 if that's convenient, or 6A perhaps.

MR MORRISON: Your Worship, before that's fully admitted can I just raise one matter by way of clarification, I suppose. I was going to ask the question about whether that part on page 4 under the heading "Justification to Re-enter the Mine" was to be pressed in this report, and I rather apprehend from what Mr MacSporran has just said that he intends to do so, and what I wish to question is whether that is an appropriate topic for this Inquiry to follow, particularly at this late stage of the Inquiry.

Can I just make a few points about that to demonstrate why I raise that? It's trite to say, of course, that the function of this Inquiry is in fact limited by statute. The topic that's being advanced is one obviously for the future since it hasn't happened up to this point. The recommendations you might make, and no doubt will make, in your report will be recommendations directed, as the statute requires them to be, towards prevention of this explosion again. I doubt, though I don't know, but I seriously doubt that the panel would ever come to the state where it would recommend re-entry as a recommendation, and I am certain it would never do so unless it had heard quite a detailed amount of evidence about the risks associated with re-entry, the ways in which it might be done, the dangers to life not to mention property and so forth.

Now, at this stage we are in the last week or so of this Inquiry and evidence about that topic would have to proceed on a very detailed basis. There are no doubt experts in the field - a prosaic example, other Mines Rescue people themselves who no doubt would be required on any re-entry to be the people who go into what on any view is a terribly dangerous atmosphere inside the mine. The foundation advanced for this area, I think we can see from this document, is two-fold. Firstly, on the first page it says that Mr Brian Lyne requested a justification for re-entering and that's probably the prime reason why it's turned up in this report and not the main report, and then in so far as you can discern

it on page 4 the justification is given, if you posed the hypothetical question, "Why do you wish to advance this and why is it to be done?", and the answer is really given that it's important to know the causes of an explosion to prevent further occurrence.

Can I make a point about that? SIMTARS have dealt in some detail with the cause of the explosion. In fact as it seems from the main report MSHA agrees with them, so does Mr Highton in his report, and as you will have noted - perhaps you haven't noted - I don't think there is any expert to be called at this Inquiry who disagrees with the central thrust of SIMTARS, that is to say, it was in probability an event behind - in 512 and the cause for it. So the information that might be sought under a re-entry doesn't seem to advance that in the scope of this Inquiry. The information which was sought to be identified is really not enumerated for you nor the practices which it might be said led to it.

A further point to be made about this area is that really no-one has been given an opportunity to deal with this as a topic. This document was only provided yesterday notwithstanding that it seems to have been in the possession of the Department since the very early days of February, and it goes without saying one would have thought, that if in fact this is a topic to be ventilated - pardon the expression - at this Inquiry, it is something upon which there are a multiplicity of issues; method of re-entry, the inherent safety of doing so according to each method, controls that might be put in place, the risks to be run, the timing of it, and none of those have been matters raised before or dealt with by any witness. If it's to be ventilated at this Inquiry and within the life of this Inquiry, and I make that point expressly because if we are going to proceed down this track I can easily foresee, and I'm sure the members of the panel can, that dealing with those sorts of issues will require not only a multitude of witnesses of different disciplines, but we will be here a much longer time. I can easily see, if all the parties wish to call people who might comment on how to re-enter or whether you should and how you should do it, we could be here weeks, weeks more, and of course those weeks won't come right now because obviously people need to formulate their ideas, investigate this and one can't really imagine it ever happening without perhaps an extensive regime of borehole testing, perhaps more borehole camera work.

So the question I raise is really not so much by way of an objection to that part of the report, although I suppose it has that flavour, but it's something that, with respect, I would urge does not fall within the purview of this Inquiry's scope at this point of time. It's a topic that of course can be raised and no doubt will be between the relevant parties. No doubt MSHA's information has been provided to Mr Lyne, Mr Lyne and MSHA will no doubt make representations to the mine operator. That, of course, will have to involve Mines Rescue personnel as a quite separate area. They, of course - Mines Rescue are not represented here in these proceedings and no-one that we know of from Mines Rescue has been asked to comment on this.

XN: MR MACSPORRAN

WIT: STEPHAN C R

So it's something which, in our submission, won't fall within the purview of the Inquiry, is likely to very seriously delay the Inquiry if it's to be proceeded with because we will all have to be given an opportunity to adduce some evidence on it and to investigate it and that's going to take some time, and in any event, it's difficult to see how this area can impact on whatever recommendations you will make. As I say, it's difficult to understand how you would ever come to the stage of recommending re-entry as part of your function investigating what happened in August, but you would never do so until an absolutely full investigation had been done about all the ramifications otherwise people might be put at risk and no-one wishes to do that without a full investigation. Of course that investigation can be done between the relevant departments and parties.

So I would urge Your Worship that the scope of that area of justification to re-enter be limited. It perhaps doesn't need to be ruled out of the report. I don't really urge any particular course in that respect, but it is going to open up some very serious issues which will seriously delay this Inquiry and I don't think it really should be pursued here.

MR MACSPORRAN: Your Worship, there are, I suppose, two issues. Could I just indicate this firstly about the question of this topic arising late in the piece? It's true to say that the supplementary report from MSHA, which is the one just tendered as Exhibit 6A, was provided to the parties only yesterday where in its body contains a section at the end which has been identified as referring specifically to that issue of justification for re-entry, but it's not true to say that's the first notice anyone has had of that issue being flagged as a possible point for discussion at this Inquiry. In fact in Mr Lyne's report, and in the draft form even which was tendered as Exhibit 1 back on the first day of these proceedings which was 18 October last year, in the end section of that the very topic was flagged under the heading "Mine Re-entry", in these words - and I'm reading now from the final report - I don't have the draft in front of me, but the topic was raised even in the draft in the final report, 1A.

It's raised in these words under 7.7: "The investigation has identified the probable location of the first explosion on a scientific and theoretical basis. Further consideration should be given to the benefits of re-opening the mine for the purpose of gaining the maximum amount of evidence and knowledge from this incident in order to minimise the possibility of a re-occurrence."

So the issue was flagged as early as 18 October last year, if not slightly before that when the draft report was distributed to the parties. Certainly on that day it was tendered, and indeed it's been confirmed to remain an issue by it remaining in the final report tendered on the start of the second session here, 6 February this year. So as I say, it's not true to say that it's first arisen by way of possible point for discussion only yesterday.

Your Worship, the Inquiry's powers are limited obviously by statute, section 74 of the Act. The Inquiry there is to establish the nature and cause of the accident, and further if it deems appropriate, to make recommendations for the future. It's very clear on the evidence here thus far there were two separate explosions involved in the incident with a substantial interval of time in between. A part of the function of this Inquiry would be to establish the details of the nature and cause of the first explosion and the second explosion, the circumstances prevailing in the mine between the two explosions, the force and magnitude and path of the first explosion bearing upon the question of whether there might indeed have been survivors from that first explosion, a question of if there were survivors, in what circumstances they survived, where they were at the time they finally passed away.

All of those features could only be determined this report, the MSHA report makes very clear, from a detailed underground investigation. In fact as much seems to be the thrust of Mr Morrison's cross-examination in part of Mr McMaster most recently when he was cross-examining along the lines of that one could not eliminate potential ignition sources unless a detailed examination of certain underground equipment was carried out. I suppose that's really quite an obvious point but one that the MSHA witnesses really reinforce as being the only way with certainty it can be established what the nature and cause of these explosions, and particularly, of course, the first explosion was.

It's true to say, as Mr Morrison has, that all of the experts seem to be basically in agreement that the first explosion may well have originated inside the 512 Panel and the ignition source may well have been a spontaneous combustion which had been taking place for some time prior to ignition. However, in my submission those reports make it clear in themselves that that conclusion, as 512 being the most likely source of the ignition, is based upon the lack of any other evidence to the contrary. Again the MSHA reports make it clear that in the absence of a detailed underground investigation, which in all probability would provide evidence one way or the other, a conclusion about the source of the ignition and its magnitude et cetera could never be definitely reached.

So in my submission the issue of re-entry of this particular mine arises fairly and squarely for consideration here. The question of what the Inquiry ultimately determines about the prospects of re-entry for this mine or any other mine in the future that's unfortunate enough to suffer such an event as this is a matter entirely for the panel. It doesn't detract from the usefulness, in my submission, of raising the issue to be determined at this stage, that is the issue is raised. After consideration the parties can, of course, cross-examine in relation to the usefulness of such a course being adopted, and further more, and I suppose most importantly, can make in the end result some detailed submissions about the utility of such a course, but it is, in my submission, a legitimate issue to be raised at this stage for consideration.

WARDEN: You weren't going into it in any more detail than generalisations as they appear in the report?

MR MACSPORRAN: That's so, Your Worship. As the report makes clear, really there are good reasons why without such an investigation any conclusions drawn about the cause of this event would have to be considered to be tentative, if you like, or preliminary. That point is made throughout the MSHA reports and indeed even in the last report. That being the case it is flagged as an issue for consideration that without such re-entry of this mine such conclusions can only be considered tentative. It wasn't proposed to go into the nuts and bolts, as it were, of such a practice or procedure. If it was to take place that would clearly be a matter for the parties to discuss and resolve as a safe and best practice way of undertaking such an exercise. That's quite a different issue to the function of this Inquiry, in my submission. It really is raised here for the Inquiry's consideration for potential to recommend how best to prevent such a tragedy in the future, and that involves finding out what actually happened as opposed to what the evidence from the surface might seem to indicate actually happened. Those are my submissions, Your Worship.

WARDEN: Mr Martin?

MR MARTIN: Could I be heard briefly, Your Worship? It's a very, very delicate issue as the panel well realises, and any consideration of re-entry will have to be only after close consultations with the next-of-kin and the widows. So I would ask that to be borne in mind, but central to a re-entry is the fact that the remains of 11 men are there. It is their grave so we will have to be very careful about that.

WARDEN: Thank you.

MR CLAIR: Your Worship, might I be heard just briefly on this matter? I must say it's a matter that catches me a little by surprise and I feel that at least on the run that I should make some submissions which may or may not reflect advice that might ultimately be given to the panel, but as I understood, because Mr Lyne's report was tendered on the first day, this has always hung at least as a question as a background to the proceedings. The issue really has only at this point come into focus in evidence with the tendering of this report. I don't think there has been any questioning much of witnesses up to this point about the desirability or otherwise of re-entering the mine.

It is in my submission, undeniable that the question of re-entry is there as an issue that this Inquiry can legitimately look at. Mr MacSporran has outlined some reasons for that. Ultimately it must be said that it is within the powers of the Inquiry to look at what sort of investigation should be carried out in order to put the Inquiry in the position to make - well, to fulfil its obligations, its statutory obligations under the Act and make findings and recommendations.

So that, as I say, in the end result it can't be said that it's not an issue for the Inquiry, and it's a matter that has to be looked at as part of the investigations.

At the same time the point made, first of all, by Mr Morrison that it's a step that ought not to be taken without adequate evidence on the point and it may be necessary for some detailed evidence to be taken on the aspects that he has mentioned, the method of re-entry, what controls would need to be put in place, what risks are involved, all of those aspects would need to be covered before even any final decision could be made by the Inquiry that there ought to be re-entry.

I would also submit that some weight ought to be placed on the point made by Mr Martin that it's a step that would only be taken after consultation and perhaps some evidence as to other effects of re-entry, so that it is a step, of course, that would not be taken lightly. However, as I said at the outset of my submissions, it's an issue that's there and it's really been there from the first day.

Can I make this submission: that at this point the matter ought to be dealt with to the extent that it does arise, and certainly whilst the witnesses from MSHA are here, since the matter arises as a point in their report, along with the other points, specifically those relating to the effects of the first explosion, can the matter be dealt with at that level at this stage, and Mr Morrison and the other parties conduct cross-examination of these witnesses on the basis that it is a point at least arising to the extent that it's reflected in the report. Then without the exhaustive evidence being called on the issue, the panel can, as part of its deliberations, determine whether there is sufficient evidence before the Inquiry for the Inquiry to properly carry out its statutory obligations, that is, to make findings as to nature and cause and to make recommendations that will be useful for the future. If the Inquiry, at that point, finds itself in a position where it feels it can't fulfil those statutory obligations without making further investigations by way of re-entry of the mine, then there ought to be no direction, that is, firm direction, that such investigation take place or no finding that there should be re-entry of the mine without the opportunity for further evidence and submissions at that stage.

Such a course would take cognisance of the fact that it's an issue but at the same time take cognisance also of the fact that it's not a step to be taken lightly, not a step to be taken without full evidence, adequate evidence, being given on the point and without full submissions being made to the Inquiry about the desirability or otherwise of re-entry; such evidence and submissions being made after the Inquiry determines initially whether it has sufficient evidence at this point, or at least at the end of evidence at this hearing, to fulfil its statutory obligations.

MR MORRISON: Your Worship, can I be heard just briefly on a number of points? It's true to say that at page 20 of Mr Lyne's report the one line does appear as the last line of

the report, that further consideration should be given to the benefits of re-opening the mine. One line from a Chief Inspector in a draft report and then in the final report is hardly in the same category as commissioning a report to deal with the issue specifically from an expert in the field, and that's the difference between the one line in Mr Lyne's report and commissioning MSHA to actually deal with this issue. That's why, up to this point, it's been easy enough to cope with.

Of course, MSHA make the very trite point - not to demean the point - but the very trite point that if you can't go down, then there is evidence you can't see, or potential evidence you can't see, and they have made that point in this report. So, to the extent that that has an impact on the way the Inquiry is dealt with, that's already there, and you can consider in your minds, as no doubt you already have, whether someone in a more appropriate circumstance ought to think about getting further evidence, but not for this Inquiry, not within any scope of this Inquiry; it's quite a different thing, and I note that the section of Mr Lyne's comes right in the last section of the report simply under "Matters For Consideration", so it's, as it were, a one line comment, like an afterthought by the Chief Inspector and the last matter for consideration. It's quite a different thing from commissioning a report that deals with it specifically.

Can I move to the next point, and that is this, which impacts both on - I think it picks up a point that Mr Clair was making which puts it in a different light - that the panel is, of course, charged under the Statute with performing a certain function that it's here doing. Now, you either discharge your duty and finish and complete your functions and issue your report or you don't. Now, if you are going to finish your functions and issue your report, then this issue can't be dealt with unless we adjourn the Inquiry so all that evidence can be got and it comes in as an issue to be dealt with in a full blown true nature. If you are going to give your report and discharge your functions and come to finality, then this issue really has to be put to one side. In so far as it raises it in a general way, it's doing no more than MSHA has done in their main report which is to say if you can't get down, you can't see all that might be seen. To go further than that really is to get into the nuts and bolts, even though one says you are not going to, because it's clear, with respect, from what Mr MacSporran says that part of their submissions will be that there should be re-entry - not that people should think about it, there should be - and you are going to be urged to make some comment about that which really puts you in an invidious position. If it's to be a live issue which you have to deal with, and properly, to discharge your functions, then we are not going to finish the Inquiry in the next couple of weeks, no way. You either finish it and deliver your report or you give some interim recommendations and findings and wait to finish your report eventually when it's all in, and that's really a product of the Statute.

Now, the position that we are in really is that a report has been commissioned - we are here dealing with only part of it,

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obviously some part of it is supplementary to what's gone before - but that part of the report is specifically to deal with the request of Mr Lyne, in other words, put forward justification for going in so we can ask the Inquiry to recommend it.

In so far as it's said in this Inquiry we aren't going to go into the nuts and bolts, then how can anyone sensibly cross-examine? The two positions really are these: (1) "I can't go in because the mine is sealed and, therefore, I can't see all that can be seen." We know that. It's not something that anyone would cross-examine about; it's a trite point. To go further than that and say, "There are things to be seen, there are reasonable probabilities about finding evidence that will impact on this and, therefore, we should go in.", that's quite a different matter about which evidence would be gained by all parties and consideration would be given to it, and I can think of one witness just off the top of my head who would have been centrally involved in cross-examination about that, Dave Kerr, Superintendent of the Mines Rescue Brigade, whose men are going to be put at risk, not at risk, on how these things go if any re-entry is made. I am sure he would want some say in this, and I am sure questions would have been directed to him; not to mention John Blyton, a deputy of the Mines Rescue Brigade, and all those men who might actually be asked to put their lives on the line.

So, if the nuts and bolts are to be advanced, how does one sensibly cross-examine beyond the proposition as baldly as it was stated? It's in the first report. That's why, in my submission, you are in a position now to say whether it's an issue that can be dealt with or not. You really don't need to hear any more about it by way of general cross-examination as to the principle. What's the principle? You can't go in and see what's there to be seen; no more to be said about that. Beyond that it's got to be, "You should go in.", and that's the offending part.

So, in my submission, it really shouldn't arise, and may I make a last point in deference to Mr Martin who, I think, probably appreciated that I didn't mention the family sensitivity only because I knew that is a matter that Mr Martin is to deal with anyway. I wasn't meaning to minimise it in any way. But I place it on the more general propositions that I have raised and, in my submission, it really shouldn't proceed in the life of this Inquiry unless - unless the course that Mr MacSporran is urging is because the findings can only be preliminary, and that's the point that he makes, you are to in fact adjourn until this issue is fully investigated to bring the final report in. I am not sure that anyone would welcome that proposition.

MR MACSPORRAN: If I might just reply briefly. In terms of the question of the next-of-kin's sensitivities, I mean obviously everyone is aware of those and that's one main reason why, in my submission, everyone should be very keen to establish what actually happened and, more importantly perhaps, to make useful recommendations as to why it should never happen again. That is one main reason why it would be

important, in my submission, to ascertain from a detailed underground investigation the actual events that occurred. That's one aspect.

In terms of not going into the nuts and bolts, it is fairly obvious from the MSHA reports that there is evidence in the expert opinion of the MSHA witnesses that can be gained from such an underground investigation. It's not simply a matter of saying, "Unless you go down, you won't know." It's a matter of going a step further and saying, "In all probability there will be significant evidence to be obtained and evaluated which may confirm or put to rest various theories that have been advanced as to the cause of these explosions, and particularly the first." It's proposed to go that far at least in the examination, if permitted, with the MSHA witnesses and, in particular, Mr Stephan.

On the issue of whether or not the Inquiry can at this stage say that that issue can't be resolved sensibly without the Inquiry adjourning to further consider the matter after the evidence is heard, let me submit this: that what's really being asked to be done is simply to raise the issue before this Inquiry and, as Mr Clair, in my submission, rightly observed, the Inquiry can then determine at the appropriate stage whether the evidence thus far before the Inquiry is sufficient for it to make a finding or whether it needs, in the end result, to adjourn and further consider the matter and take further evidence on this very issue of re-entry or re-opening the mine.

So, that's not a reason, in my submission, for curtailing the issue at this stage. It's sought to be raised, as it has been legitimately flagged in the Chief Inspector's report and draft report, as an issue quite properly and legitimately for consideration for this Inquiry. What the Inquiry does with it at the end of that evidence is a matter for the Inquiry after cross-examination and full submissions.

WARDEN: Yes, thank you. The panel members have indicated they want to discuss the matter briefly, so we will have a short adjournment as it will impact upon their considerations. Thank you.

THE COURT ADJOURNED AT 9.55 A.M.

THE COURT RESUMED AT 11.26 A.M.

CLETE ROBERT STEPHAN, CONTINUING:

WARDEN: Thank you, gentlemen. The Inquiry is of the view that in order to carry out its statutory responsibilities the question of re-entry is one that may have to be considered and cannot be ruled out. Full consideration can't be given to the question of whether re-entry is desirable until the evidence which is currently intended to be led before the Inquiry is completed. If at that stage the Inquiry, after considering all of that evidence, is of the view that re-entry may be desirable it would not form any firm or final view on the question of re-entry without giving the parties the opportunities to lead further evidence and make submissions at some later stage.

At this stage the issue is one that can be canvassed with the witnesses who are presently intended to be called before the Inquiry. It is not envisaged at this stage that any additional evidence should be called. Thank you.
Mr MacSporran?

MR MACSPORRAN: Thank you, Your Worship. Mr Stephan, I think we had reached the stage where you had identified the supplementary material that had been forwarded in January this year after Exhibit 6, the report, had already been received in Australia. Did Your Worship mark that as an exhibit, the supplementary report? Was that 6A?

WARDEN: That's Exhibit 6A.

ADMITTED AND MARKED "EXHIBIT 6A"

MR MACSPORRAN: Could I take you then, Mr Stephan, to Exhibit 6, that's the initial report, and you've mentioned, I think receiving at MSHA a series of raw data to work on to enable you to express an opinion about certain aspects concerned with this incident. Your report indicates in the second paragraph, if I can direct your attention to that, on page 3, that "Additional information from a complete underground investigation would be necessary before the causes and origins of the explosions could be determined with certainty.", and that's, as I say, in the second paragraph of page 3 of the initial report; is that so?-- Yes.

Do you stand by that opinion having reviewed the data sent to you in relation to this incident?-- Yes.

You then go on to speak in the next section on the same page - under the heading "Preliminary Evaluation of the Explosion"

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you detail a number of factors that would need to be considered to come to any definite conclusion about the source, origin and other matters associated with this event; is that so?-- Yes.

Can you tell us with reference to that paragraph, if you need to, the sort of areas in general that would need to be looked at to enable you to come to some firm conclusion about the events involving this explosion?-- Yes. Typically in an explosion investigation part of the work that I would do underground would be to make an evaluation as to the extent of the flame. The flame in an underground explosion, of course, is fuelled by the methane or coal dust or other fuel. The ignition source for that flame or for the explosion would have had to occur somewhere within that flame zone. So in order to establish where the ignition source may have occurred it would be very important to establish the extent of the flame in that explosion.

Now, with the data you received - is it a fair comment in respect of that that it was a substantial body of raw data that had been gathered by the investigative team in Australia?-- There was a substantial body of data delivered to us.

In spite of that body of data do you still hold the opinion that it would be necessary to go underground to investigate the aspects you are now talking about?-- I don't believe that there was any evidence within that body of data that would indicate an extent of flame to me. So, yes, it would be important to go back underground for that purpose.

We will come back to those points in a moment. Can I just take you back to the report on the third page? The next topic covered is the fuel involved in the explosion and there is reference made to the calculation of the H/C ratios for various sampling points. Do you see that?-- Yes.

Isn't it the case that that section of the report was in fact completed by one of your co-authors, that is Dennis Giardino?-- Yes.

Could I ask you though, generally in respect of that section of the report does it come down to this, that from the work that Mr Giardino did he was able to express an opinion about the likely fuel source from various areas sampled from the underground atmosphere?-- Yes, that's true.

The first of those related to samples - this is on page 6 of your report I am now referring to - the borehole samples taken from the 512 seals area; is that so?-- Yes.

The data there, and in particular the index, indicating a methane explosion predominantly?-- That is what it indicates.

The following page deals with the data from the 510 borehole area which again indicates a methane explosion?-- Yes.

The final point of significance is the 520 area borehole which

shows a slightly different H/C index range; is that so?--
Yes.

Indicating in Mr Giardino's opinion a possible coal dust involvement in the original explosion and/or localised fire burning during the period immediately after the first explosion?-- Yes.

Again, as we say, this part of the report was done by your co-author?-- Yes.

Can I take you then to page 9 of the report? At the top of the page the summary is given that we have just referred to and then you say in the next paragraph: "Although methane has been tentatively identified as the primary fuel for the first explosion, it is impossible with the available information to quantify the amount of methane consumed." Can you just tell us briefly, if you would at this stage, why that is, why it's very difficult to calculate the quantity involved?-- Well, for one thing the extent of flame that I mentioned before would be very dependent upon the amount of fuel that would be available for that explosion. In this case if we had 2,000 cubic feet of methane and we diluted that to even a 10 per cent mixture we would have a volume of approximately 20,000 cubic feet. This volume of 20,000 cubic feet of an explosive mixture when ignited could result in flame that would expand up to five times beyond that area. You could see that that might involve a volume in the mine of 100,000 cubic feet and that would be the extent of the explosion that we would be able to generate - or the extent of the flame that we could generate in an explosion of 2,000 cubic feet of methane. The pressures that we had theorised occurred underground were in the order of magnitude to suggest that quantities of methane way below 2,000 cubic feet actually occurred and actually were involved in the first ignition.

You say in that same paragraph that I referred you to on page 9, that's the second paragraph from the top, "Based on experience, it is reasonable to assume that only a small quantity of methane within the explosive range was available for the first explosion - probably less than 2,000 cubic feet." Why do you say that? What's the experience you base that upon?-- Well, that experience would be based on the investigation of dozens of explosions in underground coal mines in the United States and also on past research that had been completed in the United States on the ignition of methane and its effects.

So you are saying that not all of the methane present would have been, in your opinion, within the explosive range and hence able to be ignited?-- That's true.

You go on to say in the same paragraph, "It is expected that quantities of methane in excess of 2,000 cubic feet would result in pressures that would have caused greater effects on the surviving miners." I take it for that opinion you've had regard to the statements given by survivors who came out of the mine shortly after the first explosion?-- Yes.

Looking at a quantity of about 2,000 cubic feet of methane, how can we have some idea what sort of space that would take up inside a mine like the 512 Panel underground?-- If we, like I said, diluted that 2,000 cubic feet to an explosive mixture of 10 per cent even, that would involve the 20,000 cubic feet that I talked about, and this 20,000 cubic feet would probably fill an area of the mine equivalent to a linear distance of the length of about 33 metres underground.

The next section on page 9 deals with the topic of ignition sources and you say there that, "Based on the currently available information..." at the time you compiled the report "...at least two possible ignition sources must be considered.", and you detail those as being the 512 Panel and the 510 panel in the vicinity of the 512 seals. Can you just tell us why those two areas remain, if they do remain, possible ignition sources in your opinion?-- Well, in our experience in the US mines most of the ignitions and explosions that we see are such that they have involved the actions of those people that were underground at the time. That is one of the reasons that we consider it to be important to locate the victims after an explosion so that we know what equipment they may have been operating or what they might have been doing at the time of the explosion, and the energies or the heat requirements for ignition of energy are so low that even explosion proof equipment, if it's not maintained in that condition, would certainly have enough energy to cause ignition. Similarly the temperatures in a spontaneous combustion situation would be high enough to cause ignition.

Well, just on that point, you mention the temperatures from a spontaneous combustion would be high enough to initiate an ignition; what sort of temperatures are we talking about in terms of a methane mixture?-- Well, the temperatures in a spontaneous combustion situation could become high enough to ignite the methane. The minimum ignition point for methane would be in the order of 537 degrees C.

The balance of that paragraph talks about the results from the continuous monitors in the area, that is the 512 seals and the 510 panel areas. Is that really a part of the investigation in the report that is more properly dealt with by your colleague, Mr Urosek?-- Yes.

That section concludes with these words: "A review of the available information, such as gas concentrations and reported forces, minimises the possibility of the explosion being initiated from 5 South. However, this could only be completely eliminated by a thorough underground investigation." Do you mean to convey by that something about - you were saying before about your experience in the United States being that in 90 per cent of cases there have been involvement of miners in initiating explosions underground?-- Yes.

So, to eliminate 5 South you would need a complete

investigation of the underground workings and the location of man and equipment to exclude those as being possible ignition sources?-- Yes.

Could I take you then to the next section of your report on the same page which deals with flame? Can you tell us generally what sort of evidence you would hope to be able to gather in an underground investigation so far as flame is concerned, the path of it?-- Well, we would certainly take a look at the autopsy reports on the victims to see what effects the flame may have had on those. We would take a look at the dust that was left after the explosion. In sampling the dust we would be able to subject it to certain tests that would be able to tell us whether or not flaming had occurred at each of those locations where we sampled the dust, and, of course, we would be looking at any other combustible materials that are left underground.

Can you tell us, in respect of the sample of the dust, what sort of tests you would employ and what sort of things you would be looking for to confirm or dispel the theory of the flame's path?-- The two tests that we would conduct on the dust would be the Alcohol Coke Test and an incombustible analyses of the dust.

What do those tests hope to achieve in terms of evidence of the flame's path and its source?-- The Alcohol Coke Test will identify various levels of coking that occurred in the dust which are indicative of flame. The incombustible analyses would basically give us an idea as to the quantity of the incombustible content in the dust, and that would lead to a decision as to whether coal dust participated in the explosion.

And as we have already said, I think, in the earlier section which Mr Giardino wrote, the index in particular, the H/C index, is some evidence that coal dust was involved in one particular area of the explosion forces; is that so?-- Yes.

And in the last paragraph of page 9 under the "Flame" section you speak of that point, don't you, when you talk about the propagation of the methane and coal dust explosion that may have continued into portions of 5 South?-- Yes.

Again, why do you come to that conclusion in this section of the report?-- Well, there really isn't any evidence from our perspective to indicate where the flame may have ended, and because of the readings that Dennis had taken, just the involvement of coal dust seems to be likely in that area of the mine.

Can I take you then to page 10, the next page, and the final two paragraphs of the section dealing with flame? Are they really the province of your colleague, Mr Urosek, as well?-- Yes.

Can I take you then to the next section dealing with forces? Could I ask you to explain to us briefly, if you would, how

forces develop at and beyond a point of ignition of an explosive substance?-- The point of ignition is a very specific point, a very specific location in a mine, and that point of ignition must, of course, occur within an explosive mixture of a fuel, whether it be methane or coal dust in suspension. After that ignition point occurs a flame begins to generate. That flame occurs in the fuel and causes a heating of the atmosphere around the flame, and when that flame gets so large, a significant amount of heating occurs to where the gases ahead of the flame are expanding due to that heating, and it's that expansion of the gases that really causes the forces in an explosion.

All right. I think you mentioned in the body of that section dealing with forces the forces travelling in all directions away from the point of its origin leaving a transition zone?-- Yes.

And is such a zone, that is a transition zone, would you expect that to be observable underground at the site?-- Yes.

And what sort of signals would you hope to see to establish such a transition zone underground?-- Well, the transition zone would be an area where the forces of the explosion would actually have changed directions. If we were heading into the mine in a certain heading, we could see that perhaps the forces at each location are heading in an outbye direction and eventually we would get to the point in that entry that if ignition had occurred there, on the other side of the ignition point the forces would be heading into the mine, inbye, so there is where the transition zone would occur, where that change in forces has been identified.

And what would the signals be or the signs be underground to indicate such a change of direction of the forces?-- Well, we may see that dust accumulations would occur on the opposite side of the posts on either side of the ignition source.

Does that tell you something about the magnitude of the forces involved?-- Yes, it could.

And what might it tell you?-- Well, in a low pressure explosion the dust accumulation from the explosion would be on the side of objects nearest to the point of ignition; in a moderate explosion the dusts that are transported by the pressure wave are basically deposited around the entire post or other structure underground, and in a higher pressure explosion the dust accumulation would occur on the side of the object opposite to the ignition source.

And are these things that you anticipate being able to observe from a detailed underground investigation?-- Yes.

Can you give us some idea of the sort of forces that we are talking about by relating them to everyday occurrences, such as, for instance, the phenomenon of popping of the ears? If a person is underground and experiences a popping of the ears, does that tell you anything about the sort of pressures or forces generated by an explosion potentially?-- Yes, it

could.

And what would be the level where that might happen, what level of force?-- Ears may pop at a level less than 1 kilopascal.

What about, for instance, the sort of force necessary to break window glass? We are talking very generally obviously, but to get some idea of the forces we are talking about?-- Breakage might occur at about 4 kilopascals.

What about branch damage to trees - again talking very generally?-- Yes, about 6 kilopascals.

Force that might be involved in knocking a person over underground?-- About 7 kilopascals.

Actual trees being blown over?-- At 14 kilopascals.

Power poles being snapped?-- At about 35 kilopascals.

And actual damage to human eardrums?-- Also 35.

Failure of 12 inch thick brick walls, flexural failure?-- Flexural failure at about 45 kilopascals.

Can you explain to us what you mean by "flexural failure"?-- Flexural failure would be a bending failure as opposed to a compressive or a tensile failure.

Does that level of - you say 48 kilopascals depends to some extent on the load on the wall at the time it is subject to these forces flexurally?-- Yes, it would.

And in what way, what way -----?-- The greater the compressive loading would be on a wall, the greater the flexural pressure would need to be to cause failure in that wall.

All right. Moving further along, damage to human lungs?-- About 100 kilopascals.

A threshold of force in relation to human fatalities?-- About 240 kilopascals.

And the level of force where, if humans are subjected to it, 50 per cent of them wouldn't survive?-- About 345 kilopascals.

Well, can I ask you, in relation to the usefulness of an underground investigation, what benefit there would be in examining, for instance, the area of the 512 seals we have heard about in evidence here? What would you hope to achieve by examining those underground?-- Well, the main point of looking at those seals would be to make a determination as to which side of those seals the explosion originated.

Now, there is evidence before this Inquiry from a borehole video of one of those seals. Would you be able to determine

anything conclusively from the remnants and/or debris from one such seal given that there was more than one seal present in 512 roadways?-- I don't think we would be able to be conclusive about the evidence at one location.

Can you explain to us briefly why that is, why you would need to look at the balance of those seals, firstly?-- Well, there may be a possibility that an explosion generated in 510 could have damaged the first seal that it had seen and allowed the explosion flame to travel into the 512 area where it might have intensified and all the other four seals may have shown signs of being blown out of 512.

Well, if you were to do an underground investigation, would you look at all of those seals to determine the direction of the forces, if you could?-- Yes.

And what would you look for in terms of debris and direction of debris to determine the direction of the force?-- Well, we would have a general idea as to exactly where those seals may have been located at the time of the explosion and we would be able to tell from the debris which direction those seals may have blown.

And what about the location of the debris from the seal site itself, the distance from the location?-- Well, if a seal was designed to the point where it could withstand even - if it could withstand 345 kilopascals of pressure, if that seal had actually seen that type of a pressure wave and was destroyed because of that pressure wave, the debris would be thrown a good distance away from its original location. If a seal was in place and had a catastrophic failure occur due to a pressure wave of only 14 or 20 kilopascals, that pressure wave, being that it's much lower, would not be able to displace the debris very far from its original location, so that debris would still be left close to the original site of the seal.

Again, are those things that you would hope to be able to observe from an underground investigation inside the mine?-- Yes.

Can I take you then to page 11 where you continue with the section dealing with forces and you say, "Based on the data received, it appears that the original methane accumulation was probably ignited in the 512 Panel or in the 510 entries near the 512 seals. A low order explosion generating approximately 5 psi began to propagate." What is that in kPa, 5 psi?-- About 35.

And then you say, "The limited quantity of available methane prohibited the explosion flame from propagating to 5 South. However, insufficient quantities of incombustibles did not arrest the participation of coal dust in the explosion.", and you go on to say that as the forces propagated a level of 8 psi was reached, which is, what, 56 kPa?-- Yes.

Into 5 South. You say finally there, "A pressure wave of about 4 psi..." - which is, what, 28 kPa?-- Yes.

"...may have travelled to the face of the 5 South section. " Now, in concluding the magnitude of those forces and saying the limited quantity of available methane, are you making certain assumptions to draw those conclusions?-- Yes.

Do you concede that there is - it's very difficult to be conclusive on the data available to you at this stage?-- Yes.

And, again, to advance the position you would need to conduct an underground investigation?-- Yes.

You have told us, I think, that you had regard to the reports of survivors who came out of the mine after the first explosion; is that so?-- Yes.

You go on to indicate conclusions reached from all of the data, including reports of survivors; is that so?-- Yes.

What I want to ask you is: what is the likely effect of a force of about 28 kPa upon people working underground at around about the section of the 5 South face?-- I think that pressure wave would - I'm sorry, would you ask that again?

If we assume, as you say in the report, that the forces generated by the first explosion may have resulted in a level of about 28 kPa reaching the face at 5 South, what effect that may have had upon people working in the 5 South area at the time?-- If the people in 5 South had actually seen a pressure wave of 28 kPa, they would have been knocked down and roughed up a bit but they would have survived that explosion. They might have been held to the floor for a while where they wouldn't have been able to get up for a few seconds.

Again, the figure of about 28 kPa is based upon the other factors we have mentioned, that's quantity of methane, ignition source and things like that?-- Yes.

Now, you go on to say on the same page things you would need to look at to - as you have said before, I think, already - to eliminate certain potential ignition sources underground; you would need to conduct a thorough review of all the material?-- Yes.

Now, in your supplementary report, if you could just look at that for a moment, if you have it in front of you, Exhibit 6A. Can I take you to page 3 where you are dealing in the last paragraph before you come to the section dealing with mines with two explosions. You are dealing with this question of the amount of methane involved in the first explosion and the pressure wave and forces that may have been generated; do you see that?-- Yes.

And you mention, I think there in particular, the evidence from Deputy McCrohon, who was one of the miners who came out of the mine after the first explosion, as having experienced some effects on him at the time; is that so?-- Yes.

Can you explain to us, then, how that affects your estimate of the forces involved in the first explosion and the quantity of methane involved?-- Well, the way I understood it, Deputy McCrohon was knocked down by the force of the explosion and held down, but I hadn't heard of any medical problems with hearing or anything that would indicate a higher pressure wave at that location than we had originally estimated. From research in the experimental coal mines, we know that the size of the methane body greatly affects the pressures that are produced in ignitions of those bodies, and I'm still of the opinion that much less than 2,000 cubic feet of methane was involved in the first ignition.

Does the question of it being about 28 kPa at 5 South again depend upon where the ignition source was and path travelled?-- Yes.

What's the effect of the forces turning corners or having to go around corners inside the roadways? Does that have an effect upon the level of the force that's ultimately propagated?-- Yes.

What's the effect?-- If pressure turns a 90 degree corner, it would generally lose about half of its magnitude.

So, again, depending upon where the ignition occurs and where the effects are felt and what's in between, you are potentially able to estimate quite accurately from an underground investigation the size of the explosion?-- Yes.

You go on to say at page 11 that the ventilation deficiencies may have a part to play. Are those areas again more appropriately dealt with by your colleague, John Urosek?-- Yes.

Well, on page 12 you speak of - in the last paragraph before the section dealing with barometric pressure - that, "After evaluating all of the available information, the evidence suggests that the explosion may have originated in the area identified as the 512 panel or in the 510 panel near the 512 seals." Again, are you concluding there that you can't exclude at this stage the 510 area in the vicinity of the 512 seals as being a possible ignition source?-- That is true.

Could I ask you this: we know here from the evidence that there were, in fact, two explosions; the first shortly before midnight on the Sunday evening, the 7th of the August, and the second a couple of days later, I think Tuesday or so, around midday - around that time. What are the prospects of an underground investigation being able to distinguish between the two explosions and the aftermath of them?-- I believe that it is possible to do that.

Can you explain briefly, if you would, how that is; what sort

of things you would be looking for to distinguish between the two; what features there would be to enable you to say that one was in a given location and not the other, and vice versa?-- Well, for one thing if we did a complete dust analyses of the mine, we may find two separate and distinct areas of flame which would certainly indicate that two different locations of ignitions have occurred. That would be in the case that those flame zones did not overlap. In the event that those flame zones did overlap, we could also look at the force data that would have been - would have been in existence underground. For example, on seals or stoppings, if a low pressure explosion causes the failure of those stoppings, they would be blown in the direction of the force, but the first explosion generated - apparently generated a much lower force than the second explosion. So, in that case, the stoppings or the seals would be - debris from the stoppings or those seals would be right in the location near the original site of such a wall. The second explosion, generating much higher pressures, would have caused the debris to be blown a lot further. With the pressures that we have assumed occurred in the first explosion, I wouldn't suspect that all of the stoppings would have been destroyed by such a small pressure, so some of those walls would have still been left standing at the time of the second explosion, and they would provide good indicators of the direction of the second explosion.

Right. Are you able to say anything about the effect or likely effect upon parts or debris from the stoppings that were damaged in the first explosion themselves being moved by the second explosion?-- Well, in the first explosion, if a wall is damaged, the pressure wave sees the whole face of the wall, so it exerts quite a large force on that wall which, in turn, you know, causes it to fail. Once the blocks are laid down on the floor of the mine, the pressure has a tendency to skirt right over the top of them and leave those blocks in the location they were in.

In that way you were able to distinguish different forces in the same area?-- Yes.

Has there been - or have you been involved in instances in the United States where you have had to investigate incidents where there have been more than one explosion involved underground?-- I have not been involved in occurrences where a second explosion has occurred days later.

Are you aware of some investigations that have been done in the United States where that has been the case - there has been more than one explosion underground?-- I know that there have been such occurrences.

And has it been possible in those cases, or some of them, to distinguish between the effects of the first and later explosions?-- Yes.

Now, I want to ask you something quickly about the topic of re-entry of a mine. In relation to the practice in the United States, can you tell us what that practice is in terms of

re-entry of a mine that's been damaged by an explosion?-- After an explosion in the US mines, we have rescue, recovery and investigation in that order, and I am typically not involved in rescue or recovery of the mine, but just the investigative process.

Is that done pursuant to any statutory sanction, or is it a matter of practice only as far as you are aware - that is, the mine is recovered and investigation proceeds?-- Just a matter of practice.

And how widespread is the practice in the United States that the mine is recovered and investigation underground proceeds?-- I believe it has occurred in all cases.

I take it - correct me if I am wrong, Mr Stephan - would you have yet had an opportunity to evaluate the prospect of re-entering this mine, given the data you have been given and the circumstances that apparently currently exist?-- I don't understand the question.

Have you given any thought at all yourself to the difficulty or otherwise of re-entering this mine, given what you at this stage know about the circumstances now prevailing?-- Yes.

Can you express that opinion, please?-- Well, from an investigative standpoint, I wouldn't be very willing to enter the mine unless the proper ventilation had occurred and that the stoppings were all in place - not necessarily permanent stoppings, but at least temporary stoppings - and that the roof had been adequately supported.

And is that a procedure that is invariably carried out before the investigative process occurs in the United States?-- Yes.

And you expect it to be the same here, obviously?-- Yes.

In other words, you wouldn't be expecting anyone to go in to carry out an investigation when the area couldn't be made safe?-- Yes.

In terms of the adequacy of the ventilation or re-ventilation of the mine, is that something that your colleague is normally involved with?-- Yes.

Thank you, Your Worship.

CROSS-EXAMINATION:

MR MARTIN: Mr Stephan, I don't want to discuss your report with you, but rather just try to get some information from you for the benefit of this Inquiry as to the way certain things are done in the United States. As I understand it, it is a Federal Act which controls all coal mining in the United States; is that right?-- Yes.

XXN: MR MARTIN

WIT: STEPHAN C R

Could you just help this Inquiry, if you would, please, in relation to legislation which might exist as to monitoring points - that is, distance apart or where they must be located under legislation?-- It is not in my area of expertise.

All right. Would Mr Urosek - is that how you pronounce it?-- Urosek.

Urosek?-- Yes.

What about the communication to the computer on the surface of any samples; is that your field?-- No.

Well, what about, say, a final explosive-proof seal; is that your field?-- Explosion-proof seals?

Yes?-- Yes.

Is there a legislative restriction in the United States as to the width of the heading or roadway? Is it 20 feet?-- I think that it would vary in each of our 10 mining districts.

Well, just take, say, a 20 foot wide heading - using something your accustomed to - feet - what is required by way of an explosive-proof seal? Is that for management to arbitrarily determine, or is that a matter of legislation?-- No, the Federal laws require that our explosion-proof seals be able to withstand explosion pressures of 20 psi.

And in terms of, say, a 20 foot width heading, what sort of material are we talking about? What sort of depth of construction?-- Explosion-proof seals could be made from solid concrete blocks that are mortared in place with a centre pilaster. They could also be constructed of cementitious foams. We have polyurethane and limestone grouts that we can form into explosion-proof seals. We also design explosion-proof seals from crib blocks - wooden crib blocks.

And is what you describe what we have heard here as a monolithic plug?-- Some of them are.

Thank you.

CROSS-EXAMINATION:

MR MORRISON: Mr Stephan, did I hear you right to say that under Federal law in the States the explosion-proof seals have to withstand 20 psi?-- Yes.

Translating to about 140 kPa?-- Yes.

Is there no State in which that standard is greater?-- No.

Is there some in which it is less?-- No.

XXN: MR MORRISON

WIT: STEPHAN C R

It is all governed by Federal laws?-- Yes.

Okay. I understand. And that relates, does it, to stoppings which are, by their name and by their build, explosion proof?-- We term them explosion-resistant seals.

In their construction are they similar in any way to what might be a concrete block stopping?-- No.

They are much thicker?-- Yes.

And of the monolithic structure that Mr Martin just referred to?-- They are in that form, yes.

I see. And even in that form, they only have to withstand, by law, 140 kPa?-- Yes.

All right. To your knowledge has there ever been anything in the States that required the withstanding of a force - that is to say by a seal or a stopping - of anything in the vicinity of 345 kPa?-- No.

Do you perceive the need, say in the states, for such a jump in the resistance of a stopping?-- No.

Or is 140 adequate in your view?-- 140 appears to be adequate.

Now, before I go to the report itself, if we just continue with that thought, in the States you use a combination of products, including concrete blocks - prefabricated, did I understand you to say?-- Yes.

Moved into place?-- Yes.

Are they tied one to the other in any form?-- They are constructed in a staggered manner, yes.

So, they are keyed one to the other?-- Yes.

Or cementitious forms or - including grout-----?-- Yes.

-----would be used. Do you know any product that could withstand 345 kPa in that configuration?-- Before we allow seals in our underground mines, we do conduct a full scale explosion testing on those seals, and our experimental mine is set up to generate pressures between 20 and 35 psi and the 345 kilopascals, being equivalent to about 50 psi, is a pressure we never subject our seals to, so I wouldn't know if they could survive that type of explosion or not.

So, apart from literature that you have been involved in yourself as a result of those testings, nothing that you have read in the literature in the States would suggest there is any product that could withstand those pressures?-- That is true.

Can I just ask you a couple of things about the report,

XXN: MR MORRISON

WIT: STEPHAN C R

please? You still have it with you?-- Yes.

Now, on page 8 of the report - perhaps I should take you to 6, first - 6, 7 and 8. I appreciate that Mr Giardino did this area, but nonetheless he is not here to talk about it, so I'm afraid you have to. On 6 and 7 we have 2 H/C index graphs, each of which indicate, as I understood your evidence, that the explosion was methane based?-- Yes.

We can tell that because of the proximity of the graphed line to the methane indicator at the top as opposed to the coal dust indicator at the bottom?-- Yes.

Now, when we turn to Figure 3 on page 8, do we not see exactly the same thing at the start point for the data - that is, in close proximity to methane, dropping only later in time?-- Yes.

Now, I notice that the start point for that data has a designation on elapsed days of 1 - that means one day after the initial explosion, doesn't it?-- I suppose it does.

So, at one day after the event, the data was still indicating a methane explosion, was it not?-- That is what it appears.

And as time progressed, we see the graph drop, which simply indicates the involvement of coal or coal dust?-- Yes.

Not just coal dust, it could be coal - solid coal?-- I'm not sure.

Well, we only had two explosions. One occurred one day prior to this data point commencement, and the other was some time subsequent to it. So, the involvement that produced the data which we see at elapsed days 1.1 through to, say, 1.4 is likely to be coal rather than coal dust; would you agree?-- Well, being that I'm speaking for Mr Giardino, you know, I have some uncertainty about these charts; however, I would say that it appears that the H and the C are products of combustion and I am believing that those products of combustion occurred as a result of the first explosion and are not necessarily products that are being generated in the time of this chart - that this chart designates the time of sampling those products.

I accept that. Would you agree that the data that we see on Figure 3 is consistent with coal burning in the area one day or more after the explosion?-- It could be.

So that it's quite consistent with this graph that there was an explosion which may have generated fires, for instance, underground?-- That could be.

And these samples reflect products of combustion from fires rather than the explosion itself?-- And that is possible.

Can I suggest that that is reinforced as so when one considers the previous two figures? We note the start points there at - for Figure 2 about - something over 1.3 days from the explosion, and for figure - I'm sorry, for Figure 1 something other 1.3 days and for Figure 2 just over .9 days. If coal dust had been involved in the initial explosion you would expect to see it reflected in Figures 1 and 2, would you not?-- I'm not sure at this time exactly where they are located in proximity to the third figure. I'm not so sure that the products of combustion from small burnings of coal would result throughout the mine. They may have been products of combustion that are isolated to just this one area.

Sorry, let me understand that right. You are not sure whether the products of combustion from burning would be reflected or wouldn't be reflected in other parts? I'm wondering whether I've got the double negative here or -----?-- Yes, I understand. I really don't know that the burning of the coal dust or the involvement of coal dust in the explosion would have been extensive enough to allow products of combustion from the coal to occur throughout large areas of workings.

Well, I wonder about that because the first two figures deal with the two areas which on this report are the likely or probable sources of the explosion, that is inbye 512 seals or just outbye 512 seals; isn't that right? Figure 1 deals with 512 - a borehole in 512, and Figure 2 deals with a borehole in 510?-- Yes.

So that if coal dust was involved in the first explosion, they being the two postulated areas, would you agree that we should see it reflected in these graphs?-- Well, those areas were the ones that would mostly involve the methane and I believe the report basically details the fact that the coal dust involvement would just occur along 5 South.

Now, if that was so would you agree with this proposition, that whatever the force of the explosion at 512, if it propagated as wholly or partly a coal dust explosion into 5 South, its force would be greater than that at 512?-- I believe that the forces could vary. They could be higher or lower.

Isn't it right to say that routinely - I suppose it might not be routinely for this proposition - usually coal dust explosions are greater in force than pure methane explosions?-- No.

Are they not? Are they not normally more violent in nature?-- They can be.

There is no way of telling here, is there, that it in fact

propagated as coal dust or partly coal dust into 5 South as opposed to us seeing the products of fire?-- That is true.

Now, if you had a small explosion commencing with just a methane explosion which then gathered force as wholly or partly coal dust, would you not expect to see that reflected on these graphs considering the positions these holes were in? Would you not expect to see a greater emphasis on coal dust in 5 South, that's Figure 3?-- I couldn't be sure.

The opening point for the data is one day after the event and it opens, as we see, at pretty much like the other graphs, methane -----?-- Yes.

Would that not suggest that my proposition is correct?-- Well, after the explosion occurred there may have been a problem with the stoppings in the mine whereas the 510 and 512 may not have seen very much ventilation, so the air changes in those areas may have not have been sufficient enough to bring those products of combustion to the sampling points.

Can I ask you to look at page 9 of the report, please, for a moment? There is there made the assumption, in the last paragraph before the heading "Ignition Sources", that something less than 2,000 cubic feet of methane was involved in the explosion. I have perhaps called it an assumption, I don't think that's fair to you. You say that's based on experience?-- It is based on experience, but purely an assumption in this case.

Let me just ask you about that experience. When you were asked to describe it you said it was - the experience was a product of investigations into other explosions and also past research?-- Yes.

The past research you are referring to is not your own, that's historical records of explosion data, is it?-- Yes.

The investigations that you refer to, are they your own?-- Yes.

Now, what in those investigations do you draw on for this assumption? Is it simply a generalised comparison of the appearance of the explosion, its apparent magnitude?-- In the explosion investigations that I've been involved in we typically do not see as much as 2,000 cubic feet of methane being involved in the explosion, but yet we see pressures on the order of those that have been reported underground.

The pressures that were reported underground, you are referring to what you can derive from survivors' accounts?-- Yes, and that is all.

Those survivors' accounts, the things you were looking for in relation to those was whether someone said their ears popped, whether they were knocked down and the time they were held down?-- Yes.

That's basically it, I think, isn't it?-- Yes.

Now, you would accept, wouldn't you, and your experience would tell you, that those sort of accounts are dangerous to rely on for their accuracy?-- People do have varying opinions about how long they may have been held down or what forces might have been - that they might have been subjected to, but from even a medical standpoint, I didn't hear about or read about any rupture to eardrums or lung damage which is something that would be a different matter.

Well, that may be that omission, as it were, establish an upper range that the force did not meet?-- Yes.

But that doesn't establish, does it, with any accuracy the level that the force did meet?-- Well, suffice to say that it may have been a force that occurred at a level less than what would be necessary for the rupture of eardrums.

Yes, that's what I'm really driving at. In terms of any accurate statement that's about all one can say, isn't it?-- Yes.

Because you get variances between the survivors; some mens ears popped, some didn't. Some mens ears hurt, some didn't. So according to individual characteristics one could get an entirely misleading view of the force, if that was your base data?-- Yes.

Likewise the position of Mr McCrohon matters for this area, does it not?-- Yes.

Because that was some extra information that Mr Lyne sent to you that was part of the process that resulted in the supplementary report?-- Yes.

Have you been told about Mr McCrohon's actual evidence in the Inquiry as opposed to the statement?-- No.

To the extent that he might have departed from the 20 second duration that you took into account, that would have an obvious impact upon your assessment?-- Yes.

And if I can put it in short terms, the less time he thought that - or he accounted for his being held down, the lower the force that was impacting on him?-- Yes.

Now, he was also in a particular position in the mine that you must have been aware of or determined?-- I am aware of his proximity to where the first explosion is believed to have occurred.

Now, he was at about 15 cross-cut on the Main Dip. Are you able to identify that for us? This is not a test in that sense, I'm just wondering if you can pinpoint it for us approximately?-- I don't know exactly where he was at.

Being on the Main Dip and about 15 cross-cut, let me just explore that for a moment. Assuming an explosion in 512 - you might like to turn around in a moment and look at the map?--

XXN: MR MORRISON

WIT: STEPHAN C R

Yes.

I may not be right about this, but I think I am. Assuming an explosion in 512, the explosion has to do, one, two - three at least 90 degree turns. That is to say the force in order to get to the Main Dip and then reach Mr McCrohon, would you agree with that? Would a map be better than that model?-- No, I agree with that.

And in that example the explosion by the time it reaches Mr McCrohon has halved three times, and halved not in the total, but if we start at 100 it's gone to 50 at the first turn, 25 at the second, 12 and a half at the third?-- That would be true in the absence of other fuels.

Other fuels than methane?-- Well, the addition of fuel to the explosion flame where accumulations of methane and/or coal dust may have been involved in extending the flame and forces in that direction too.

In other words a boost along the way?-- Yes.

The survivors' accounts and the path they travelled and the amount of damage along the path they travelled would tend to suggest that's not the case; would you agree?-- That information would tend to suggest that significant forces did not reach that area of the mine.

Yes. There are some simple facts that we know from - leaving aside idiosyncratic facts that we know would tend to suggest that, for instance, there was no impediment to their driving out apart from the vision question, no debris in the road?-- Yes.

Lights were still on near where Mr McCrohon was and the belt was still running?-- Yes.

There was no physical impediment at this stage of the mine, apart from visibility, to him getting out?-- That's true.

All of those facts would suggest that the booster effects that we have just talked about is probably absent here?-- I can't be sure.

The fact that he didn't suffer any injuries to his ears and was held down for whatever period of time he was held down, that is a very indeterminate base upon which to make a calculation of pressure, is it not?-- Yes.

Again the most that could be said would be that whatever the forces were they did not reach the level of rupturing eardrums, for instance?-- Yes.

Whatever that indicative level is?-- That is true.

Can I turn back to the report then for a moment? You said that your experience in the States was that you did not usually see amounts of methane greater than 2,000 cubic feet?-- Yes.

XXN: MR MORRISON

WIT: STEPHAN C R

I think I've understood that right, haven't I?-- That is true.

So when you postulate that here, on what basis do you make the assumption that it's sort of 2,000 or less apart from the fact that it's an explosion in the coal mine?-- I just wanted to establish an upper level for the quantity of methane that may have been involved in the ignition.

How do we establish the upper level as - let's assume for the moment 2,000, why pick 2,000?-- It was a number that - basically if it were a body of methane that would exceed 2,000 cubic feet it would generate much higher pressures in the mine. Even accumulations of methane much less than 2,000 feet can result in the pressures that we are talking about here.

The pressures that we are talking about here are again based upon the survivors' evidence and evidence of damage or absence of damage?-- Yes, that's right.

There is really nothing else, is there?-- No, there isn't.

So if what you are saying is that if it was greater than 2,000 cubic feet you might have expected greater impact on the survivors?-- Yes.

How does one make that connection even based on experience? What is the thought process or the process of logic that leads to that conclusion?-- It's just from the fact that experimental explosions have been conducted and we are relatively familiar with what types of pressures result from the ignition of different size gas bodies.

So you can draw on some research about experimental explosions that might help you in that area?-- Yes.

But is there any base in experience that suggests that this assumption is accurate apart from that experimental data?-- Well, from an experience standpoint of 24 or 25 underground coal mine explosions there haven't been very many that have exceeded 2,000 cubic feet of methane as the fuel.

That's the point that I was trying to make, perhaps a little lamely before. In essence the assumption is really only valid on the basis, as I understand it, that you've not seen or experienced coal mine explosions that exceed 2,000 cubic feet and therefore that's your upper limit?-- Yes.

Now, to make the assumption that's made there at page 9 that only that quantity was involved, that assumption also involves two other points, may I suggest, and that is firstly that the quantity was reasonably pre-mixed with air. I think that's a point you made, it didn't have to be diluted down to 10 per cent?-- Yes.

Secondly, that the ignition point was close to the outbye side of 512 or close to the inbye side - immediate inbye side of the seals in 512?-- I don't know where that statement is

coming from in here.

See, you say it's impossible to quantify the amount of methane but we make the assumption - we have discussed that - of 2,000 cubic feet and that was available for the first explosion. Now, you don't postulate any source of methane for that explosion other than the accumulation in 512; am I right about that?-- Yes.

So therefore would you agree that necessarily underlying that assumption is the fact that the point of ignition must have been close to the seals or just outbye the seals. They are the two areas that have been identified as the possible source?-- I would agree that ignition would have occurred in the proximity of the seals, one side or the other.

Now, the small quantity that you postulate doesn't really take account of the fact that there was - apart from convection, no mixing process in the panel; is that right?-- I guess I don't understand what the question is.

Do you postulate or is it necessary to postulate for your assumption that the quantity of methane was uniformly mixed or may it have been non-uniformly mixed?-- 2,000 cubic feet of methane would have had to have been diluted to some degree in order that the concentration would have been between the five and the 15 per cent at the point of ignition, but I'm not to suggest that the entire 2,000 cubic feet ended up in a homogeneous mixture through the entire entry.

That's what I'm interested in?-- Yes.

Is it necessary for this assumption that that be so or is it not necessary that it be so?-- It's not necessary that it be a homogeneous mixture.

So it is consistent then with your postulation that there may have been an explosive mix immediately inbye the seals that's not reflected in the methane in the balance of the panel?-- That could be true.

And bearing in mind that the inbye end of the panel is down dip then the point immediately inbye the seals is likely to be, on that postulation, in the explosive range when the balance of the panel isn't?-- That is true.

Does that in some way support the assumption you make, that it might have been a small explosion?-- Yes.

Generated only by the amount of methane immediately inbye the seals and not by the balance of the panel?-- Yes.

If that's so then that would suggest, would it not, that the point of ignition is not or could not be, on that assumption, down at the inbye end of the panel; isn't that right?-- Yes.

It is necessary for your postulation that the ignition point be close to the seals?-- Yes.

Now, can I just take you down to the next section in your report under "Ignition Sources"? Can you just tell me as we go along, where it's necessary to do so - I don't mean now - I don't think I've made an adequate note of just which part is Mr Urosek's province and which is yours, so please feel free to correct me. Can I go to the paragraph directly under "Ignition Sources" and about five lines down this sentence appears, "Miners were assigned to work in the 510 panel near the 512 seals before the explosion." Can you tell me where that information came from?-- That is just information that had been passed along to the Mine Safety and Health Administration.

From the Department here?-- All of the information that we would have received would have come from the Chief Inspector.

Now, in this section it proceeds upon the basis that if human activity was involved in the explosion, at this stage of the report at least, then it was the human activity of those miners?-- That is the indication here, yes.

Now, as we know, those miners were directed at least to do some work between 512, the area of 512 and 4 South but not in 510 as such; do you understand that to be so?-- Yes.

Even with that being so, do you still stand by the statement in the report?-- Yes.

Now, can I ask you then in the next paragraph to just tell me about the first sentence there, "A review of the available information, such as gas concentrations and reported forces..." - then you go on to say - "...minimises the possibility of the explosion being initiated from 5 South." Now, the reported forces there is based upon what I might refer to as that anecdotal evidence from the survivors?-- Yes.

Now, as I read this report at this point at least, you would place, in terms of probability, an ignition source in 5 South as being less probable than some activity of the miners designated to work in the area of 512?-- I haven't really established any probabilities. Our discussions have primarily centred around the activities of those two because we have heard about methane accumulations in the vicinity of the seals, but without actually going underground I just don't know if we would be able to eliminate the ignition source coming from 5 South.

All right. Just pausing on that, is the way we should understand your report and the supplementary report basically that nothing can be ruled out?-- Yes.

You don't in fact expound upon the variety of things that might have led to an ignition source, but there are a number, aren't there?-- Yes, there are.

When I say there are a number, I mean there are a number of features of a coal mine that are potentially an ignition source?-- Yes.

Cables and the like. And is it your position that you can't rule any of that out in this case?-- Yes, that is true.

Now, can I just ask you another thing before we move onto the latter part of this report? You mentioned just a moment ago that you had been told, or you had understood that there was some methane accumulations near the seals. Now, I take it that you mean just outbye the seals in 512?-- No.

Just inbye?-- Inbye, yes.

Beg your pardon, I thought you might have been indicating you

had some information about an accumulation just outbye?--
No.

Now, can we take you down to the next section in this report which is headed "Flame", to the last paragraph on that page? I had in mind that you had mentioned Mr Urosek in relation to this area. Is this something of his?-- No, I can still speak about flame.

Now, it says, "For the first explosion, it has been theorised that an explosive concentration of methane accumulated in the vicinity of the 512 seals." Now, when you use the word "theorised" there, do you mean by MSHA?-- Yes.

Is there any necessity to put it on the plane of theorisation or would you accept that in fact the data from point 5 just inbye the seals shows expressly the point that you make there, an accumulation of methane just inbye the seals?-- I just don't know how we would be able to accept the data from one point, from a standpoint of investigative purposes, to identify where ignition might have occurred.

All right, but we are not talking about so much where ignition occurred here. My question was more directed at what this sentence is directed at, that is to say, a concentration of methane just inbye the seals or in the vicinity of the seals. Would you accept that the data from point 5 shows precisely that?-- Yes.

There is no need to theorise about anything, is there? There is in fact hard data which shows it?-- I think the only reason that there might be any doubt would be related to the equipment used, the failure of that equipment to take an adequate sample, and that is an area that I'm not knowledgeable in, but the theorisation has to be there.

Assuming the equipment was working correctly, then there is no need to theorise, is there?-- There would not be any reason.

And just dwelling on that point that I raised with you before, given the gradient of the panel inbye to the seal, then that accumulation is likely to be the greatest accumulation in terms of concentration?-- I don't exactly know where that sampling point is in relation to the seals.

Well, if you would like to turn around I will try and demonstrate it for you, or if you can remember the map I don't mind. It's at the first intersection immediately inbye the third road down as you look at that map, the belt road. It may in fact have some designation on it as belt road?-- I see where it says "monitoring point 5".

Yes, you're there. That's where it is or was?-- Okay.

Now, accepting that, it's up dip from the inbye end of the panel and, therefore, would you agree with me that whatever the accumulation was at about that point, in terms of concentration it must be greater than further down the panel?-- I think that the methane would be diluted more as

it approached the seals.

Simply by its migration path?-- Yes, and the concentration would be less in that area than at the furthest inbye points.

All right. Concentration of an individual piece of methane, you mean, or concentration overall?-- Overall.

So, would that not again then suggest, from the analysis that has been done by you, that the methane on the inbye end of the panel is more than likely to have been not explosive - in the explosive range, that is?-- I believe the methane on the inbye portions of the panel to not be explosive.

And that again, on the analysis of MSHA, would suggest that the source of ignition could not have been on the inbye end either?-- That is true.

Now, looking down at that last paragraph on page 9, can we have a look at the last sentence, please, which says, "The propagation of the methane and coal dust explosion may have continued into portions of 5 South." That's an inapt expression there, isn't it, in so far as it might suggest that the explosion at 512, or in that vicinity, was methane and coal dust because it's quite contrary to figures 1 and 2?-- Well, I spoke a little earlier about the length of flame as compared to the initial accumulation of methane, and in this case the 2,000 cubic feet of methane, once diluted, may have contaminated an area in linear distance up to 33 metres, and if we keep in mind the fact that the flame expands five times further from that initial ignition of methane, the maximum amount of methane being 2,000 cubic feet, the most flame we could get off that would be equivalent to only 165 metres in linear distance, so additional fuel would have had to have been picked up prior to that explosion running out for pressures to be anywhere else in the mine.

I see. So, as I understand your analysis then, the explosion must necessarily have propagated at least some distance in the form of methane and coal dust?-- Yes.

Now, in terms of what we discussed earlier about the number of turns that the - what I might call the explosion force had to do, or to make, in order to reach Mr McCrohon has to be much less than that to get down to 5 South, doesn't it?-- Yes.

Effectively, at most, two turns, then in a direct run down the intake lines?-- Yes.

And assuming that the ventilation hadn't been knocked out at the point that the explosion was there, it would in fact have travelled the path of the intake line on the belt road, most likely?-- I don't believe that to be the case.

Well, do you postulate another area or is that one eliminated?-- I just don't think that the explosion necessarily follows the path of the ventilating air.

But, nonetheless, the force that is likely to have reached the

men at 5 South, by the sheer logistics of the mine, must be greater than what met the men in 1 North-west and Mr McCrohon?-- That would be reasonable, yes.

And, again, it's an area that - the basis being simply the anecdotal evidence, the absence of damage - is very difficult to assess?-- Yes.

Beyond stating the upper limit that it obviously did not reach the men in 1 North-west and in the main dips?-- Yes.

Now, can I take you to page 10, please? Now, you start off the paragraph there by saying, "The data supplied by the Department of Minerals and Energy has been used to make an estimate of the area involved in the initial explosion." Now, what data was supplied that enabled that assessment to be made?-- I believe that the information in these first two paragraphs will have to wait for Mr Urosek.

Okay. Well, I won't ask the questions of you, rather of him. Can we then go down to the fourth paragraph, that is to say, on the page, the second one under the heading "Forces"? Now, as I read that paragraph, do I understand correctly that you are postulating a very weak explosion in the initial one?-- The second paragraph in under the "Forces" heading is a paragraph that is general and relates to all explosions.

All right. So do the rest of the paragraphs on page 10?-- Yes.

So, those ones don't necessarily relate to this explosion but may depending upon other matters?-- Yes.

Staying with the thought, though, is it right to say that on the basis of MSHA's assumptions, what is being postulated is a weak explosion?-- Yes.

That, nonetheless, may be followed by a much stronger or greater windblast?-- A weak explosion is - what I am relating to is establishing the pressures that occurred underground. What you are referring to, I presume, is the oscillating pressures that occur underground before equalisation of the atmosphere occurs.

Correct, not detonation and retonation but the oscillation?-- yes.

If you follow that. Now, on that basis what I put to you is correct, isn't it?-- Yes.

Now, can you turn over to page 11, please? At the top of the page you say, "Based on the data received, it appears that the original methane accumulation was probably ignited in the 512 Panel or in the 510 entries near the 512 seals." Now, that says no more than what has been said before and we have discussed, I take it? There is no new point being made here?-- That's right.

And then it goes on to say, "A low order explosion generating

approximately 5 psi began to propagate." Now, do I understand that the 5 psi postulated there is again based upon what might be termed the anecdotal evidence?-- Yes.

And the next sentence reads, "The limited quantity of available methane prohibited the explosion flame from propagating to 5 South." Now, that's an assumption that may or may not be borne out by those H/C ratios. If we look at the H/C ratios for figure 3, which is 5 South, don't we see that even a day after the first point of explosion the data is exhibiting methane, not coal dust?-- Well, I'm not sure about the length of time that the products of combustion take to reach the sampling point, etc, but I think the statement here in the MSHA report is basically alluding to the fact that there was not enough methane available in the area of the 512 seals to allow the flame from that explosion to reach all the way up the headings in 5 South.

All right, I'm sorry, I'm perhaps not concentrating enough on the word "flame", and that comment is really directed only to the predicted flame path?-- Yes.

All right. Now, you go on in that paragraph to postulate that as the explosion entered 5 South the forces generally increased to about 8 psi. Now, at this point, without being disrespectful, this must surely be speculation?-- Absolutely.

Likewise the next sentence?-- Yes.

Now, does it follow then, from what we have been discussing, that with the pressure forces being based upon the anecdotal evidence and the degree of speculation involved, that the conclusions themselves on page 11 must themselves involve a substantial degree of speculation?-- That is true.

Now, can I ask you to go over to - I'm sorry, I have just been reminded of the time and I am about to move to a different point.

WARDEN: Yes, it might be an appropriate time to adjourn the proceedings, gentlemen. Can we resume at 2.15, thank you?

THE COURT ADJOURNED AT 12.58 P.M. TILL 2.15 P.M.

THE COURT RESUMED AT 2.24 P.M.

CLETE ROBERT STEPHAN, CONTINUING:

MR MORRISON: Mr Stephan, I wanted to take you to page 13 of the report to the heading "Gas Concentration Analysis". This is an area you can discuss?-- No.

All right. I don't need to take you to it then. No part of that is yours, I take it?-- That is correct.

Now, can I just ask you this: in relation to proceedings in this Inquiry, you have only been here for a short time, haven't you?-- Yes.

Relatively short time?-- Yes.

When did you arrive?-- Sunday, the 12th.

But you have no doubt been shown a number of the documents from the Inquiry?-- I haven't seen any transcripts.

Have you seen any of the reports?-- I have seen reports, yes.

So, amongst the reports you would have seen would be a report by Mr Mitchell?-- Yes.

Who you know?-- Yes.

I don't mean necessarily personally. You know of Mr Mitchell's reputation. And Mr Highton's report?-- I'm aware that report exists, but I have not read it.

You have not read it?-- No.

I see. Dr Van Dolah's report?-- Yes, I have seen that report.

Of course, the SIMTARS report?-- Yes.

You have had the opportunity to study the SIMTARS report?-- Yes.

Now, you would have seen - and in the case of Mr Highton could I ask you to accept that each of those experts felt able to reach the conclusion that the explosion was caused by spontaneous combustion in the 512 panel - that's the fact, isn't it?-- I accept that they have come to that conclusion, but in my own report - my own report here is that would not necessarily be the case.

Well, can I just ask you about that for the moment? Can I take you back to 12 in the report?-- Page 12?

Page 12, the paragraph immediately above "Barometric

XXN: MR MORRISON

WIT: STEPHAN C R

Pressure". In that paragraph, two sites only are postulated as an ignition site or explosion site: 512 panel, or 510 panel just near the seals; isn't that right?-- The evidence that is available to this point would indicate that those are the only two locations where ignition may have occurred.

Fine. And in relation to ignition sources, the evidence to date would indicate either spontaneous combustion or the actions of the men who were designated to work in that vicinity?-- In lieu of an underground investigation, that is the only thing that we have to go on.

All right. In that sense, your conclusions on the evidence so far are broadly in line with those of the other experts, aren't they?-- Yes.

Now, in relation to those other experts, you would have noticed, then - and in the case of Mr Highton - can I ask you to assume that their work depends to a large extent upon the analysis of gas data from sample points; is that so?-- I will make that assumption.

In the case of Mr Highton, I ask you to assume it. It is the case for SIMTARS as well; you would have noticed that?-- Yes.

And the utility - or the use, then, in the case of SIMTARS, of certain of those gases in relation to ratios that might be applied?-- Yes.

All right. In the case of Mr Highton, let me ask you to assume that it is largely based on an analysis of the gas data?-- I will make that assumption.

Now, whatever else we might find out on a re-entry, a re-entry will not affect the gas data, will it?-- It will not.

So, to the extent that any experts have been able to draw conclusions based upon the gas data, the re-entry is not going to affect the gas data and their conclusions, if it is based on that?-- It will not, suffice to say that the gas data is based on certain very specific points that occurred underground and not an analysis of what's going on throughout all the workings.

I accept that. Now, one thing a re-entry does involve is potentially considerable risk to those doing it; is that so?-- Yes, it does.

You, in fact, instance in your supplementary report at least one occasion where, on a re-entry - not quite similar to what this one would be, but on a re-entry, nonetheless - 11 more fatalities were caused, and I'm referring to the Scotia mine in Kentucky. Can you recall that-----?-- Yes.

-----example being given? Where, in fact, there were 15 fatalities in the first place and then another 11 people were killed attempting to recover and re-enter the mine?-- That is true.

And those 11 fatalities included three Federal coal mine inspectors, and that's, no doubt, not the only instance where people who have been involved in a re-entry have been killed; that's true, isn't it?-- I'm not aware of any other cases where that may have occurred.

But certainly the risk is very great, isn't it?-- Yes.

Now, can I ask you a couple of things about re-entry? When you gave a supplementary report, it was in response to a request by Mr Lyne to consider, amongst other things, this question?-- Yes.

Were you offered a reason why this question should be discussed or considered?-- No.

Do you have in mind - either by analysis or otherwise - a time factor that might be involved in re-entry of this mine?-- No.

Ballpark figure?-- As to how soon an investigation may begin?

Well, we will take it in two stages, because I think - perhaps three stages. You identified three. That's re-entry, recovery and investigation?-- I identified rescue, recovery and investigation.

Correct. Through to investigation, then, because that's the ultimate end of a re-entry as you postulated here - the time-frame to get to that point?-- Well, the rescue efforts are those that occur immediately after an explosion and are primarily designed to get survivors out of the workings.

Can I interrupt only to perhaps explain myself a little better, because I think we are at cross purposes. I'm asking in relation to the postulated re-entry to this mine, do you have in mind a time-frame when that investigation might occur?-- I do not know how long it would take to recover this mine.

It could easily be - given the nature of this mine and the fact that, according to the parameters you espoused before lunch, you would really need all the seals that were down to be relocated or re-done and the mine re-ventilated and, to the extent necessary, the roof re-bolted - it could easily be 18 months to two years, couldn't it?-- It is very typical in the United States that after an explosion occurs, recovery of the mine, with workings as extensive as these, may occur within two weeks.

Well, we are not talking about the United States here, we are talking about Australia. Have you any experience in Australia?-- No, I do not.

And you have no time-frame in mind over which this might occur?-- I do not.

I have nothing further, Your Worship.

RE-EXAMINATION:

MR CLAIR: Just on that last point, Mr Stephan: I do notice that in the supplementary report on page 3 there is reference to Consol No 9 Mine in West Virginia where the mine was sealed on November 30, 1968 with 78 miners unaccounted for. In September 1969, the mine was reopened and operations to recover the remains of the miners were begun. Now, there is reference there to new mine entries having to be driven and extensive damage, but I notice there the recovery operations actually continued until November, and do I see there 1978 - or 1976 - thereabouts?-- Yes.

And then the recovery operations were ceased at that stage, it seems, leaving 19 victims still buried in parts of the mine unexplored. Was that a particularly large mine, or are you aware as to whether there were some particular features that caused it to take so long under recovery operations?-- I am really not familiar with the workings in that particular mine.

Okay. Now, there is really only one area that I want to ask you about, and it arises out of something that you said to Mr Morrison before lunch to the effect that you were of the opinion that the ignition point in the 512 panel must have been in the vicinity of the seals-----?-- Yes.

-----I think is what you said. Now, perhaps in the vicinity of - that is a fairly vague phrase - but you did go on later to say that the methane within the inbye portion of the panel would not be in the explosive range in your view at the time that the area - or at least at the time the methane in the area you described as being within the vicinity of the seals was within the explosive range, or at least at the time of the explosion. Am I summarising what you said correctly?-- Yes.

Now, that would tend to indicate that you are distinguishing between this area that you described as being in the vicinity of the seals, and some other area which you regard as the inbye portion. Can I ask you, first of all, just how you would define those areas in terms of what you said in answer to Mr Morrison? What do you mean by "in the vicinity of the seals"?-- Well, I suppose the answer was vague because I wouldn't be sure of the dilution rates which methane would be subjected to. When I talk about "in the vicinity of the seals", I would most likely be referring to about half the distance to the furthest inbye point.

When you refer to the "inbye portion of the panel", what would you mean by that?-- It would be those portions of the panel that would be further than half-way in.

Okay. I'm interested in the view that you express that the methane concentration - or at least perhaps the view that you express that the ignition point must have been within the vicinity of the seals. Now, why do you say that as opposed to the ignition point being further inbye and, perhaps, in what

you have described as the inbye portion of the panel? Why do you say that the ignition point must have been within the vicinity of the seals?-- As the methane would enter the workings, it would be of a high concentration, and because of the lack of the ventilation in that particular area of the mine, being that it was sealed, I would - it would take a while before that methane would be sufficiently diluted to enter the explosive range, and it would naturally follow the contours of the mine, and it would - as it would work its way up in the workings, it would be diluted and it would just take a certain distance for that to occur.

Aren't there, though, a number of variables that would have a bearing on the methane concentration at various points within the panel at any given time?-- Yes.

For instance, in order to express any concluded view along the lines that you have - that is, that at the time of the methane concentration of the seals moving into the explosive range, the methane concentration inbye must be beyond the explosive range - in order to express that kind of view, wouldn't you need to know, first of all, the point at which the methane was being produced within the panel, for a start?-- We would not only need to know that, too, but the liberation rate - how much methane would be coming in at that point.

That's the next point I was going to mention. If there were, in fact, a number of areas in which you might expect methane was being produced in the panel, then you would need to know the rates at which it is being produced in various areas, wouldn't you?-- Yes.

Wouldn't you need to know what migration paths there might be within the panel to allow the methane to move back to the area where the monitor point was, adjacent to the seals?-- Yes.

So, again, that could have a bearing on what the relative concentrations were at any point within the panel?-- That's true.

You would have to take into account that methane, in fact, is lighter than air and would travel along the roof of the panel; is that right?-- Yes.

And perhaps also you would have to take into account the height at which the monitor point was located - that is, the actual sampling head of the Unor system was located at the monitor point itself; isn't that right?-- Yes.

Because if, in fact, that was located within the general body, somewhere half-way between the roof and the ceiling - I should say the roof and the floor - then you may not - given the absence of ventilation and mixing, you may not register a methane concentration up at the monitor point until the methane, in effect, layered down from the roof to get to the sampling head; is that right?-- Yes, that's right.

And, again, in terms of what the position might be, at the time of ignition of the explosive mixture on this postulation,

then you would really need to know at what height any source of ignition was; is that so, too?-- The height of the ignition source does affect the pressures you might see in an explosion.

But it would also have a bearing on when ignition might occur within an explosive mixture, because if, for instance, the ignition source was on the floor, well, then, the explosive mixture would have to, in effect, work down from the roof to a point where it is sufficiently heated by the ignition source to be ignited; is that right?-- Yes.

So, the position could be quite different if the ignition source was on the floor as opposed to it being some point nearer to the roof?-- That is true.

So, in fact, there would be quite a wide range of variables that might have an effect on this question as to the relative concentrations of methane at the time of any ignition of an explosive mixture within the 512 panel; isn't that so?-- Yes.

Now, can I come back to this opinion that you expressed earlier, and ask you whether, having regard to all of those variables, you would still express the view that at the time of ignition that, first of all, the ignition must have been within an area that you described as being within the vicinity of the seals?-- The question again, please?

I'm asking you whether you would still express that opinion - having regard to all of those variables that I have mentioned, whether you would still express that opinion that the ignition of an explosive mixture in 512 - if, in fact, that was the cause of the explosion here - whether that must necessarily have been within this area that you described as the vicinity of the seals?-- In the absence of an underground investigation, the best thing that we have to go on is the data that has been supplied to us thus far, and that data would indicate that an explosion occurred within the vicinity of the 512 seals. However, an underground investigation would tend to clarify that issue and even help to rule out ignitions in 5 South. I can't even say that - that an ignition of methane in 5 South is not a possibility at this time.

I appreciate that, but at the moment I'm looking at the possible explanation that there was an ignition of an explosive mixture of methane within the 512 Panel. We will confine ourselves to that postulation. That's one of the possibilities -----?-- Okay.

----- as the cause of the explosion. Now, looking at that what I'm asking you is whether, having regard to all of those variables that I've directed to your attention in the course of my questioning, whether you would still be of the view that the point of ignition must necessarily have been within the vicinity of the seals in 512 as opposed to somewhere further inbye in the panel?-- Yes, I am still of that opinion.

Well, can I ask you this: let's just assume for the moment that there was in fact a heating which was occurring, say at a point within the 512 Panel around 9 cross-cut. Just assume that for the moment, around 9 cross-cut. You can identify that for yourself by looking at the model there?-- Yes.

Why is it that you would say - I mean I take it first of all that around 9 cross-cut would not fall within your definition of the vicinity of the 512 seals; am I right there?-- That is true.

Given what you told me earlier. Now, can you explain why on the basis of the view that you've already expressed why it would be the case that that could not be the point of ignition at some point after the sealing of 512 Panel? What features would you point to to rule that out as the point of ignition?-- The only consideration that I would have would be the amount of methane that might have been entering that panel over a certain length of time and that the time required for dilution of such methane. This is not to say that the concentration at the most inbye portion would be 80 per cent methane and exactly one cross-cut out it would be 70 per cent and so on. The concentrations of methane are going to vary greatly in different areas of that panel, but I believe that the methane in that panel would have been liberated in such a way that the higher concentrations would have existed in the inbye portions of the panel and ignition in that area wouldn't have been very likely, because if 2,000 cubic feet of methane would have been ignited at the inbye side of that body a much greater force would be generated than if ignition occurs in the centre of the explosive body.

Can I just take up two aspects of what you said? First of all you say that you would expect the concentrations further into the panel to be at least beyond the explosive range, that is more concentrated than at the point up near the seals?-- Yes.

I think that's at least one aspect you refer to. Now, again doesn't that depend on where the methane is being produced within the panel and the migration paths of the methane throughout the panel after sealing?-- Yes, it would.

Are you able to explain how that factor might relate to the view that you've expressed that it would necessarily be more concentrated within the inbye portion of the panel? Are you

able to say where the sources of methane were within the panel?-- I am not able to and I am just making an assumption that that's where it would be coming from.

Are you able to say anything about what migration paths existed within the panel, that is what stoppings might have still been in place and which may not have been?-- I am not able to do that.

Are you able to say by what means the methane might move about the panel from the point at which it's produced after - that is after sealing?-- I am not able to.

I mean after sealing there is no longer any ventilation within the panel; is that right?-- That is right.

So there is no movement of air in effect to move the methane about inside the panel?-- Right.

The tendency would be for it to layer down from the roof in the absence of some mixing agency. That is, by way of some form of ventilation it would tend to layer down from the roof?-- Well, that would be its tendency except that if roof falls occur that would have a mixing effect too.

So all of those factors then to which I've just referred would also have a bearing on what was happening with any mixtures of methane within the panel?-- Yes, they would.

And the natural inclination would be for the methane to migrate outbye, that is up the panel?-- Yes.

And if there was no other factor other than simply the tendency of the methane to migrate outbye towards the seals then you might well expect that the mixture at the seals would become more concentrated more quickly ultimately than within the area further inbye, again dependent on the point of production et cetera, but all other things being equal and methane being lighter you would expect it to migrate out towards the seals; is that right?-- Yes, but during its migration it begins to dilute and once it's diluted it stays diluted. It doesn't reconstitute itself unless additional methane is entered into the environment.

Of course it dilutes as it proceeds, no doubt -----?-- Yes.

----- through the panel?-- Yes.

So, for instance, methane produced at the very furthest point inbye the panel will dilute as it moves up the roadway; is that so?-- It could.

Coming back to my example about the possible source of heating, for instance in 9 cross-cut, then there would really be no reason why you may not get some diluted aspect of the methane passing over that heating at some point during this process of migration of the methane; is that right?-- That's true.

In the end result isn't it the case that there are some uncertainties in this whole area that it's impossible to express any firm view about relative concentrations of methane within the panel at the time of the ignition; is that so?-- Yes.

When I say "relative concentrations", that is relative concentrations at various places within the panel at the time of ignition; is that so?-- Yes.

Moving to another point - although I said I only had one area to clear up - just briefly, we have heard and read that as explosive forces in effect turn a corner, 90 degree corner, they reduce by 50 per cent. I think - is that a correct summary?-- Yes.

Is the distance which the explosive force travels in a straight line a factor which effects the degree of force?-- Yes.

So if we were to take, for instance, a force that was within 5 South just adjacent to the junction with 510 then you might expect that the force of the explosion at a distance inbye equal to the distance between that point I've just mentioned and the junction of 5 South with the Main Dips, that those forces would be the same?-- The magnitude of the forces can change over the length of the explosion based on the available fuel. If no other fuel is added to the explosion then, of course, the forces will begin to deteriorate.

I suppose obstructions too might also have something to do with it. For instance, a belt structure or something might tend to slow down the forces?-- Well, actually if the fuel is proceeding ahead of the flame front structures would cause additional turbulence and thereby increase the force.

Again a number of variables, but what you say then in relation to the fuel may lead to a situation where if, for instance, the area outbye of that point in 5 South adjacent to the junction with 510, if there was, for instance, effective stonedusting on the outbye area that may tend to dampen down the explosion whereas if there was less effective stonedusting down into 5 South that might tend to generate more force to the explosion?-- Yes.

That might be one factor. I see. Now, just one further related aspect, you mentioned the size of the flame, I think, the explosion flame at one point. In terms of the production of the explosive forces, are they actually produced at the point of explosion or are they produced within the area of the explosion flame?-- The forces of an explosion extend well beyond the area of flame.

But are they generated by the occurrence of the flame or are they generated at the point of ignition?-- They are generated as a result of the flame. The flame itself heats the surrounding gases which causes them to expand and thereby the resultant force is generated.

So if the explosion flame, for instance, was to have extended beyond a junction then the forces are generated at the point of the flame and travel along the roadways from that point?-- Yes.

That is from the flame rather than from the point of ignition?-- That is true.

Okay. Thank you, Your Worship.

EXAMINATION:

MR PARKIN: Mr Stephan, could I follow up on a point that Mr Clair has just raised? This is about the explosion being initiated in the vicinity of 512 seals, and I would like to put these two propositions to you. The first one is that we have to remember that the panel had only been sealed just over 23 hours for a start. Also, as you know, it was basically a three metre seam and in areas of the panel some two metres of bottoms were taken. So in areas we have got five metres. Now, in the middle of the panel if you've got a heating on the floor or rib spalling on the floor where the heating occurred, why would you assume that the explosion had to be initiated near the seals?-- I think that when I refer to ignition near the seals I'm referring to ignition on either side of the seals, but on the inbye portion of the seals where spontaneous combustion might have been a problem I believe that I am including that as a possible ignition source.

But you do agree that it would be possible in the panel, taking due recognisance of the time that the panel had been sealed, the fact that we have got a five metre extraction, if you did have a heating in the middle of the panel, say near the floor or on the floor, it could have been ignited there; do you think so?-- Taking the time frame into account we would also have to know what the liberations would be in that panel, but it doesn't seem very likely that significant quantities of methane would accumulate throughout that panel in such a short time.

Yes, but methane does migrate, doesn't it?-- Yes, it does.

So if you've got a five metre seam is it reasonable - you tell me - isn't it reasonable to assume that it could have been initiated in the middle of the panel?-- It is reasonable. The air flow in the panel although would have been sealed off. I'm not so sure it would have been completely stagnant.

You do agree with me that it's a possibility that it could be - it could be ignited in the middle of the panel?-- Yes, I do agree.

Could you tell me on what basis the first report was initiated? What were the premises that you were told when you completed the first report?-- I'm just trying to think back

to those days. After the Mine Safety and Health Administration offered their assistance they were provided with a bit of raw information, raw data from - through the Chief Inspector, and I believe that my purpose in this report was to try to establish the extent of flame, the magnitude and the direction of the explosion forces, and to identify ignition sources if possible.

It wasn't suggested that a re-entry be appropriate at that time, you were just looking at the bare facts?-- Yes, that's true.

There are just a few points here that you might help me with, and I think you explained under cross-examination by Mr MacSporran how you can determine the differences between the two explosions, but perhaps you might enlighten me - one would assume that after the first explosion there would be mine fires in the explosion area; is that correct?-- I would not assume that at all.

So that's - well, I'm trying to ascertain how you would be able to tell the difference between the first explosion and the second if in fact you hadn't got mine fires, which presumably there were mine fires underground, wouldn't they distort those facts somewhat?-- The first explosion would have been a weak explosion. It wouldn't have generated very much pressure and wouldn't have generated very much flame. The duration of the flame in an explosion is very short and it's not able to involve high density combustible materials in a fire scenario. So I don't believe that it would be very typical to see extensive fires after an explosion underground. So what we would be faced with is the effects of low pressure on the people who were underground, on the stoppings and the seals that were underground and on the equipment that was underground at the moment of the first explosion. Afterwards when a second explosion would have occurred, from what I know, a much greater force occurred and that would have also an effect on the materials and the equipment used underground. However, as I had stated before, stoppings and seals that would have been in place at the time of the first explosion may not have been compromised due to the force of the first explosion, but the force of the second explosion being much greater may have had the end result of blowing those walls out, and keeping in mind that those walls would have been blown a lot further due to the higher force and that that higher force would not have had the same effect on blocks that already would have been laying on the mine floor due to the first explosion. So I believe that the evidence from the first explosion will still be available to us even though the effects of the second explosion must have been much greater.

One final point, you stated in your report that direct action of miners have resulted in over 90 per cent of all explosions in the US since 1872; is that correct?-- Yes, I did say that.

How does that differ, say, from if you took those figures from, say, 1985 or 1990?-- There have been very few explosions that have occurred in that time span that have been away from the miners underground, and I would be referring to

ignitions due to roof falls and that sort of thing underground. I am aware of perhaps two ignitions in the 1985 to date time period that were a result of roof falls.

Thank you.

EXAMINATION:

MR NEILSON: I have only one question for you. Are you aware and were you aware when you issued your first report that the area of the 512 Panel had been drained of methane?-- No.

You weren't? Well, assuming it had would that then change your views about how methane may have congregated in the 512 Panel after it was sealed?-- Well, methane is inherent in the coal and I don't believe retrieving all of it would be possible, and when I speak in terms of how much methane would be available, less than 2,000 cubic feet is pretty much a drop in the bucket compared to liberation rates of the whole mine.

I'm asking you the question because I'm assuming, and I should ask you this question - were you eluding to the fact that in the very back of the panel the methane concentrations would have been so high that you would not have had an explosive mixture?-- If there would have been an excess quantity of methane in the panel, yes, that would be true.

But given the fact that you are assuming - I thought you may have picked it up since you've been here - that the panel had in fact been drained of methane and the short period of time between when the panel was in fact sealed and the explosion occurred, then it may not have been the case that those - such high concentrations would in fact have been present in the back of the panel. Is it fair to assume that?-- Yes, that would be true.

So in fact there could have been in the back of the panel. or for that matter anywhere, during the course of the migration there could have been either explosive ranges of methane or mixtures going into that explosive range?-- Yes.

Thank you.

EXAMINATION:

PROF ROXBOROUGH: Mr Stephan, we have heard in evidence that the mine had water barriers placed at strategic places throughout the mine; are you aware of the purpose of water barriers?-- Yes.

Do you use water barriers in the United States?-- No.

XN: PANEL

WIT: STEPHAN C R

Is it the case that water barriers can confine or cut off a methane explosion?-- No.

It's not the case?-- I do not believe it to be the case.

You are aware of demonstrations which have shown that water barriers and stone dust barriers do cut off methane explosions?-- I believe that in order to extinguish an explosion that the particle size of the extinguisher needs to be the same or smaller than the fuel that's being exploded, and I believe that stone dust can provide an effective barrier against a coal dust explosion because of the particle sizes. I believe the water barriers provide a good means to cool the flame and perhaps reduce its length, and once the fuel - you know, once the fuel runs out, of course, the explosion is over.

Were you given information on the location and size of the water barriers in place at Moura?-- No.

So, it would be true to say that you didn't take the effective barriers into account in your analysis?-- That is true.

So, if water barriers could be effective, or can be shown to be effective in inhibiting the propagation of an explosion, it would be reasonable to suppose that the explosion - the first explosion was more violent than you originally estimated?-- It is possible.

Thank you.

EXAMINATION:

MR ELLICOTT: You mentioned in your evidence means to determine the extent of flame and an entity called the transition zone on a subsequent investigation; do you recall that?-- Yes.

Can you tell me the possible effect on the techniques used to determine those things of an area being submerged in water for some time?-- We have done explosion investigations in areas that have been completely inundated for months and it has had no effect on the evidence.

Are you aware of the general nature and structure of the Tcrete seals that were used in 512?-- Generally speaking, yes.

Have you applied your mind to the possible effect on those types of seals as opposed to the possibly more familiar cement block seals?-- I haven't really made any comparisons.

Have you seen the borehole videos that were taken?-- Yes.

Are you able to reach any conclusions as to the nature of things from viewing those?-- The conclusions that I would make from what I had seen or conclusions that just would apply to that one particular location inasmuch as debris from the seal seemed to be near the location of the borehole which would place it near where its original location had been. I suggest that the higher pressure explosions would blow debris significantly further than what this debris had been shown to be.

Did you notice evidence of the anchoring roof bolts from the Tcrete seal in that video?-- I don't recall.

When you say that you considered the ignition point to be in the vicinity of the seals, did you in fact mean the ignition point or did you mean the primary source of explosive energy or the primary fuel source?-- The ignition source.

Okay. Can you see that there may be a case to differentiate an ignition source from a primary source of fuel?-- The ignition source may exist at one particular point in the mine. The fuel, in the case of methane, has the ability to move about.

Would it be possible to have a source of ignition remote from a principal fuel source?-- You could have an ignition source separate from the fuel source, but you couldn't get ignition until the two came together.

Would it be possible for something like a roof layer to act as a fuse between them?-- Yes.

So, two possible scenarios may be that if there was an ignition source outside of the 512 seals, a roof layer may have acted as a fuse to methane accumulated inside the seals?-- That would suppose that there would be an area in the seal itself that would be open enough for that to happen, yes.

And I guess an alternate possibility is if there was something inside 512 that could act as an ignition source and there was a layer of methane within the panel that could act as a fuse to a larger body of methane near the seals?-- Yes.

So, in that case the point of initiation could be remote from the principal fuel source, the principal source of energy for the explosion?-- It could be.

That's all, thanks.

WARDEN: Mr MacSporran?

FURTHER RE-EXAMINATION:

MR MACSPORRAN: Just a couple of brief matters, Your Worship. Mr Stephan, you spoke very briefly about the work done by your colleague in terms of the H/C ratio for those three locations, borehole locations. Could I show you this map, please, to see whether you can indicate on the map the location where the samples were apparently taken? I have copies of these, Your Worship. I don't think it's in evidence already. I think one of the locations - I should perhaps turn up the figures to be exact about it, the figures in your report. If you take, firstly, figure 1 relates to location G512A(6); is that so? That's the figure in your report, figure 1?-- Yes.

At page 6, and you see that location marked on the plan that I have shown you? It might appear as a darkened hexagonal. I think it is marked "6" inside the 512 Panel?-- Yes, I see that.

That, you will see by the key, seems to indicate a borehole designated number 6 relating to 512A; do you see that?--

FRXN: MR MACSPORRAN

WIT: STEPHAN C R

Yes.

That seems to correspond, doesn't it, with the borehole sampling point with respect to figure 1 at page 6?-- Yes.

If you turn then to page 7, do you see that relates to figure 2 which is referable to G510-8(3), and do you see that marked separately - do you see that marked on the plan? It might be a little hard to read with the copy. Do you see a "3" marked there?-- Yes.

Do you see the legend relates to that as being an 8 inch borehole in the 510 panel?-- Yes.

Now turn to the next page, which is figure 3. Do you see that relates to G520-6(4), and do you see a hexagonal borehole location depicted in the 520 panel at the end of 5 South?-- Yes.

That relates to a 6 inch borehole at that location; is that so?-- Yes.

As per the legend. Those seem to be the three boreholes in particular relating to the figures contained in your report; is that right?-- Yes.

If Your Worship pleases, I tender that map.

WARDEN: Exhibit 232.

ADMITTED AND MARKED "EXHIBIT 232"

MR MACSPORRAN: Mr Stephan, during questioning you indicated that one of the pieces of information given to you was that on the night of the explosion men had been assigned to work in 510; do you recall that?-- Yes.

If you were describing an area outside the sealed 512 area, how would you describe that on the map?-- The area where those men may have been working?

Yes. If you assume for a moment it was outside the sealed 512 section. Are you familiar with the - perhaps if you have back that map that I have just tendered for a moment. Just look at the locality of the 510 and 512 Panels. Can you orientate yourself with respect to that?-- Yes.

And if you assume the 512 Panel was sealed as at that night shift commencing late on Sunday night, and if you assume that men were assigned to work outside that sealed area of 512, how would you describe where that locality was on the map?-- I would describe it as being anywhere in the headings or cross-cuts of 510.

Yes, all right, you can hand that back. Finally, you seemed

FRXN: MR MACSPORRAN

WIT: STEPHAN C R

to acknowledge there is some doubt about - first I should say if you assume there was an ignition source inside the 512 Panel, and there is some doubt, is there not, about the location of it within the panel?-- Yes, there is.

And that arises for a whole host of reasons, some of which were put to you by Mr Clair in terms of the variables that exist, or did exist at the time?-- Yes.

If you carried out an underground investigation, would you expect there to be evidence to indicate where within 512 there may have been an ignition source?-- Yes.

And an ignition?-- Yes.

Thank you, I have nothing further, Your Worship.

WARDEN: Thank you, witness, you may stand down. You are excused.

WITNESS EXCUSED

MR CLAIR: May it please Your Worship, I call John Edward Urosek.

JOHN EDWARD UROSEK, SWORN AND EXAMINED:

MR CLAIR: Your full name is John Edward Urosek; is that correct?-- Yes, it is.

And you are a Supervisory Mining Engineer with the Mine Safety and Health Administration within the United States Department of Labour; is that so?-- That's correct.

And you were a contributor to the report which has been tendered already before the Inquiry, Exhibit 6, and which should be on the table in front of you there; is that so?-- That's correct.

Your Worship, in accordance with the earlier indication, I will allow Mr MacSporran to lead the evidence-in-chief from this witness.

EXAMINATION:

MR MACSPORRAN: Mr Urosek, have you prepared a brief resume in respect of this matter?-- Yes, I have.

Could you look at this, please? Can you identify that as being your resume?-- Yes, it is.

Does it, firstly, indicate, so far as your education is concerned, that you gained your Degree of Bachelor of Science in Mining Engineer from the Pennsylvania State University in 1979?-- Yes.

Thereafter you undertook a ventilation course at Michigan State University in 1980?-- That's correct.

A managerial course at the Office of Personnel Management Executive Seminar Centre in 1987?-- Yes.

Computer courses at the University of Pittsburgh in 1987/88 and two such courses in 1992?-- Yes.

And you undertook a course in taproot investigation training last year in 1994?-- Yes.

You have been employed by the Mines Safety and Health Administration since 1974?-- Yes.

You have worked in areas - as a mining engineer - areas of ventilation, fires, explosions, dust control, roof control and enforcement activities?-- Yes, I have.

And that's been throughout with MSHA?-- Yes.

You have also worked as a mining engineer in the Ventilation

Division of that organisation since 1979?-- Yes.

You were promoted to the position of Supervisory Mining Engineer in 1985?-- Yes.

And then between 1985 and February 1995 you in fact were the Chief of the Mine Ventilation and Emergency Services Branch at MSHA?-- Yes, I was.

Finally as at February of this year you were promoted to become the Chief of the Ventilation Division again at MSHA?-- Yes, I was.

Your resume sets out a number of investigations with respect to ventilation you have conducted over the years; is that so?-- Yes.

And you detail a total of 55 of those on pages 1 and 2 of your resume?-- Yes.

You have been involved in responses to mine emergencies as detailed on 32 occasions at pages 2 and 3 of your resume?-- Yes.

You have carried out investigations in respect of mine emergencies on 11 occasions as detailed?-- Yes, I have.

Are there some overlappings, if you like, between the investigations into mine emergencies and what you refer to as responses to mine emergencies?-- Yes, that's correct.

You detail at page 3 and onto page 4 of the resume occasions when you have appeared to give expert testimony?-- Yes.

And then on page 4 and onto 5 you speak of papers and presentations you have been involved with?-- Yes.

You speak at page 5 of training you yourself have been involved in giving other personnel at both MSHA and elsewhere?-- Yes.

There are 25 such areas outlined by you in that section?-- Yes.

And finally, you detail your membership of various committees?-- Yes.

The most current of those being the tenth on page 6 which refers to your Chairmanship of the Bleeder and Gob Ventilation Training Committee?-- That's correct.

Is that an ongoing -----?-- Yes, that's an ongoing committee that MSHA has commissioned as a result of the investigations that we had in one of our previous explosions.

If Your Worship pleases, I tender that resume.

WARDEN: Exhibit 233.

ADMITTED AND MARKED "EXHIBIT 233"

MR MACSPORRAN: Mr Urosek, can I take you then generally to what your role has been during the course of investigations you outlined in your resume? In a general sense, have you been involved in, for instance, recovery operations?-- Typically our Division would get involved when there is an explosion in the eastern - an explosion or fire in the even half of the United States. Our Division would respond to that to provide gas monitoring, interpretation of the results during the recovery efforts, and then on the occasions where I have outlined would also be involved in the investigation of those particular incidences.

Now, during the recovery phase how would that proceed? Would the operating company, for instance, present a plan to MSHA relating to the method to be used to recover the mine?-- Yes, typically what would happen, our Inspectors would issue an order that would inform the company that they must submit a plan to us to be approved before they could begin any ongoing recovery efforts, at which point MSHA would, if appropriate, approve the plan and then the plan would be implemented, and that would continue through the recovery effort until it was completed. Our role in that would be to evaluate what's going on as far as the gases, the ventilation systems during that - during those recovery efforts.

What sort of guidelines, for instance, would there be for MSHA to acknowledge and approve a proposed plan for recovery?-- Well, essentially what it is we are concerned with is the safety of the personnel involved during the recovery, and that's foremost; to ensure, you know, that it can be done safely, and with that we just have to look at each step. That's why it's generally done in a step-by-step procedure. Take one step and evaluate what you have done, then continue on.

Once that process is approved and commences, you say that your role would be to be part of that recovery operation - that is, present - during its being carried out?-- Our role would be to assist our enforcement personnel in their decision-makings as to the - as to how the recovery efforts are going on and to advise them of any dangers that may be going on or anticipated during that effort.

What steps, if any, would be taken at that stage to ensure the preservation of evidence that may be discovered along the way?-- That's something that - typically what we would do is as the rescue teams would be going underground, there would be some of our personnel there to ensure that as things were moved or if they needed to be moved that they could mark that into evidence, so that when it came time to do the investigation you could determine where - what had to be changed and what the changes were so you could go back to reconstruct the scene prior to the accident.

XN: MR MACSPORRAN

WIT: UROSEK J E

Would that have a bearing, for instance, upon the decision to move any equipment that was discovered upon re-entry and recovery?-- Yes. As a matter of fact, you would only do the absolute minimum amount of changing possible to ensure safe recovery. So, any equipment or anything that could be left intact would be, and only those things that it's necessary to change would be changed.

And if you did change something, for instance, would you record its position and features before moving it to change its position?-- Yes.

And would there be ultimately a detailed map giving details of the evidence discovered upon re-entry and recovery?-- Yes, there would. That's one of my typical jobs in investigation, would be to start where the first area of forces from the explosion is and work our way back into the mine until we reach the point where we have no more evidence of the forces or we have passed the ignition location.

At some stage during that process is there a marrying with those details survivors' statements and information of that kind?-- Yes. We need to compare that with the survivors' details, we need to compare that with the people at the mines to determine where these things may have actually been located prior to the explosion, try to gain as much information as possible from reports that are given by the deputies.

Is there in particular, so far as you are concerned and your role, an emphasis upon the ventilation system in the mine?-- Yes, that's the other area where my responsibilities would lead us to, is I have to determine the ventilation that was in effect immediately prior to the accident. So, we need to try and reconstruct, by looking at the damages, what condition those controls would have been in and actually what the ventilation would have been immediately prior to the accident.

And is there a set method for undertaking that task?-- Well, we try to use - we naturally use a computer simulation, if that's - depending on the information that's available. Typically we will conduct a ventilation survey of the mine or use any data that was done previous to the explosion. With that then some of the areas we realise are often destroyed, some of the ventilation controls, so we try to redo that via computer simulation to determine the air flow that could have been in these areas that could have led up to a methane build-up or whatever may have caused the explosion.

Well, is that exercise then relevant to, amongst other things, determining build-ups of methane that may have been in a particular area prior to explosion?-- Typically what we will find in trying to reconstruct the ventilation system is things that have gone wrong within the system, for instance, ventilation controls that may have been removed; short-circuits that could have occurred; goaf areas that are not ventilated, that methane has been allowed to enter the active workings. Those are the type of things that we would find during a ventilation investigation.

Can I take you, then, to the actual report, Exhibit 6? I think that's in front of you. Can I take you to page 9? Your colleague told us this is one of the areas you are more familiar with than he is. Perhaps I should ask you. See the heading "Ignition Sources", the paragraph below that, the sentence half-way through that paragraph commencing, "The results from the continuous monitors in the area..." - and we are talking about the area around 512 and 510?-- Yes, what we meant by that sentence was in reviewing the results of the data that was provided to us from the monitoring system, it indicates that none of the monitoring locations, except the one in 512, indicated any great quantities of methane; however - and that's when we continue on with this. What we found in the explosion investigations in which I've been involved is oftentimes there are short-circuits within the ventilation system that have allowed certain areas to accumulate methane that may not show up at these monitoring locations, and so to make a determination that just because these monitoring locations show it clear of any methane, that doesn't mean that other areas of the mine there might not have methane accumulations.

I think you said the fact of methane potentially accumulating would be a relevant factor to consider when you are looking at a fuel source for an explosion?-- Yes.

In particular, in that paragraph, you mention the monitoring point 18. I think there is a map in front of you which has been recently tendered through your colleague. You see point 18 marked on that map?-- Yes, I do.

Do you see the location of that? Exhibit 232 we are talking about, for the record. You reviewed data relating to that and you indicate in that paragraph that the data from that location appears inconclusive?-- Yes.

And what does that tell you about the need to conduct a thorough investigation, in this case underground, to examine that area?-- Well, that is one of the splits that it was coming from in the 510 area - from what I understand of the ventilation system - and because of our review of that and discussions with the Chief Inspector and the information we received from SIMTARS, it didn't seem like that data fit any particular pattern, so that could be a potential area where there could have - something could have occurred - there could have been a methane accumulation in 510. We just don't know that from looking at that data.

So, you are not saying, as I understand, there was a methane build-up there; it is just that it can't be excluded without further investigation?-- That's correct.

Can I take you to the following page of your report, page 10, and the first two paragraphs which come under the heading of "Flame" in the report? Do you see those?-- Yes.

They refer to data supplied by the Department of Minerals and Energy to be used to estimate the area involved in the initial explosion and the type of explosion that occurred?-- Yes.

Can you tell us what that data was and how you assessed it?-- Well, this was the data that we had received from SIMTARS and essentially describing - what we did with it is we looked at the - we said the point of origin for the explosion could have been near the tube bundle sampling point in the 5 - 512 panel, and from my point of view that's very simple because that was the only sampling point where an explosive quantity of methane did exist. That's not to say there weren't other areas or even that was the area where the ignition occurred. That's just one area that we know about.

What do you mean when we talk about being near the sampling point, point 5 inside 512?-- That's all we can say about it. It could be a layer, it could be a body. To say the size of it or its extent or how it got there, at this point I don't think we have enough information to really come up with a conclusive determination of that.

Are you, in your opinion, in any way excluding as a possible ignition source inside 512 the bottom half of the panel?-- I couldn't exclude any portion of it at this point.

Would an underground investigation perhaps shed some light upon such a feature as the source of ignition if it was inside 512?-- It would depend upon the availability to get into the panel itself and to ascertain, you know, what happened there.

You go on there, I think, in the second paragraph to talk about - again about the monitoring in 510, and you raise the possibility of a ventilation deficiency allowing methane to accumulate?-- Yes.

And that's really an expansion, if you like, of the point you made a moment ago about that point 18 and the status of the gases inside 510?-- That's correct. Since we did have a methane accumulation at that monitoring point 5, we don't know if there was a ventilation deficiency that could have occurred near those seals that could have allowed methane to leak into the 510 area. We don't know what the methane was - sorry, what the air flow right in front of those seals - how far that could have been. It could have been a cross-cut. We just don't know that.

You mention the prospect of methane coming out through the 512 seals. What's been your experience in terms of seals?-- My experience with seals is that they do breathe, and even a small change, for instance, in the barometer or the ventilation of the particular area - and depending on its set-up, you can have methane coming from these seals. If there is not adequate ventilation provided to the front of these seals at all times, there is a great possibility for methane to accumulate in these areas and to extend for whatever distance, depending on what the ventilation quantities in the area are.

What about the pressure differentials across the seals? Does that play a part in the ability of the seals to breathe?-- Yes, the pressure differential caused by both the barometer

and the ventilation system and in the integrity of the seals themselves and the strata around them can cause different amounts of leakage. Even the best seals - or what I would consider substantial seals, we found significant leakage around those seals - maybe not through the seal itself, but through the strata, which can allow methane accumulations to occur.

Has it been your experience that it is virtually impossible to prevent some sort of breathing or leakage from sealed areas?-- Yes.

Could I take you, then, to the following page - page 11 - which is under the heading "Forces", about just over half-way down the page there is this statement: "The transition zone" - that's referring to the forces - "The transition zone identifies the location of a probable point of origin. In attempting to determine this location, investigators must evaluate the following factors:", and you will see a number of them outlined there 1 to 8?-- Yes.

You will see number 8 stipulates ventilation deficiencies located throughout the mine as being relevant to those evaluations?-- Yes.

Again, you may have said something about this already, but what sort of things do you look for in this respect as ventilation deficiencies? What sort of signs are you looking for as part of the investigation?-- Well, there are a number of clues that can lead you into finding some of the deficiencies, and basically where people have been working - if there is just an equipment move, or, for instance, in this case they had just built these seals and there is some equipment there that they need to move, people have a tendency to maybe remove a ventilation control to get a piece of equipment in - to move whatever they need, you know, to move as part of their duties, and sometimes they have a failure to put those things back, because they don't realise the possible impact of that. That's typically what we will see in some of our underground investigations. What it leads to is short-circuits, and that allows methane to migrate from other areas of the mine to areas where it can be ignited.

Do you expect - or has it been your experience that such deficiencies are observable underground after an explosion, for instance?-- Yes.

You go on on page 12 in the same category to talk about short-circuits, which is what you have just mentioned. "C. Contour of coal seam and change in barometric pressure", and you have mentioned, I think, the barometric pressure point already. What do you mean to convey by referring to the contour of the coal seam itself in that respect?-- Well, I think it has been alluded to a little bit by Mr Stephan, but the elevations of the coal with methane being lighter than air will tend to accumulate to the higher locations, but you just can't say that's the only factor, because the pressure differential across the seals - the actual ventilation of an area prior to sealing, there is a lot of factors that have to

be considered with that.

And then finally in D you mention the possibility of roof fall in the goaf pushing methane outbye the 512 seals?-- Yes.

That's another - I take it you mean to convey a possibility that would need to be investigated by a detailed investigation underground?-- Yes.

And there would be evidence of such an event, if you were able to re-enter particularly the 512 panel?-- Yes.

You deal then at the bottom of page 12 with the question of "Barometric Pressure" and you have included there a graph of the behaviour of the barometric pressure over the relevant period?-- Yes.

And does that indicate that there is a possibility that there was breathing through the seals by virtue of barometric pressure changes?-- Yes, if we were to view the chart, we would find that there are very minute changes taking place at that time; however, it has been our experience in dealing with some of these seals that even small changes and reversals in the barometric pressure can allow the gases that are behind the seals to migrate to the areas on the working side of the seals.

So, you could have a source of methane that is completely outside or outbye the 512 seals?-- Yes, I don't think we could rule that out.

If you had an ignition source somewhere in that area, well, you have a potential for ignition of that mixture?-- Yes.

On page 13, you deal with the "Gas Concentration Analysis". Can you summarise that briefly for us, if you would, as to the conclusions reached by the virtue of that analysis?-- Well, essentially it just shows that after the explosion, that these four locations - the concentrations were very similar, which can indicate to us that possibly the sampling locations were all in relatively the same area, or the amount of ventilation that was occurring to these areas was basically the same, so that they would be diluted and carried away in the same rate. So, it is very difficult, without an underground investigation, to know exactly what those tubes are telling us.

You are saying that there is a number of variables that would affect how you can interpret in any given way that data?-- Yes.

I think you - about the third paragraph from the bottom of that page you talk about the rate of dilution and the gas concentrations of two locations, and then you draw the conclusion that some of the ventilation controls may have remained in place following the first explosion - we are talking about the areas of 510 and 5 South sections. You say that was consistent with the analysis of forces caused by the first explosion. Now, firstly, when we talk about forces

caused by the first explosion, those are, if you like, assumptions made by your colleague from data he examined as to what forces may have been involved?-- Yes.

Now, you have looked at the gas concentration analysis and concluded that that data, on one view of it, is consistent with the conclusion he has drawn about the forces present from the first explosion?-- Yes, that's one possibility to explain the decrease in the numbers that we saw at those locations.

Of course, without detailed investigation underground, that remains simply one of the possibilities?-- That's true.

You go on to say that, "As it appears that the ventilation controls in 5 South were not significantly damaged, contaminants from the first explosion could have been swept into 5 South and spread throughout the active faces."?-- That's possible.

That's obviously following the first explosion?-- Yes.

Could I take you to this point: some of the data that relates to the H/C ratio says in relation to the 520 borehole data - this is at page 8 of your report - I understand this is your colleague who did this exercise - that's Giardino?-- Yes.

The data there, in his opinion, suggests possible coal dust involvement in the original explosion and/or localised fire burning during the 36 hour period after the first explosion?-- Yes.

Now, what's been your experience in looking at data taken from samples underground after an explosion to determine whether or not, in fact, there is a fire, as opposed to products of combustion left over from the explosion itself?-- That would be one of our functions that we would be typically given to do after there is an explosion - to ensure the safety of the teams going underground. It is a very difficult task and oftentimes it is almost impossible. We find that the contaminants from a fire or from an explosion is much - are much higher than we would anticipate from a fire. Essentially what we do is we trend the data and at some point there is generally enough ventilation that the gases begin to be diluted and carried away - you know, away from the system. The only hope we have of actually determining if there is a fire after there has been an explosion is at some point those trends will no longer continue down and they will begin upward. There are other factors you have to consider also, such as the change in the barometer which can move those gases around. I reviewed the data from this explosion. I have the same conclusions in looking at that. It is very difficult for me to determine if there was any kind of fire. There could very well have been, but to say that there were fires burning at some location, we have not found that to be our experience - that there typically is not - but it doesn't mean that there is not.

Have you had experience in the past in the United States where the data has been strongly suggestive of a fire underground

and later examination has revealed no such fire, but the products of the earlier explosion remain?-- Yes. In fact, one of the last explosions that we worked on would be the Southmount No 3 explosion and there was a concern of a fire after the explosion. The rescue teams went underground. We continued to sample. When they reached a certain point in their investigation, they were able to obtain some samples that were different than we had looked at in the past. They also gave us some conditions that we didn't have previous information for, such as the temperatures that they encountered. MSHA immediately pulled that rescue team from the mine. We drilled a bore hole into that area and we watched that area for a number of hours, approximately 12 hours, and the trends continued to decrease. The problem - the teams had indicated that there was a heating which was of grave concern to us, but after a period of time, we were convinced that there was no fire. They went back underground, and, indeed, there never was a fire in that area, but just a review of the gases - it was very difficult to make that determination.

Can I take you then to the question of training? As your resume indicates, you have had significant involvement in Mine Emergency Responsiveness Development for Coal Mine Safety and Health, Senior Staff, starting in 1981?-- Yes.

Can you tell us what that involves and what that relates to?-- Essentially what happened was that MSHA determined that there wasn't enough - the response to these fires and explosions wasn't going quite as well as it should be, and basically because we were in a position where we have very few of those any more, and when we responded to them, we found that all parties weren't working together, specifically the operator of the mine, MSHA, the state officials that may be on site and the union officials that may be there. So, this program was developed to improve that response to these things, so that when we all got together on site, we know what each other is doing, what each other's responsibilities are and so we can work much better together, and that's essentially what the training is - to recognise the things that can happen and be aware of them and be prepared for those.

Again, as your resume indicates, that sort of training has started in 1981, so far as your involvement was concerned, and gone through until - 1993 is the last entry on your resume related to it?-- Yes.

So it has been an ongoing feature of MSHA's involvement in this sort of training?-- Yes, typically what we will do is use one of the latest disasters we have had and use some of the lessons from that to implement training so we can get it not only to our own people, but the company people and the union people to improve our response.

What form does the training take, generally? Can you tell us briefly about that?-- Essentially what it is is we design a mock mine. We give a list of parameters about the mine, discuss its production, how many people work there, and some background information. It is a role-playing exercise where

someone will play a superintendent, someone will play the mine foreman, someone plays the MSHA district manager, someone plays the head of the State agency. They are given information specific to the mine concerning the ventilation or where all the people were immediately prior to the accident, then we will give different situations. For instance, they may all be working in the mine office, and all of a sudden smoke comes out of the fan shaft, and then they - that's it, then we sit back and we watch to see what they are doing, and they may call underground, at which point we will give them information as to what they are learning, and it is really to get them to know what to do and to do the right thing.

You say your involvement has been through MSHA; has it been your experience that the operator companies themselves have taken on board the programs and trained their own staff in the same way?-- Yes, as a matter of fact some of the companies even go so far as to actually use their actual mine and set up a day and have a scenario actually at the mine, and there has been occasion where they have not only just involved their own people from the mine, they have involved government people, different union people to come in and participate in that.

Thank you. Thank you, Your Worship.

WARDEN: I think we might take a short break, Mr Martin. I would indicate we will try and finish this witness this afternoon. Thank you.

THE COURT ADJOURNED AT 3.52 P.M.

THE COURT RESUMED AT 4.12 P.M.

JOHN EDWARD UROSEK, CONTINUING:

WARDEN: Yes, Mr Martin?

CROSS-EXAMINATION:

MR MARTIN: Could you just help the Inquiry, please, with any legislation which exists in the United States in relation to monitoring points or the location of monitoring points within panels, extraction panels, for instance?-- To my knowledge we don't have a general requirement that has monitoring locations within panels. There may be some mines though in the United States in which that may occur as part of their ventilation plan, but I personally don't know of any.

All right. Is there not a requirement that there be no greater distance than 1,000 feet between monitoring points?-- That would be on a - typically on a CO monitoring system which we would have along a belt line and there are specific requirements for that as a fire detection or fire prevention system.

Can you tell the Inquiry, please, what sort of alarm systems exists in the United States so far as you know them? Is there a Unor Maihak system commonly in use or is there a telemetering system, or what systems to your experience -----?-- Well, on the mines they would have a CO monitoring

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system typically along their belt. They would have - it would be an electrical system more than a tube bundle type system to my experience. There are a number of mines though that do use their mine monitoring system to monitor other locations. For instance, maybe a section return or a main return or an area near seal. They may be looking for methane concentrations, they may be monitoring for methane. It just depends on the individual mine. Some of those are put in by the mine operator on his own behalf and some of those are put into the - as part of the ventilation plan for that particular mine.

Say in the telemetering system - is that what you refer to, telemetering?-- Telemetry system?

Telemetry, right. Is that monitored on a computer at the surface?-- Yes.

What sort of alarm system exists on that computer? Is there an alert first set at a particular level and an alarm set at a particular level?-- Typically, yes.

So if one just takes an example, say a level of 5 ppm carbon monoxide as the alert level, if that alert occurs by receipt of gas at that level what happens in practice to the acceptance of that alert?-- Well, there are different requirements for different mines on those alerts. Some alerts it may require them to do nothing more than investigate, you know, what caused that alert. Other mines that alert may require them to remove people from a certain area of the mine. It just depends on the particular circumstance that the monitor was installed for.

Is that a matter of Government legislation?-- Well, it just depends again what the monitoring system was used for. Some of them are, some of them are just something that the company would put in for their own uses.

I suppose what I'm coming to is can anybody within a mine just go along and accept or acknowledge, say, the alert and reset it at a higher level?-- Not typically, no.

Is there legislation against that?-- Well, again it would depend on the monitoring location. If you have a 5 ppm alert level or 10 ppm alarm level, that's something that would be in legislation. You could not change that unless you had some good reason and you presented that to the local enforcement people as to why you needed to change that level, and then it may be permitted for you to change it.

So, the local enforcement people would have a big input as to what level it was reset at, whether it be alert or alarm?-- Well, again, it would be dependent on the system. It may be the local enforcement people in that particular district, or they may have to even re-apply for petition for modification where typically these things are put into to have those levels changed. So, it may be even a more involved process.

And is it the case that before changes were permitted, an investigation would be required as to what triggered it in the first place?-- Yes.

And is there proscription or penalty attached to not - to resetting without permission from the local enforcement people?-- Well, for instance, if you did not - if your plan required you to do certain things following an alarm and you did not do those, yes, there would be a penalty assessed with that.

Thank you.

CROSS-EXAMINATION:

MR MORRISON: Mr Urosek, can I just ask you to direct your attention, if you would, to page 13 of the report, particularly the first paragraph, where you deal with the results of the tube bundle system after the first explosion. You point out that they were indicating an atmosphere at locations 5, 6 and 7 and 16 which were similar?-- Yes.

Now, I think your recollection of the data will tell you that the results from those points at one particular stage were almost identical, it's difficult to tell one from the other?-- They were very similar, yes.

Now, you mentioned this could be due to the sampling lines being damaged or ventilating air for the locations being the same due to damage to controls in these areas. You then go on to point out, "A steady decline in these readings also indicated that the ventilation controls in 5 South may have been damaged but were generally intact." Now, you were there indicating a steady decline in all of those four points and with the same degree of similarity?-- I'm not really sure what question - what you want me to answer here.

I will try and make it clearer. You mention a steady decline in the readings - you see that sentence there halfway through that paragraph - "A steady decline in these readings...". You are there talking about all four points, 5, 6, 7 and 16?-- Yes.

And as they declined did they decline, nonetheless, being similar one to the other?-- Yes.

That would suggest, would it not, that the - I am sorry, I

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will start again. Wouldn't that suggest merely that the lines were still drawing the same atmosphere from approximately the same point, not necessarily that the ventilation controls in 5 South were intact? Can I make my point a little clearer? You can only sustain the view that the ventilation controls in 5 South may have been generally intact if you assume that points 6 and 7 were generally intact because they are the only points for 5 South?-- It's very difficult without an underground investigation to determine why those points were reading the same things. There is so many reasons and so many possibilities that these are probably just a few of them.

Well, perhaps you can try and answer the question that I am posing, namely, that the mere fact that you get a steady decline doesn't suggest the 5 South ventilation controls were generally intact, you would only derive that from a reading of point 6 and 7 if they were intact, they being the only points for 5 South?-- Assuming they were intact, yes.

That's the point I am trying to make, and perhaps I am not making it clear enough yet, but the statement that the ventilation controls in 5 South were generally intact can only be sustained if you assume lines 6 and 7 were intact?-- Yes.

Now, in relation to re-entry about which you have spoken already, it's axiomatic, isn't it, a great deal of research has to be done?-- Excuse me one minute on your last question. I have just a clarification of that.

Sure?-- The stoppings in 5 South not necessarily have to be inbye the location of the intersection of 510. It could have been anywhere in 5 South. So, the ventilation - those controls being intact indicate that there has been some air flow reaching those areas for them to be diluted. To what extent we don't know.

So, what you are pointing out really is when you use the terms ventilation controls in 5 South, you weren't confining it to the section inbye the junction, it was the entire section in contemplation out to the main dips?-- Yes, because we don't know where those tubes might have been broken or the impact of the ventilation controls in those areas.

I understand the point you are making. Can I return to the re-entry question? I started to say that is it not axiomatic, before one can do that, there is obviously a lot of data collection to be done, research to be done, planning to be done on whether one goes back into a mine or not?-- Yes.

Now, you are, no doubt, familiar with the sort of investigations you make at MSHA before you do in fact re-enter and they would involve not only yourselves but operators, Mines Rescue personnel, enforcement agents and so forth?-- Typically what will happen is the operator of the mine is responsible for the safety and health of his people. He will develop a plan with whomever he feels necessary to develop that plan so that he can ensure the safety of his people. He will then present that to MSHA and usually to other parties, the State and possibly the Union people. We will look at that

and see if we concur with that operator, maybe offer suggestions or ideas for improvement, and that's how we would approach that type of thing.

From what you say, do I understand that MSHA doesn't - in the absence of such a proposal, MSHA doesn't propose re-entry?-- We have never had an operator that did not go back in, so I really - MSHA has the authority to do that.

It's never needed to exercise it?-- And has never needed to exercise it.

I gather from what you say then that in such investigations in the past there has been a certain imperative on the part of the mine owner to get the mine re-operating as an operational mine?-- Not necessarily. One of our requirements is to determine the causes of an accident so that no further accidents can occur with the similar circumstances and to make improvements and possibly make new regulations, where necessary, to keep these things from occurring again. Without a thorough investigation, it's impossible to determine that. So, I suppose that if MSHA determined that if a mine operator refused or didn't have the resources, or for whatever reason, other things could be looked at, and I think that's part of the reason that that's in our portion of the law.

In relation to this mine, though, there has obviously been no detailed investigation done as to whether and how this might be done?-- We did not complete - no, that would be something the mine operator would do.

I have nothing further, Your Worship.

WARDEN: Yes, thank you, Mr Clair.

RE-EXAMINATION:

MR CLAIR: Thank you, Your Worship. Mr Urosek, can I ask you this: from your experience you would, no doubt, have become aware of the kinds of early indicators that might have been looked for in mines in the United States to demonstrate the presence or otherwise of spontaneous combustion; would I be correct there?-- One of the things that I have been fortunate in is that the areas east of the Mississippi have experienced very little problems with spontaneous combustion, so, therefore, in my career I have done very little work with it to be classified as someone who could give you an opinion on spontaneous combustion based on some experience. I would be lacking in doing something like that.

You don't feel qualified to make any observation?-- No.

I have no further questions, Your Worship.

EXAMINATION:

MR PARKIN: Mr Urosek, could I just return to the question of the explosion being initiated in the vicinity of the 512 seals? Is that still your view, that you believe that's where it initiated?-- I think that that's one possibility. Again, the only reason I can say that that's a possibility is because we had a sampling tube into an area where we had an explosive mix, but I don't think we could discount that there are very many other areas of that mine where there is the possibility for an explosive mix that we don't have a tube to detect that, but that certainly is one that we do have, so that possibility does exist.

But you viewed the question asked this afternoon that the panel was, you know, after 23 hours - you know, the build-up of CO was very, very quick in that time. You have got possibly five metres of seam if you take some areas where the bottoms were taken. I mean, it is very possible that that explosion could have initiated in the middle of the panel?-- I'm sorry. It could have, as far as I know, you know, initiated anywhere. The methane at that particular location is just an indication of just that. Typically we would find, when we seal a panel, there is a lot of variations that can occur, and when you sample very near the seals there are some things that we don't know. For instance, in the hours before the area was sealed what was the ventilation in that panel? Was there adequate ventilation to ensure that the - there was no methane building up in any other part of that panel? That once you began the sealing and stopped the air flow that that - those gases could then migrate to that area, or was it a sudden increase in the contaminants at that location? My experience would have been since it's just a newly sealed area that that may have been - I don't want to say for sure - but that may have been gases that had been further back in the panel that's just finally migrating to that location, but without an underground investigation I don't know.

What's the probabilities? I mean, you are saying - if you read your report, one would assume that the explosion occurred or was initiated very near the seals, either inbye or outbye them?-- Well, the only thing that I could say of that portion of the report is that that's the only location where we had a sampling tube, and what we are saying is that's one possibility there at the sampling tube because we know that's an explosive mix, but my experience has been that in a sealed area such as that, to say that we had an equalisation of contaminants throughout that area, I don't believe that that would be true. I believe that we would have higher concentrations at other locations and it would be affected by the barometer, the ventilation pressures, the actual tilt of the seam. There is just so many factors to consider in that that we really don't know where that methane was or what the concentrations were at some of those other locations.

But, I mean, you made an assumption on the quantity of CH₄ in

the first explosion?-- That was done by my colleague, and I really don't have any expertise to comment on that.

Well, I am sure you will be able to comment on this: could I ask you, in your experience, what conclusions you are going to draw when you know that prior to the explosion there had been several reports of smells and hazes and things of that nature; that in 22 hours the build-up of CO was from 12 to 150, and I might indicate to you that's a very rapid increase; that the Graham's Ratio, or if you want to use the CO/O2 ratio, was .7 or thereabouts; you know that there was an explosive mixture behind the seals. I mean, what conclusions do you draw from that?-- When I answered the question about spontaneous combustion, my experience with that being very limited, but dealing with the ratios and the gases I deal with a lot basically during the recovery and then looking again at the possibility of re-opening some of these areas. These changes are something that you just can't dismiss, specifically any rapid changes. I would expect some rapid changes to occur when the sealing did happen basically because you stop the air flow through the panel, but to reach - to go from levels of 8 or 9 or 12 ppm to greater than 50 ppm certainly indicate something was going on somewhere and you need to look at that.

Thank you very much.

EXAMINATION:

MR NEILSON: Mr Urosek, you have now got me a little bit confused. I thought you advised Mr Clair that you had very little knowledge of spontaneous combustion, and now I take it that you do have some knowledge in determining - or at least recognising what the gases that are a product of spontaneous combustion may be doing at any point in time?-- I guess my answer - and I must apologise for that - I have not been in a position where I have had to determine whether a spontaneous combustion has occurred, or what the results of that has been - but I have looked at the concentration - or the different indices and the different CO and - not so much CO make, but the CO concentrations - but in regards to after a fire has occurred or after an explosion or after a mine has been sealed for a period of time and looking at re-entry into that, it is something I would deal with - the indices - more often than that, and my experience with that - and I don't know if it can be drawn to spontaneous combustion or not - my experience with that has been that the indices themselves are just that - they are indicators - and we depend much more on the trends of the various indices to make our comparisons of what's going on, rather than what the actual numbers for the indices mean.

Can you just expand on that a little bit more for me? When you say you look at the trends, can you tell us what it is you would look for in terms of a trend?-- Well, it would be essentially the rate of fall or the rate of rise. You have to look at the other things, the barometer and how it would affect those things. The numbers that we would typically see - and I don't have any in front of me - but, for instance, point 4 in a Trickett ratio means a certain thing - burning, or whatever the number would be. It has been our experience not to count on those type things, because for different coal seams for different mines there could be different reasons why those things may not be accurate, but it has always been our experience that the trends of rise and fall and looking at different indices, not just one particular one, has always been a proven method that we have used to determine the status of what's going on in a fire.

You sat through Mr Humphreys' evidence yesterday?-- Yes.

You would have heard quite a number of questions put to Mr Humphreys about things that are espoused by a gentleman by the name of Mackenzie-Wood and that he gained some experience from the German experience, indicating that if you have a CO make of 10 lpm, then you should take certain action, and if you - if it rises then to 20 lpm make of CO, then you should take other type action. You heard that yesterday?-- Yes.

The question I would like to ask you is are you aware if those values have any significance in the United States of America? Does anybody relate to those values in the States?-- Again, that's dealing with the spontaneous combustion issue and I don't really know if there is anyone that uses those type numbers or not.

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It could be possible that they do, but you just wouldn't know about it?-- That's true, yes.

In terms of your own experience, would it be fair to say that you have either little or no experience in trying to determine what may have caused an underground explosion without the benefit of an investigation of the mine itself - in other words, re-entry?-- Yes. We have never attempted to determine from - without going underground - what happened, and just - you know, that question is something I thought about, and just looking at how we conduct our investigations, we do a lot of preliminary work before we go underground - review the books, the reports that have been sent out, the ventilation plan, and oftentimes what we find when we get underground is things are changed from what we find in the books. For instance, maybe an examiner - I'm thinking for one of the latest explosions we had, although in reading the results of his examination in questioning the individual - he did a complete and thorough examination, however we found when we went underground that he neglected to go to one particular entry - or it just so happened that particular entry where he failed to make an examination was where methane had built up and an individual went into the area and methane was in the area and caused an explosion. I can think of another individual that was supposed to do a weekly examination around a gob area, and in the books - if you had read the books and talked to the individual, you would have determined that that was done, and indeed that area was clear, but we found on investigation that that was impossible that that could have occurred because it was a roof fall that had blocked that and had been there for quite a while. So, we find that there are requirements that they must keep their ventilation controls to within so many feet of the face - two cross-cuts - yet when we go underground doing the investigation, we find no remnants of any ventilation controls in those areas, so there was no way there could have been any ventilation to those areas and that allowed the methane again to come out of the gob area. So, oftentimes in a review of what we find on the surface - and once we get underground, there is a much different view, and I don't really know how we could come up with any conclusions without the underground investigation.

Are you aware that in 1986 there was an explosion at Moura as well?-- I heard that, yes.

Are you aware that there was a re-entry where people actually went down and the bodies were recovered and an investigation was done?-- Yes.

Are you aware that there was no final conclusions - no real conclusive report given at the end of that investigation?-- I have never read the results of that investigation to determine that.

But you will, won't you?-- Probably, yes.

Do you find you have similar experiences where you have, in fact, re-entered and really not been able to draw any firm

conclusions?-- That's never - in my career we have never had that occur and I don't know of any investigation where we have come up to - where we could not determine what has happened. We may end up locating it back to a certain area of the mine where there is more than one ignition source - for instance, there may be two or three pieces of electrical equipment in this area where my job would be to determine if the methane could have got there. We would determine that by looking at the ventilation system and reconstructing via computer simulator - whatever method we had available - as to what the ventilation was, and determine - so, it may come out that we can't exactly pinpoint that somebody pushed a button on a shuttle car, but we may say something like maybe he pushed a control on a shuttle car, or something - a light fixture failed, or any number of things in a that general area. We have never not done that.

Okay, so you do have some similarities to our experience as well - in other words, you may be able to isolate a number of ignition sources, but not the exact one; is that what you are saying?-- If they are all within a very small area, yes.

Thank you.

EXAMINATION:

PROF ROXBOROUGH: Mr Urosek, Mr Stephan has indicated that in his opinion water barriers would not confine the progression of a methane explosion; do you agree with that?-- I really don't have any experience on the use of water barriers or what they would do as far as to confine a methane explosion.

Water barriers are not used in the United States?-- No, they are not.

Do you know if the reason they are not used is that they have been demonstrated to be ineffective in the area?-- I really don't know why they are not used.

Okay. Thank you.

WARDEN: Nothing arising out of that? Thank you. The witness can stand down. Thank you. You are excused.

WITNESS EXCUSED

MR CLAIR: Your Worship, arising out of the questioning of Mr Humphreys yesterday, there are two other witnesses that Mr MacSporran has indicated that he has available here, and that's Mr Hester and Mr Cliff. I understand that Mr Hester won't have a lot to say in answer to what Mr MacSporran wishes

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to ask him to clear up some matters. I am in a position to call him. I think Your Worship indicated at some stage that you are prepared to go through to 5?

WARDEN: Five or a bit after if it is convenient to get at least one out of the way today.

MR CLAIR: Thank you, Your Worship. I call Colin John Hester.

COLIN JOHN HESTER, SWORN AND EXAMINED:

MR CLAIR: Your full name is Colin John Hester; is that correct?-- That's correct.

Mr Hester, were you a contributor to the report that has been tendered in that matter, being Exhibit 5 - if that could be obtained, Your Worship - is that so?-- That's correct.

You have been present in Court during the time that Mr Humphreys has been giving evidence?-- That's correct, yes.

Just have a look at that document, if you would? That's the report to which you have referred?-- That's true.

Thank you, Mr Hester. Thank you, Your Worship.

EXAMINATION:

MR MacSPORRAN: Mr Hester, just a couple of what I hope will be minor points to clarify with you. Firstly, you, as you told Mr Clair, were, in fact, a contributor to the SIMTARS report; that's so, isn't it?-- Yes.

And your qualification are a Bachelor of Applied Science, Applied Chemistry from the Queensland University of technology?-- Yes, that's true. It was the Queensland Institute of Technology in those days.

All right. Your role in writing this report was confined to which particular areas, can you tell us briefly?-- My section of the report deals with the operation and maintenance of the CAMGAS system, the carrying out of analysis on site post-explosion and the investigation into the calibration of the Maihak monitoring system post-explosion.

Well, with respect to those areas, can I direct your attention firstly to page 14 of the report?-- Yes.

It is the main report itself - Exhibit 5. And some issue arose, I think, during Mr Humphreys' questioning concerning the expiry date of the cylinders used for examination of the

210395 D.47 Turn 15 sbd (Warden's Crt)

tube bundle, and, in particular, those used in table
2.1.5.1?-- Yes.

Do you see those?-- Yes.

I think the dates referred to were July 1991 and perhaps it even referred to the next one, June '92 to indicate the cylinders used were quite old?-- Yes.

Firstly, that table relates to work you did?-- That is correct.

Secondly, are the dates accurate in the sense that the gases appear to be old as it were?-- I believe that is the case.

Were you conscious of that at the time you used them for the purposes outlined in the table?-- Yes, I was.

Tell us why you nevertheless continued to use those cylinders with knowledge of their age?-- Because these were gases available on site, actually the property of BHP, and it's my opinion that the gases wouldn't have deteriorated from the stated concentrations over the duration between the expiry date stated and the date that we did the test.

Is that related in any way to the sort of gases the cylinder contains?-- It is. My judgment that the permanent gases contained in the cylinder would not have changed is based on my experience in analysing gases of similar matrices for clients in my normal work, and also through discussions with the people who mix these gases at BOC Gases.

So is the end result of all of that that despite the expiry date on the cylinders you identify the - you were confident that the results to be achieved using those cylinders were accurate?-- I'm certain of that.

Can I take you to the following page, page 15, and in particular to table 2.1.5.3, a little over half-way down. Do you see that?-- Yes.

A question arose, I think, in relation to the span gas results for the carbon dioxide which read on the cylinder 3.69 plus or minus 0.7 per cent and the computer read-out for that sample being 3.41 per cent. I think the questioning centered around the proposition that that indicated that that particular reading from the computer was out of range - out of the acceptable range to be achieved for that span gas. Do you recall those questions?-- Yes, I do.

Can you tell us about firstly the cylinder figure of 3.69 plus or minus 0.7 per cent?-- Yes, I would like to clarify that. I believe that is actually a typographical error and similar errors occur in the result immediately above that for the methane gas which reads 2.53 plus or minus .5 per cent. I believe they should read .05 per cent and .07 per cent respectively, and I base that judgment on the fact that the typical error associated with the mixing of such gases is to confine the error to 2 per cent relative of the analysed amount which would be of that order.

Which would place the figure of 3.41 per cent for the computer reading as within the acceptable range for the span gas sample; is that so?-- Well, actually it would not, but the

relationship between the 3.41 per cent figure and the 3.69 per cent figure is purely that the cylinder result 3.69 is the amount that we applied to the monitor, and 3.41 per cent is the amount that we measured on that day which was some two weeks after the Moura incident. So the tube bundle monitoring system had sustained two explosions and two weeks of idleness before that measurement was taken. I include that figure only to describe the operational condition of the instrument at the time when we did the check.

Well, bearing in mind that the reading was obtained, as you say, after the two explosions, does that tell you anything about the integrity of the system potentially before the incidents in terms of its -----?-- My section of the report indicated that I felt the instruments, with the exception of the oxygen analyser, were actually operating within the design spec - specification of the Maihak Unor system in that the drift to 3.41 per cent since the Maihak calibration of some months before was within the less than 1 per cent of full scale per week drift acceptable for such instruments.

So you say that even after the two explosions the drift evidenced by that read-out was within the acceptable levels?-- That's true, and the instrument was operating reasonably linearly as well and without great drift from the zero and span points despite the fact that it had withstood two explosions and the associated contamination that might be expected to follow that.

Could I just take you back - sorry to jump - take you back to page 14 again, table 2.1.5.1? Is there a typographical error there as well in relation to a deviation in the methane and carbon dioxide gases? It's a similar typographical error?-- Yes, I believe that there is. That error seems to be carried throughout.

So instead of plus or minus .5 and .7 respectively for methane and carbon dioxide it should be .05 and .07 per cent?-- You could take those figures to be .05 and .07, please.

Could I take you finally then to page 17 of the report? This is another matter that arose during questioning. Top of the page which refers to the "SIMTARS Calibration Check on Analyser System", under the heading "Methodology", attention was drawn to the fact that the - that you, I think, in fact checked the calibration status of the analysers using SIMTARS Method LP0022. Firstly; is that correct?-- That is correct.

The paragraph goes on to say, "This method...", that's referring to the SIMTARS method of calibration checks, "...is based on Australian Standard A2290.3..." which refers to maintenance of gas detecting and monitoring equipment. What do you mean to convey by "This method is based on Australian Standard..." as outlined in the report?-- Okay, SIMTARS Method LP0022 is a method based on the Australian Standard 2290.3. It does not exactly follow that method in some cases so we cannot quote that we follow the method exactly. The terminology "based on" means to say that we follow it as nearly as practical, but there are some cases where we may not

be able to say that we followed it word for word, and they might include such cases as having to do the analysis on site at Moura, for example, as was the case here, and also the fact that in the Moura example we actually did no calibration span adjustments. All we carried out was a check which means that we didn't completely follow the method 2290.3 throughout.

Do you mean to convey by that that you didn't actually calibrate the instrument, you simply checked its current calibration at the time you looked at it?-- That is correct.

So the Australian Standard which requires you to follow the method to calibrate it wasn't necessary to be followed?-- Well, it was necessary to follow it to the extent that we checked the analyser's performance with regard to 2290.3, but we made no actual calibration changes. So that part of the actual standard has been omitted.

But the part that dealt with procedure for checking the calibration was in fact followed?-- Was followed according to 2290.3, that's true.

That's the Australian Standard?-- Yes.

Thank you. I have nothing further.

MR MARTIN: I have no questions.

MR MORRISON: Your Worship, I may have, and if I may I will do them tomorrow morning. I mention that simply because we were given no notice that Mr Hester was coming. It's only by chance that I had kept the SIMTARS report here at all today. So I would like a little time to think about it, and we might fill up the next five minutes - or even 10, because Mr Cliff is in the same position. If we could be told, it might be helpful for all of us to know what it is Mr Cliff is going to say. I currently have no idea what he is going to say.

WARDEN: Thank you. Witness, we will stand you down until tomorrow morning. Do you understand that?-- Yes.

Mr MacSporran, do you want to respond to that. Perhaps just open up Mr Cliff's evidence for the information of members of the Bar table and the panel.

MR MACSPORRAN: Your Worship, I'm prepared to give some broad outline of that. The areas that Mr Cliff will be most likely speaking of will be the issues of the SIMTARS seminar of 1989, how that came about, the fact that it wasn't repeated and the reasons for that, but in spite of that the work that he has done with others since 1989 by way of research into Bowen basin coals, and indeed along that same line, the papers he has presented and seminars he has conducted for training generally. Then he will deal with some of the aspects of those papers as set out in Appendix 5.2(A) of Volume 2 of the SIMTARS appendices which refer to two papers Mr Cliff delivered or was involved with dealing with the issues of CO make and the parameters for it and Graham's Ratio and the parameters for it as well as the issue of the significance if

any of Graham's Ratio parameters or trends after sealing of a panel.

He will also talk to the issue of the work that Mr Cliff carried out in testing the integrity of the Unor tube bundle system and the point that's been made already, and what he can say of it in terms of purging and leakage problems associated with certain points. Finally, possibly the question of the point 14 oxygen deficiency and the history of the point 14 data that's already been placed to some extent before the Inquiry. Those are the broad areas that it's anticipated Mr Cliff will speak to tomorrow.

WARDEN: Thank you. That's a help, I think.

MR MACSPORRAN: Your Worship, could I finally, just as a matter of housekeeping, tender two further bundles of documents? I foreshadowed with Mr Humphreys that some data he used for Exhibits 158 and 224 were not in fact in evidence and I should tender those bundles of data that relate to those exhibits. I will tender firstly what is described as the hourly averages for point 16 between 27 October 1993 and 27 July 1994 and that data relates to aspects Mr Humphreys used for the compilation of Exhibit 158. Secondly, data for point 13 between the dates 21 February 1994 to 20 March 1994, the hourly averages for those points which relate to the 401/402 sealing. That's relative to Exhibit 224. I don't have full copies of each of those data bundles, but they will be available for the parties to inspect should they wish to, and I can indicate that they came from Mr Clark from BHP who kindly provided them to Mr Humphreys for the purposes of his data compilation.

WARDEN: Thank you. We will mark them Exhibit 234 and Exhibit 235 as read into the record by you, Mr MacSporran.

ADMITTED AND MARKED "EXHIBIT 234"

ADMITTED AND MARKED "EXHIBIT 235"

WARDEN: One final matter in case you overlooked it, Mr Mackenzie-Wood will be flying in tomorrow and if necessary we will interpose him at some suitable stage. He may have some certain travel arrangements to meet. Thank you. Can we have a nine o'clock start tomorrow?

THE COURT ADJOURNED AT 4.58 P.M. UNTIL 9 A.M. THE FOLLOWING DAY

XN: MR MACSPORRAN

WIT: HESTER C J

WARDEN'S COURT

MR F W WINDRIDGE, Warden and Coroner
MR R J PARKIN, General Manager, Capricorn Coal Pty Ltd
MR P J NEILSON, District Secretary, United Mine Workers' Union
MR C ELLICOTT, Training and Development Officer, Department of
Mineral Resources, New South Wales
PROF F F ROXBOROUGH, Professor of Mining Engineering, School
of Mines, University of New South Wales

IN THE MATTER OF A CORONIAL INQUIRY IN CONJUNCTION WITH
AN INQUIRY (PURSUANT TO SECTION 74 OF THE COAL MINING
ACT 1925) INTO THE NATURE AND CAUSE OF AN ACCIDENT AT
MOURA UNDERGROUND MINE NO 2 ON SUNDAY-MONDAY, 7-8 AUGUST
1994

GLADSTONE

..DATE 22/03/95

..DAY 48

THE COURT RESUMED AT 9.05 A.M.

COLIN JOHN HESTER, CONTINUING:

WARDEN: Thank you, gentlemen. Witness, you are on the former oath that you took yesterday; do you understand that?-- Yes.

CROSS-EXAMINATION:

MR MORRISON: Mr Hester, there was just a couple of things I want to ask you about. You mentioned yesterday in answer to a question by Mr MacSporran that the cylinders of gas that were recorded at page 14 of the report as being substantially past their expiry date were nonetheless used in order to check calibration of gases?-- Yes, they were.

Now -----?-- Of instruments. They were used to check the calibration of the instruments.

Sorry, yes, you are correct. You mentioned yesterday that based on your experience in analysing gases you were of the view that they wouldn't have deteriorated much?-- That's true.

But did I understand correctly the case to be that you didn't in fact check whether the contents of the cylinders were in fact of the stipulated levels?-- One of the gases was checked and found to be the same, but one of the gas cylinders was also empty after we had carried out the tests, so it was impossible to check that gas.

So the answer is such tests as were done - or such checks as were done were inconclusive?-- The check on the cylinder which was tested was conclusive, agreed that the gas levels were okay.

That's on one gas?-- That's correct.

Not the others?-- True.

In relation to the use of the Australian Standard 22390.3, the method adopted by SIMTARS didn't follow that standard except in a broad way?-- Well, it's closer than in a broad way but it doesn't follow it exactly.

And I think it says in fact in the methodology appendices that it was used as a guide, the Australian Standard was used as a guide?-- Correct.

The real reason that it wasn't followed exactly through to calibration, I think, was because you were on site and that

XXN: MR MORRISON

WIT: HESTER C J

was evidence as it were?-- In part that is true. There are several other reasons as well though.

But certainly that reason alone would have stopped you from following that through, wouldn't it?-- That's correct.

Now, can I ask just a couple of other things? You have been involved with a number of the personnel at the mine in the past in relation to the gas chromatograph?-- Yes.

I'm not sure if you were involved in teaching people how to use the gas chromatograph, but I think you had something to do with that?-- I was.

Those people included Max Robertson, Allan Morieson, Jacques Abrahamse?-- I think you should also probably mention Ken Selff.

I didn't mean to exclude others, but including those three?-- That's correct.

Now, it's certainly your understanding, and it's something that you conveyed to them, that the chromatograph wasn't accurate for determining low levels of CO below 10, for instance?-- I accept that.

And in the case of Mr Robertson and Mr Abrahamse, for instance, it's true to say, isn't it, that there was no occasion when you suggested to them or to others at the mine that the chromatograph should be used in some way other than the way it was being used?-- How do you suggest that it was being used?

Well, it did have a use that was being followed, didn't it, in terms of sending results for testing and so forth, very regular testing?-- SIMTARS tried to encourage the use of the CAMGAS GC to supplement the continuous monitoring system, but the primary focus is to ensure that the machine is operable at all times.

Let's just go back to that point. You say SIMTARS tried to encourage that, you are talking about an industry thing, aren't you?-- Yes.

Now, getting back to my question, my question was directed to yourself. There is no occasion on which you said to Abrahamse or Robertson or Selff or anyone else, "Now, listen guys, you have to use it differently to the way you are using it."?-- We don't actually have a policing role in this regard.

You may not, but what I say is true, isn't it?-- Well -----

Whether or not you regard it as a policing role or not, the simple fact of the matter is that that wasn't said by you, was it?-- I believe that it probably was actually said at various times that the uses to which the CAMGAS GC can be put to and they are probably broader than the use that the GC was being put to.

I can well understand you might have made a comment about potential use of the GC. That's not the question I'm asking you to answer. What I'm asking you to answer is whether you agree with the proposition that it is true that you didn't actually say to, say, Selff or Robertson or Abrahamse that they should be using the chromatograph other than the way that they were. That proposition is true, isn't it?-- I think it's a little hazy, a little bit of a grey area actually.

Are you saying you have no memory of saying it, but equally no memory of not saying it; is that the position?-- I would think that the expression that it can be used for various tasks would indicate that we expect it may be used for those.

I'm sorry, the expression "for various tasks", are you saying you might have said something that was taken by you to mean one thing or potentially included one thing but may not have been taken that way by others?-- Perhaps.

It's only a perhaps definition, isn't it? You will have to respond -----?-- Sorry, yes.

I have nothing further, Your Worship.

WARDEN: Mr Clair?

RE-EXAMINATION:

MR CLAIR: Mr Hester, you've just answered some questions from Mr Morrison about what I take to be your understanding of the way in which the gas chromatograph was being used at Moura. What was that understanding? How did you understand that it was being used?-- The chromatograph was being kept in working order which is primary to the CAMGAS philosophy, that is that the workers on site will actually maintain an operational GC through the link to SIMTARS. Outside of that SIMTARS has no direct control over the use that the mine site personnel put the GC to, but I believe that the training courses that SIMTARS offer give details of the uses which the GC can be put to. The responsibility to use the GC in that way lies with the mine site rather than SIMTARS.

You've gone a bit beyond answering my question. Just coming back to your understanding of the way in which it was being used, what was that? First of all, that there was this recording of results and the transmission of results on at least two occasions a week, is that right, to SIMTARS?-- That's correct. SIMTARS requests that the GC be kept in a maintained condition by the transfer of a couple of data and method files each week, and BHP Moura were at least keeping that - keeping to that, and in most cases exceeding that.

The purpose of that activity, that is recording the results, and twice a week at least transmitting the results to SIMTARS is simply to constantly check the calibration of the gas

RXN: MR CLAIR

WIT: HESTER C J

chromatograph; is that so?-- That's correct.

Does it have any purpose other than that?-- Well, the data and method files which are sent to SIMTARS don't necessarily constitute every sample which is run through the gas chromatograph. They are simply a check, if you like, for SIMTARS and for the mine site that the machine is operating within its design parameters. So we may not actually know what samples are being run at individual mine sites, in fact that is the intention, that we don't necessarily have to be - have an invasive presence.

To come back to my question, the purpose of that activity is in effect to check the calibration of the machine?-- The calibration and maintenance of the machine, that's true.

Now, you understood that the gas chromatograph at Moura was being put to that use, that is that it was being used constantly to check its own calibration in effect?-- It was.

Well, what other use - on your understanding, what other use was being made of the gas chromatograph at Moura?-- I don't necessarily, as I've expressed, know what samples are being put through the machine, so it's speculation on my part that the machine may have been being used for analysis of mine gas samples for which it's suitable. I have no evidence either way to say whether it was or not.

You didn't know specifically whether it was being used for that purpose?-- No, but anecdotally I believe that it may not have been.

Now, these other potential uses that were mentioned in the course of the training or whatever you might call it that was offered by SIMTARS as part of this CAMGAS system, what were they? What are the additional uses? Obviously if you keep a piece of equipment calibrated you keep it calibrated for a purpose so that it can be used at some - in the event of certain occurrences?-- Well, one obvious role and the role to which it was put is the monitoring of fire gases after an incident, a heating or an explosion, for which the machine is entirely suitable. It's also able to fill in a couple of voids in the knowledge of gases which are occurring during a heating. That is, it's a machine suitable for the measurement of such gases as ethane and ethylene and hydrogen which are important fire gas indicators. These gases can't be monitored by any other means either by portable monitor or by the tube bundle system. So it finds an important role there.

Now, in respect of the use of the gas chromatograph to analyse gases during a suspected heating, did you ever feel the need to mention to people associated with the Moura mine that they should use it in that way or did you make some assumption that they would in any event?-- I feel that that topic was covered during the CAMGAS seminars which we ran, but bearing in mind the instrument is not a low level CO measuring device it's not to take the place of the tube bundle in that record, it's more to look for the other fire gas indicators like ethylene and ethane.

Beyond the seminars did you feel any need at any time to mention to the people at Moura that were familiar with the use of the gas chromatograph that the gas chromatograph should be used in the way that you mention, that is to analyse even at lower levels the gases associated with a heating?-- Not being aware that there was a difficulty at Moura I imagine that we didn't enforce this thought in the lead up to the August event, but -----

Did you feel that there was any need to?-- No, I thought that that was probably covered during the CAMGAS courses, but we could have supplied that information on request.

What about the use of the gas chromatograph after sealing in circumstances where there might be some question of a possible heating? Did you ever feel any need to mention to anybody at Moura that the gas chromatograph could be used in those circumstances, or again did you simply assume that that was one of the purposes for which the machine was kept constantly calibrated?-- I believe that this information is disseminated through various seminars and CAMGAS courses. Perhaps it would be better to allow Dr Cliff to elaborate on those because I believe he is better prepared in that regard.

I have no further questions, thank you, Your Worship.

EXAMINATION:

MR ELLICOTT: You indicated to Mr Morrison that you had checked one of the on site calibration gases. Can you tell me which one you checked?-- I believe it was the gas marked low span.

Low span. And did you check the concentration of all gases in that span?-- I believe so.

Can you turn to page 18 of the report, please?-- Yes.

You see the heading midway down the page "Channel 4 - Oxygen Monitor"?-- Yes.

I am interested in the sentence that starts in the fourth last line of that first paragraph. Can you just take a moment to read that?-- Okay, yes.

Can you explain that to me?-- When we did the calibration check on 23 August the oxygen channel was found to be grossly in error, but we didn't feel that this was representative of the situation during monitoring prior to the explosion on the 7th/8th of August, nor during the period leading up to that, so - and the indication for this was that the gas levels approaching 20.9 per cent were evident in the results stored on the Maihak computer.

Can I just pause you there? Would you consider readings around 20.5 to be approaching 20.9?-- That's what I meant to indicate.

Thanks, that clarifies that. Can you turn to page 19, please?-- Yes.

There is a section to do with "Tube Bundle Sample Selection System Integrity"?-- Yes.

Did you perform that test?-- I did.

And this was done by - I think it indicates introducing a known gas into the system - was it before the water trap?-- At the water trap connection on the tube bundle system we introduced the span gas as described there.

Now, this wouldn't simulate any loading on the pumps as a result of underground sample lines, would it?-- No, that's correct.

Did you, alternately, introduce the span gas and then fresh air to check for any purging problems?-- During that test we did not.

And I understand there may have been subsequent tests done by Dr Cliff?-- Dr Cliff carried out some tests in October and December which further clarified the situation.

He will, no doubt, tell us about that?-- I am sure that he will.

In your calibration check of the analysers, I take it you have measured what was really the voltage output of the analysers, or it may have been a current output after conversion to a voltage?-- Yes, actually the situation was that checks carried out on the 16th, which were of a preliminary nature, were measured at the PC output but the PC was subsequently taken away to have the data which had been stored on it removed and so testing after that required measurements to be made at the output of the analyser because the PC interface was now no longer present.

These are Unor 6N analysers; is that correct?-- Correct.

Can you tell me if the voltage output of those analysers is linear with concentration?-- I guess that I'm not the best person to describe that, being a chemist rather than an electronics engineer, but I believe that the output is linear.

So, there must be some linearisation within the analyser itself?-- My understanding is that there is.

Do you know what form that takes?-- No, I'm sorry, I don't.

Can you turn to Appendix 2.1.6C which is in Volume 1 of the SIMTARS opus?-- 2.1.6C?

Yes, 2.1.6C?-- Yes.

Would you agree with me that if the output of that analyser is linear, then both of the span gases used for that calibration check can't have been correct, or, conversely, if the span gases are correct, then the output of the analyser can't be linear?-- I would say that the output of the analyser is not linear rather than the former.

So, your indication that the output of the analyser is in fact linear may have been incorrect?-- I'm not sure that I indicated that the oxygen analyser output was linear.

This is the CO analyser, sorry. Sorry, page 1?-- Sorry.

It's CO Range 1 Calibration Check. I will repeat that again. Would you agree that if indeed the output of that analyser is linear with concentration, then the values or the concentrations in both those span gases can't be both correct?-- I would say it's probably the output is marginally not - marginally non-linear.

So, you would assume there is some linearisation somewhere else in the system?-- I wouldn't like to make assumptions on linearisation.

So, you are not that familiar with the Maihak system?-- Not with the linearisation.

At any stage during your calibration checks of the system did

you actually look at the values indicated on the computer screen compared to the values of the span gases used?-- I didn't have the luxury of seeing the computer screen because it had been taken - the computer had been taken away.

So, you weren't able to test the integrity of any software in the computer that may have performed linearisation or other functions?-- Only to say that the preliminary checks carried out on 16 August were checks made at the PC screen and they indicated reasonable levels of accuracy for instruments. They weren't comprehensive enough, though, to check the output of the PLC against the PC.

So, they were single point checks?-- Yes, basically because we didn't have available a wide range of span gases to check with.

Does AS2290 Part 3 require multi-point checks?-- It in fact does require multi-point checks.

So, is that a further deviation from AS2290 Part 3?-- That is correct.

Thank you, nothing further.

MR MORRISON: Your Worship, can I just - I want to clear up a couple of things.

FURTHER CROSS-EXAMINATION:

MR MORRISON: Mr Hester, I understood you - when we were talking about the cylinders, the records of which appear on page 14 - I understood you to tell me that you in fact checked only one of the gases, not all of the gases?-- Yes, that's true.

So, one cylinder and one gas or both cylinders and one gas?-- Sorry, the gases are all contained in the one cylinder, so by checking the one cylinder I checked all of the gases contained within it.

Sorry. So, it's all gases in one cylinder, not one gas?-- Correct.

I understand, all right. Now, Mr Clair was asking about whether you had told anyone at Moura or otherwise about use of the GC after sealing. Now, you mentioned that that information may have been disseminated in courses and that someone else may be better qualified to talk about it, but can you please just answer this question: it would be true to say, wouldn't it, that you did not make such a comment to anyone at Moura - regardless of what's done in courses or what other people might know about it, you yourself didn't make such a comment?-- I don't specifically recall mentioning it, although I have a great number of conversations with persons

operating GC's on site, so I - and I imagine that I try to disseminate as much information as I can, although I wouldn't be able to find evidence of a specific case where I mentioned it.

And the way in which you disseminate information is, as I think you mentioned earlier, that you feel that you might have talked about the potential uses of the machine, that would be the way you would approach it?-- That would be right.

Rather than suggested or necessary uses?-- I never apply a police-like attitude to it. I would never say that it has to be used.

All right. Does that reflect SIMTARS' attitude generally, that they adopt a policy of not in fact suggesting use in particular ways beyond saying, "Here are the potentials, work it out for yourself."?-- That wouldn't be correct to say that.

The last part?-- It's not true to say we suggest it and that you should work it out for yourself.

No, it's certainly SIMTARS' approach to things, or has been in the past, not to suggest particular uses of machines like the GC but rather simply to say, "Here are the potential uses."?-- I believe we do suggest the use of it, we don't enforce the use of it.

I understand. Thank you.

WARDEN: Thank you, witness. If there is nothing further this witness can stand down. You are excused.

WITNESS EXCUSED

MR CLAIR: May it please Your Worship, I call David Ian Cliff.

DAVID IAN CLIFF, SWORN AND EXAMINED:

MR CLAIR: Your full name is David Ian Cliff; is that correct?-- Yes.

Mr Cliff, you are a contributor - well, perhaps I should, first of all, ask you this: you are a principal scientist within the mining research area?-- That's my official position, yes.

Sorry?-- That's my official position, yes.

Attached to SIMTARS?-- That's correct.

You were a contributor to the report that was prepared by SIMTARS in respect of the accident being investigated by this Inquiry?-- I was.

That's Exhibit 5 which is there on the table in front of you; is that so?-- Yes.

Thank you.

EXAMINATION:

MR MACSPORRAN: Dr Cliff, have you prepared, or have you produced for use at this Inquiry a curriculum vitae?-- I have.

Would you look at this document, please? Is that the document you have produced for use here?-- It is.

I tender that curriculum vitae relating to Dr Cliff.

WARDEN: Exhibit 236.

ADMITTED AND MARKED "EXHIBIT 236"

MR MACSPORRAN: Dr Cliff, I don't wish to take you through that chapter and verse, but can you just outline, firstly, your formal qualifications for us?-- I have a Bachelor of Science degree, first class honours, from Monash in Chemistry, a PhD from Cambridge in Physical Chemistry, a Graduate Diploma in Business Administration, a Graduate Diploma in Outreach Communications and a Graduate Diploma in Environmental Studies.

And the curriculum vitae gives your employment history in some detail; is that so?-- That's true.

XN: MR CLAIR
XN: MR MACSPORRAN

WIT: CLIFF D I

And goes on to indicate your membership of professional bodies?-- It does.

And finally to detail the publications you have been involved with over the years?-- It does.

Now, we have heard evidence here - and you may or may not have been present - relating to a seminar conducted by SIMTARS organisation in 1989?-- I have heard that, yes.

Could the witness see Exhibit 29, I think it is, Your Worship? While that's being obtained, Dr Cliff, did you take part in the presentation of material to that seminar?-- I participated in presenting material at the seminar, yes.

That Exhibit 29, is that one of the volumes of material assembled and disseminated at the seminar?-- It was.

Can you tell us, firstly, where the funding originated from for the seminar to be conducted in 1989?-- It was a joint initiative of the Department of Mines, as it was in those days, and the National Energy Research Development and Demonstration Program.

And was there a proposal to repeat that seminar in perhaps a slightly different form for other members of the workforce in the coal mining industry?-- There was.

And was there a proposal to fund such a repeat seminar?-- It was put up for external funding, yes.

When you say "external funding", what was your understanding of that proposal?-- It was put up to NERDDP - that's an acronym for that last organisation - to fund or part fund because we could not fund it internally.

And without mentioning actual figures, is it a very expensive exercise to put on such a program?-- To the level of complexity and rigour this seminar was prepared and presented with the number of experts that we brought in to assist us in this process, yes, it's a very expensive process.

Now, the funding from NERDDP, did that relate to a levy or funds from a levy on coal owners and operators?-- It is. It's funded by - and successfully it's funded by a levy on the coal mine production.

In any event, was it the case that the funding wasn't forthcoming for a repeat seminar?-- We were unsuccessful.

In spite of that, was some work done by SIMTARS to distribute information or part of the information concerned in the seminar from '89?-- It was.

In what form did those efforts take?-- We have adopted a number of approaches over the years: formal presentations at all types of venues from conferences to workshops within industry and at scientific conferences, publication of

research findings and information within a wide variety of levels of publication, informal discussions with individual mines, and even such trivial things as cap stickers to highlight certain aspects of what should be known.

And that's all work carried out by the SIMTARS organisation?-- That's correct.

Can the witness see Exhibit 225, please, Your Worship? You will see that is a copy of a document which was prepared by you; is that so?-- That's correct.

And relates to, in its first part, the dissemination of coal testing results for Bowen Basin coals under the heading "Publications/Technical Papers"?-- It does.

Does that include some of the material that you have just mentioned?-- It does.

In particular, the first item mentioned on that sheet which refers to the early detection and monitoring of fires and heatings in underground coal mines, can you tell us something about that? The date of that is 1991?-- This particular publication was a preliminary report of the NERDDP funded study looking into that topic. It was printed in Melbourne, Combustion Institute Conference.

And then the third item on that page has the same title but dated 1992 and refers to ACARP. Can you tell us what that relates to?-- That was a seminar in July 1992. It was staged by the Australian Coal Association Research Program, which is the successor to NERDDP. At that workshop the paper was presented which showed developments of our research and findings since the other time.

The next item relates to the topic of future directions for the detection and monitoring of heatings and fires in underground coal mines. What did that relate to?-- That was principally the outcomes of a workshop that we held at SIMTARS. It's part of the NERDDP project looking at the Bowen Basin coals. That was presented to the same workshop for information and discussion and input to the further development in our research.

The next item again refers to, "The Early Detection and Monitoring of Fires and Heatings in Underground Coal Mines, pp 5-7" dated 1992 and refers to a publication in the Queensland Government Mining Journal of August, volume 93. What does that relate to?-- That refers to the republication of the earlier ACARP workshop paper. We take the opportunity to present these things at as many different venues as possible.

Then two items further down, we have again, "Future Directions for the Detection and Monitoring of Heatings and Fires in Underground Coal Mines, pp 13-15" in the same journal - that is, the Queensland Government Mining Journal, the December volume of that?-- That was the republication of the second paper we presented at the ACARP workshop.

Then the item of yourself, Mr Bell and Mr O'Beirne of 1992 referring to the "End of Grant Report", "Investigation of Bowen Basin Mine Fire Gas Analysis Parameters" as part of the NERDDP program; is that so?-- That was the final port for that project, which is the two year research project. It was presented in March 1992, from memory.

The second last item on that page refers to a mini-symposium relating to, "Recent Developments in Underground Mining in the Bowen Basin", a symposium conducted in Emerald in July 1993 relating to, "The Detection and Monitoring of Goaf Heatings"?-- That's correct. That is a presentation that we gave to AUSIMM on the development since the end of the Bowen Basin project and its applications.

That was held in Emerald, was it?-- That's correct.

Then the last item there on that page, "(1993) 25th International Conference of Safety in Mines Research Institutes, South Africa, The Use of Gas Analysis to Aid in the Early Detection and Monitoring of Fires and Heatings in Underground Coal Mines"?-- That's correct, that's a broader paper that was presented to summarise the findings of our research and work carried out up until that date at a conference of specialists from mines safety research institutes.

And then over the page it refers to a publication in 1994 in the Australian Coal Journal, volume 43, with the same topic, in effect - an article occupying pages 15 to 23?-- It is, in fact, the same article. We were asked to reprint it in the Journal.

The Australian Coal Journal - does that have, to your knowledge, a wide distribution in Queensland?-- In my understanding, it does.

The last such paper outlined there is May 1994; refers to the SIMTARS news magazine of May/June that year, and again it appears to be the same type of topic; is that so?-- It is, in essence, the same paper abridged for publication in our newsletter.

So, it appeared in the Australian Coal Journal and then later in the abridged form in the SIMTARS news magazine?-- That is correct.

And again the SIMTARS news magazine, does that have, to your knowledge, wide distribution?-- I believe it is distributed to every coal mine or every one of our clients, for that matter, in Queensland, and major people outside this State.

Now, before I come back to some details of those topics, you then go on to talk about seminar presentations. It is on page 2 of that exhibit?-- That's correct.

And you deal with the first one, which has your name attached to it, for the seminar at Blackwater Rescue Station in December 1990, "Use of SEGAS for Gas Analysis and Interpretation"?-- That's correct. SIMTARS staged a one day seminar in December 1990 at the Blackwater Rescue Station. We specifically highlighted a number of computer derived packages for use in the mining industry. SEGAS is specifically designed as an adjunct to CAMGAS for aiding in gas analysis and interpretation.

Just to tell us something more about that - you know, the CAMGAS system enables analysis of samples in various areas underground; is that so?-- That's correct.

Does the SEGAS package enable interpretations by various trending and operations of that data?-- It does.

And what sort of trends can you produce on the SEGAS software package?-- SEGAS is specifically formulated to allow trending of gas concentrations as received and on an air-free basis. If you feed in additional information, such as barometric pressure and air velocity, then you can plot it using make calculations. In addition, there are a number of equations you can either - which are pre-programmed or that you can, in fact, put in yourself, so that you may calculate any number of the standard ratios or mine-specific ratios that you may wish to use, and they, in turn, may be trended.

When you talk about trending of make, are you referring there generally to, perhaps, methane and/or CO make?-- Yes, but not necessarily. They can be used - depending on the mine, you may be interested in knowing your CO make in a seam gas, you may be looking at intrusions, you may be looking at, for example, the effectiveness of inertisation if you are using nitrogen or carbon dioxide, and it can be done through this program.

Then in the same seminar I think you refer to the same presentations relating to, "The Early Detection and Monitoring of Fires and Heatings in Underground Coal Mines"?-- The ACARP seminar, yes.

And in the ACARP one relating to, "Future Detections and Monitoring of Heatings and Fires in Underground Coal Mines"?-- That's correct.

You go on to refer to a safety conference in August 1992 where you delivered a presentation, apparently, on "Bowen Basin Coal Fire Mine Gas Analysis"?-- That is correct. That was the End of Grant Report essentially to the managers and their representatives at this annual conference.

Where was that conference held, do you recall?-- Yeppoon.

Again, there is a reference to a group meeting of Bowen Basin geologists at Gordonstone in November 1992 where you presented on the topic of, "Bowen Basin Coal Fire Mine Gas Analysis" again - same area?-- I was invited to attend this meeting. Geologist have regular three monthly meetings and they asked me to present on this matter.

You go on to say in summary form in the exhibit, "In addition to half day training courses utilising results from NERDDP projects in the use of SEGAS PLUS were presented as part of the CAMGAS training course in February 1992, and full days in the courses in March 1993 and October 1993."?-- That's correct.

Can you tell us a little bit more about what that involved?-- SEGAS PLUS is an expanded version of the original SEGAS program. What we attempted to do in the original February course is to show how we can use it as an adjunct to the CAMGAS, its operations, its uses, its limitations, and what the various trends can and cannot mean. Following interest in that half day, and because of developments in our research over a period of time, that was expanded to a full day where we went into things in more detail in the latter courses.

You mention as part of that summary the CAMGAS training course?-- Yes.

What does that generally involve?-- These formal CAMGAS training courses are run to re-acquaint and re-familiarise operators with the practicality of running a CAMGAS GC on site. It specifically looks at problems and uses of the CAMGAS GC - things like operational problems and how to get around them, how to identify different things and what uses you can use with the GC, too.

So, it deals generally with the use that a mine operator can make of the CAMGAS system on site; is that so?-- Yes, it does.

Those courses were held, as your summary indicates, in February 1992 and in March and October 1993?-- These are the courses run prior to Moura, yes.

And then, to be complete about it, that's an ongoing process, is it, the CAMGAS training course?-- We have run one since and we have two more scheduled for this financial year.

At those courses, is literature distributed?-- It is.

To all the attendees?-- It is.

In addition to that, are the attendees told that SIMTARS, as an organisation, is available to advise should problems arise?-- Yes, it is.

And, indeed, from time to time, has it been your experience that operators do seek assistance and receive assistance from SIMTARS?-- We do our best to assist the mines when they ask us for advice, and they do.

That advice is always available?-- It is. My colleagues and I wear pagers, so we are always contactable.

Is that a practice that's been in operation for some years?-- As far as I'm aware it has been in operation since SIMTARS was formed.

Which was?-- Officially on site in November 1988. I have only been in the organisation since the beginning of 1989, but we have always been available, to my knowledge, since then as well.

Can I take you, then, to some of the material? Can I take you to - you have the volumes in front of you. Look at volume 2 of the SIMTARS appendices. In particular, Appendix 5.2(A)?-- Yes.

Do you have that?-- I have that.

And that Appendix 5.2(A) contains or appears to contain two separate items; is that so?-- That is correct.

The first being the publication under the title, "The Early Detection and Monitoring of Fires and Heatings in Underground Coal Mines", and I don't know at what stage-----?-- This is, in essence, one of the 1993 publications.

So, it is one of the ones documented on Exhibit 225 - it may not be important to actually identify it, but it is one of the ones that is outlined as having been presented and disseminated; is that so?-- In essence, yes. In fact, I believe - to be honest, it is actually the abstract of the NERDDP report itself.

And the second part of that appendix, which is under the heading, "Future Directions for the Detection and Monitoring of Heatings and Fires in Underground Coal Mines", which does have a date at the bottom left-hand corner on the first page of it, which is page 6 of the actual appendix, the date of December 1992; do you see that?-- That's correct.

Now, that extract in the appendix is one of the publications of that presentation; is that so?-- That's correct, that's from the ACARP workshop.

And the actual presentation occurred earlier in 1992?-- It did, and the actual workshop itself that created this was done in January 1992.

All right. And that second part of Appendix 5.2(A) is simply

one of the forms in which the material from that presentation was published?-- It is.

In that case, it seems to be the publication of the Queensland Government Mining Journal?-- That's correct.

And again does that have, to your knowledge and experience, wide dissemination in the mining industry?-- To my knowledge it does, yes.

Could I take you back then to the first article in that appendix, which is, "The Early Detection and Monitoring of Fires and Heatings in Underground Coal Mines", and could I refer you to the second paragraph of that article - the first page of that article where you refer to the setting up, if you like, of the gas chromatograph and CAMGAS system at mines in Queensland?-- Yes.

Can you just tell us again about that? You say it was as a result of the findings of the No 4 inquiry that such course was adopted?-- That is correct. The actual recommendations, I believe, refer to a gas chromatograph at the Mines Rescue stations, but it was felt - that was felt to be impractical, and so these Gas chromatographs have been installed at each major coal mine in Queensland instead.

And the last paragraph - the last sentence of that paragraph refers to the fact that through the system, "...reliable gas analysis is possible at the mine site without the need for qualified chemists to be on site."?-- That's the essence of the system.

You refer in the next paragraph in that article to research in the area to discover the applicability of the criteria for overseas coal to Australian coals?-- That's true.

Can you tell us something about the results of that research?-- We have been conducting tests in a laboratory and looking at actual goaf heatings throughout Queensland and other Australian and New Zealand coal mines for the last five and a half years and comparing it to results taken from overseas, because the conventional wisdom used in evaluating mine fires and heatings is based on overseas experience, and we are concerned with the degree of applicability of those findings.

So, is that research - it has been an on-going process you say over the last five or five and a half years?-- It is an ongoing process.

You detail, starting on page 1 of that presentation, the description of the program that was undertaken to do the research in the laboratory?-- Yes.

Again, briefly, can you just summarise what the work method was - how it was done?-- This is a - we have adapted a standard laboratory test that's used for predicting spontaneous combustibility of coals, because the emphasis from our point of view is not on whether the coal will

spontaneously combust or not, but rather assuming that it does, what are the indications? So, the details in this Appendix describe the adiabatic oven which is used - the size of the coal, it is air dried, it is crushed. This is to ensure that we have a standard and comparable test where you can compare different coals, because they are tested under the same conditions. We then pass air through the coal, we heat the coal externally to ensure that it does get hot to various temperatures, we sample the off-gas by gas chromatography to analyse for a wide range of gases as depicted there.

All right. The sort of laboratory work you are there talking about, had that been done with overseas coals many years ago?-- The standard graphs that you will see in all the conventional literature refer to tests carried out in 1971 by Mr Chamberlain in Britain on Westoe Colliery coal, and - as far as I am able to ascertain, under basically identical conditions.

So, that's - or that work in 1971 has been used to provide some sort of parameters for those coals?-- They were the basis of his work and subsequent people have lifted his diagrams and interpretations since then.

The sort of work you have been doing in the last five and a half years or so is to try and relate similar sorts of parameters to local coal?-- Indeed.

On the same basis - same sorts of tests?-- Yes.

You go on then on page 3 of the appendix, a little over half-way down, you refer to a seminar being held in January 1992 involving Queensland Department of Resource Industries, mines inspectors, ACIRL, the United Mine Workers Federation, mine fire experts from New South Wales and SIMTARS project staff, the purpose being to evaluate the current thinking regarding mine fire indicators?-- That's correct.

That exercise, as you say, conducted in January 1992, did that in fact result in ultimately the publication referred to later in the same appendix?-- That publication is a precis of the findings of that workshop.

Was that seminar and analysis carried out by personnel from MineRisk amongst others?-- MineRisk was the facilitator of that workshop.

I will come back to that a little later, but can we just move on? You say in this paper, the main findings and conclusions, in the second sentence of that paragraph you say, "The best current indicator of the onset of a heating was found to be Graham's Ratio. There was found to be no reliable way of monitoring the progress of a heating particularly after sealing."?-- That's correct.

Now, again briefly at this stage can you just explain what that means?-- The evaluation of the data in the laboratory and comparison to the conditions which are likely to exist in a goaf indicate that Graham's Ratio is a good indicator of the onset of a heating. In other words, the change in Graham's Ratio from what you would expect in a non-spontaneously combusting environment to what is spontaneously combusting is significant. However, once the sealing occurs if you are trying to estimate the intensity of a heating after sealing, because of the complexity of the chemistry involved in the reactions it was felt, and I still feel, that it is complicated to do any further interpretation, especially if you do not have the full resources and analysis and background to carry out that interpretation.

Again I will indicate I will come back to this a little later, but are you saying here that the best current indicator as at the date of the article of the actual onset of a heating was still Graham's Ratio?-- Yes.

But that to monitor it's progress, and by that you mean intensity, you have no reliable way of doing that after sealing?-- That's true.

But in terms of whether a heating exists, detection of whether a heating exists after sealing, what are you able to say?-- I would use Graham's Ratio.

You go on there in the next paragraph, and in fact the last paragraph on that page, to talk of again the CAMGAS system and you refer to it being , "With minor modifications the GC could monitor for higher hydrocarbons as well." Now, what would be the advantage in having those minor modifications made to a gas chromatograph?-- In an environment where you are only

trying to detect the progress of a heating and not worrying about extraneous complications like potential for explosion, if you are trying to identify the intensity of a heating then it's been our experience, and that confirms overseas experience, that the intensity can be monitored by noting the presence or absence of a range of hydrocarbon gases and therefore by extending the capability of the GC to include the ability to monitor for those higher hydrocarbons you can therefore get an indication of the intensity.

Is such a modification of the gas chromatograph easily done?-- Yes, it principally requires a longer transition time in the columns in the GC. It's a mechanical modification.

Perhaps in relation to that, if you turn the page, page 4/8, about perhaps two thirds of the way down in the section dealing with recommendations you make this statement - it's the fourth paragraph in: "The detection of hydrogen and carbon monoxide can be considerably enhanced if a special detector is used on the GC." Is that what we are talking about?-- That is - the current gas chromatograph has certain detection limits. Carbon monoxide, for example, is approximately 10 ppm, hydrogen is between 50 and 100. Because they are sensitive indicators of spon com, if a special detector was fitted to the GC you could enhance that by orders of magnitude.

Now, at the top of that same page you go on to speak of - you outline really the main findings and conclusions in relation to your laboratory tests on local coal?-- I do.

In terms of the liberation of various gases at various temperatures?-- I do.

You indicate in that section that there is some uncertainty as to whether the local coal follows the overseas experience?-- That's true.

I think you conclude by saying in the last paragraph there on that page, "The critical review of existing interpretation techniques, and project data highlight change of state as the most significant factor." Is that so?-- That's true.

Can I take you to in fact the seminar that you have mentioned was conducted in January 1992 which was facilitated by the MineRisk organisation?-- Yes.

Can you look at this document, please? Now, that's entitled, "A Review of Diagnostic Techniques for Detection and Monitoring of Mine Fires." Is that so?-- It is.

Now, is this the review process again that resulted in the publication of the article headed, "Future Directions for the Detection and Monitoring of Heatings and Fires in Underground Coal Mines."?-- It is.

I want to take you to some parts of that. If you turn to the second page which is the first page of the actual text you will see there is - there is a section dealing with the

introduction and review objectives. Can you tell us about that?-- Yes, the - this workshop was convened to focus our research directions and to gain a maximum exchange of opinion from those people thought to be the most aware of this problem in Australia and -----

And personnel are outlined under the heading "Review Approach". That was yourself and Mr Stewart Bell from SIMTARS?-- That's true.

Mr Terry O'Bierne and Mr Zoltan Nemes-Nemeth from ACIRL, Mr Brian Lyne and Barry Biggam from the Department of Resource Industries?-- Yes.

Mr Bill Allison from the United Mine Workers Federation?-- That's correct.

And Mr Paul Mackenzie-Wood from the Southern Mines Rescue organisation?-- That's true.

As you say, the whole review was facilitated by Mr Jim Joy of MineRisk. Now, what was the purpose of having this review? What was the reason behind having this group of people from the industry get together and review these rules or indicators?-- It was of concern to us and others in the industry, the colleagues, particularly people like Paul, that there was deficiencies in existing rules and processes for the detection and assessment of spontaneous combustion, and we felt that by discussing this matter and by formally tabulating what we believe was industry current practice and establishing what would be the ideal or potentially ideal indicators and processes we might be able to identify effectively what needs to be done to head towards those goals.

Then you go over to outline the results. You say under the headings - firstly, "Identification of stages of a heating." Is that so?-- That's correct.

There are five stages listed in respect of that?-- That's correct.

And then there was a listing of the rules that applied?-- That's correct.

Now, what do they relate to, the rules?-- We provided a list of rules or procedures or truisms we actually use in here that are used currently in the mines within Australia, as we understand it in Australia.

Is that a listing of rules that the parties participating in the review believe were the rules that applied in their areas or in their experience?-- Within our experience, yes.

Then you go on to speak of the objectives and criterior; is that so?-- That's correct.

Rule analysis?-- That's correct.

And can you describe just a little bit further the process

involved in the rule analysis part of the review?-- The existing rules were compared with the objectives and criterion set for the ideal rule. In other words, what should be achieved, and where there were differences we evaluated the significance of those differences and then suggested changes or modifications required to those rules.

Now, can you tell us something more about the criterion for developing rules that could be used, for instance, at a mine site?-- The criterion, I think, are detailed further into the report.

Go to those now if you wouldn't mind, just to perhaps make it clear what the criterion were?-- Well, this is Table 6 and 7 et cetera. They list the criterion. For example, on Table 6 for - prediction of spontaneous combustion has criterion such as being - the criterion must be accurate, valid, current, applicable, credible, easily accessed, simple, yes and no. In other words, black and white. There is no room for equivocation. They must be seen to be applicable or perceived to be applicable and they must be part of the management system.

Can you tell us what the general thrust of those criterion are? What's the basis for the selection of those particular items as criterion for the rule you are trying to develop in respect of these areas?-- It was - the aim of the exercise was to identify rules that could be used in mines with confidence, and therefore they had to be applicable, they had to be accurate, they must be easy to use so there is no possibility of error, and they must be able to give an answer yes or no.

When you say they are designed ideally to be used at the mines, you mean used by scientists employed by the mines or by personnel who are ordinarily employed at the mines?-- The aim was for mine personnel, mine management particularly, but mine personnel.

And does that form the basis, in some cases perhaps, of a recommendation from this exercise of deleting certain rules because of the room for perhaps confusion without scientific analysis of the basis for the rule?-- It does.

So you are looking for a simple, easy to use indication that has very little room for error?-- Exactly.

Can I take you back then to the conclusion section, 4.6 in the front of the review data?-- Yes.

You set out there the team conclusions as being, "Very few of the existing rules met the criterion set for 'good' or 'ideal' rules."?-- That's correct.

Again those criterion we have just gone through as simple, easy to use, and really not subject to significant error?-- That's correct.

"Many of the rules need modification."?-- We believe so.

"Some of the rules are possibly being used in stages of mine heatings for which they are inappropriate or possibly totally misleading."?-- Yes, that's right.

"Rules related to CO make, when made mine specific, are currently the best for earliest identification of a heating."?-- Yes.

Again we will come to that in the tabulation you've done, but that was a conclusion reached after the review?-- Yes.

"The research work has generated data for Bowen Basin mines which can be used to define more precisely rules for identification and monitoring of a heating; which can aid in predicting peak coal temperatures; which can produce a hierarchy of gaseous emissions with increasing temperatures." Is that really a reference to the research work you had at that stage done in relation to local coals?-- It does.

Then you refer finally to the Logic Trees, Figures 2 to 4, which "...offer an outline for the best available methods for measuring spontaneous combustion related information...", and so on?-- Yes.

Can I take you then to some of the more specific areas, the first of which - if you look at Table 2 of that compilation - do you have that?-- Yes.

This is the table dealing with identification of a heating, and the first rule there is "Graham's Ratio is greater than 1 then heating (new coal only)."-- That's correct.

No 2, "Graham's Ratio is greater than 2 then heating (old coal only.)"?-- Yes.

Can you tell us the origin of those statements and this material, that is the relationship or the absolute values of Graham's Ratio for new and old coal?-- This was the statement of what we believe is currently used within the industry.

You say currently now or currently then?-- Sorry, currently as at January 1992.

So the figure said to be for new coal was a Graham's Ratio of greater than 1 and greater than 2 for old coal?-- Yes.

Those figures would indicate a heating?-- Yes.

Again on the same table you refer to CO make?-- Yes.

That's rules 6, 7, 8 and 9 really; is that so?-- That's correct.

No 6 is, "If CO make is greater than 10 l/min then investigate."; 7, "If CO make is greater than 15 l/min then initiate action", said to be Australian origin?-- That's correct.

No 8, "If CO make is greater than 20 l/min then initiate control measures", and that's said to be of German origin?-- That's correct.

Finally, "If CO level is greater than background then investigate."?-- That's correct.

Can I take you firstly to number 7 which is said to be 15 lpm when you initiate action, Australian origin?-- Yes.

What are you able to tell us about the source of that rule in this table?-- I believe this is because the work that - the interest that John Brady and Ron McKenna at Cook Colliery had in CO make and in applying it in their situation. This number 15 was interposed between the 10 and the 20 as an extra trigger level.

As the level where you would initiate action as opposed to just somewhere between 10 and 20?-- Exactly.

That was the experience of, you say, Mr Brady and Mr McKenna?-- Yes.

Who was Mr McKenna?-- At that stage Mr Brady was the mine manager at Cook Colliery and Mr McKenna was senior official at the mine. I'm not quite sure of his position.

Rule 8 refers to the 20 lpm level where you initiate control measures and that's said to be German origin?-- Yes.

Do you know anything about the -----?-- This does come out of the work that's been mentioned by previous people. It's actually, I believe - the articles refer to a working party set up in Westfalen and the 10 and 20 come out of that work.

I want to take you to the tables towards the back of that document, and in particular Table 12. Do you have that?-- I do.

Again this is a tabulated form of what we have been talking about where in - the second column from the left duplicates the Table 2 we have just referred to; is that so?-- That's correct.

Under the heading "Existing Rule", the next column to its right is a column referring to differences and significance of differences?-- That's correct.

And the final column on the right-hand side of that table is "Required Changes (delete, modify or replace)"?-- That's correct.

Now, dealing with Rules 1 and 2 which, as we know, speak of the Graham's Ratio values indicating a heating for new and old coal?-- That's correct.

The differences and significance of differences for those two rules is said to be this: "Old coal vs new cold unclear. Should be trended so there is..." that increase over

history?-- Yes, yes.

You need a plus or minus range for the particular seam and it's a complex calculation?-- That's correct.

Now, can you tell us a little more about the discussion that ultimately resulted in those points being made?-- It was felt that for a general mine person to apply such a ratio to put things in like old coal and new coal would only muddy the situation, that the fact that - it was felt that from the laboratory evidence could not substantiate necessarily the levels that were indicated in the literature, the 1 and the 2, and therefore it was much more preferable to establish the normal range for Graham's Ratio one would expect at your seam in your mine, and that therefore if you trended it over time and there is an increase it's a far more reliable indicator.

As opposed to relying on some absolute values as the only guide?-- Exactly.

You refer there to complex calculation. Does that relate to any attempt to calculate the emission - beg your pardon, the ratio obtainable in relation to new and old coal?-- It does, but it also refers to the fact that the way Graham's Ratio is normally applied is assumed that the gas that is entering an area is fresh air whereas in fact there is a more general formulation that requires the knowledge of the gas mixture prior to passing through an area and leaving the area.

Then the "Required Changes" column which includes in its first entry these two rules in relation to Graham's Ratio, recommends that they be deleted and with the comment "Good for progress of heating only."?-- Yes. You have to understand that this MineRisk process only gives you three options. You either delete, modify or replace, and given the absolute numbers were the indicators, we felt that it was inappropriate to cast in stone these numbers to be used in isolation, and therefore it was recommended, as already discussed under differences, that these numbers should not be used as absolute indicators but rather you should look at the trend, the progress of a heating.

Can I take you then down to the CO make rules and CO level

rule, that's rules 6 to 9 inclusive? For 6, 7 and 8 in the "Differences and Significance of Differences" column you have these comments: "Are air flows valid? Must consider background. CO make...", and these points: "Easy to do; if done correctly and CO background known; overseas results, but appear valid." Can you tell us something more about the discussions resulting in those points being made?-- Well, the essence of the CO make is a very simple calculation. CO is easy to measure accurately at very low levels, so, therefore, it's easy to do. If you know the background, then you can measure very easily and very quickly the difference between that and the background. The only real caveat is on the accuracy of the measurements in terms of the ventilation. The results are based on overseas - the German work which has been dealt with in detail here, but I am aware of application in Queensland both at Cook Colliery and at New Hope on a number of occasions where, using these indicators, has enabled adequate control measures to be put in place to prevent a heating getting out of hand.

When you talk about these measures, you mean the 10 to 20 lpm figures?-- Yes, particularly the 10 litre.

You say you are aware of your experience of that figure being used at, firstly, Cook Colliery?-- I am.

Can you recall when and in what circumstances?-- No, I don't, but both John Brady and Ron McKenna are what you would call an advocate of the CO make calculation, and Cook has a history of minor heatings.

You indicated further an instance at New Hope Colliery?-- I have personally attended to two minor heatings at New Hope Colliery where, I suppose, by absence is the best way of putting it, because they acted at a 10 lpm CO make to control measures of a heating and that heating was successfully controlled on those two occasions.

Can you tell us approximately when that was?-- 1989, July, and 1991 - I'm not quite sure what month. I can't tell you offhand.

When you say because action was taken at about the 10 lpm figure, was there discussion at the mine - that's New Hope - about that figure being the appropriate one to initiate action?-- There was considerable discussion about what the 10 lpm actually meant, but in the end they decided to accept the 10 lpm as an indicator.

And that's the source of this, or part of the source of the comment, "Overseas results, but appear valid."?-- Exactly.

Now, the required changes are said to be for those rules 6 to 8 inclusive: "Modify rule to 'If CO make trend increases over a range set for the specific pit (based on background (CO), then heating is present.'"?-- Exactly. This goes back to our fundamental conclusion of this workshop, that not to use absolute numbers but to use trends and differences from normal

behaviour.

Now, that's the ideal situation?-- That's right.

Ideally if you could establish a background CO make figure, you could then work from that figure to monitor increasing trends in CO make to enable you to detect at an early stage, hopefully, a heating?-- You would detect abnormal behaviour, which is the aim.

Which may be relative to a heating?-- Exactly.

Is there a difficulty in that ideal situation inherent in establishing a background CO make level potentially?-- From my understanding of the mining methods, yes, because as has already been alluded to at this Inquiry, the CO make would depend on a number of factors and you have to compare like with like, I believe. From my knowledge of the chemistry of the coals, well, that's true.

Well, if you can't in fact, or at least have difficulty in establishing a background CO make level, what is the answer in terms of monitoring the early onset of a heating?-- I think that it is responsible, in the absence of better information, to use the indicators other people find satisfactory.

And those indicators have been tabulated in one form or another in the "Existing Rule" column in this review process?-- They are.

Again, had you had the resources and expertise available to you and you were able to establish a background level, that would be the ideal way to monitor for a heating with CO make?-- I believe so.

I suppose is that an area that needs to be researched, that is, how you would establish a background CO make level for a particular coal or panel?-- I think it would be a method - an area that should be looked into, yes.

Now, I think this material, that is, the review process, indicates the stages 4 and 5 processes weren't carried through at this review; is that so?-- That is correct. This process took, from my recollection, five days to get that far and there was an enormous amount of discussion and uncertainty in some of the conclusions and we felt we couldn't, in the time, complete the other two parts, and also the first three parts were thought to be the most important. It's more important to prevent the horse from bolting than to shut the door afterwards.

I think you go on to say in the material that blank forms relating to those two stages were in fact distributed for use by the various participants to continue their remarks in relation to those areas?-- They were.

Just for the sake of completeness, rule 9, which is the CO level increasing against background, the modifications suggested there at table 12 is this: "If CO level trends

upwards, etc" - that's what you are looking for, the upward trend in CO level?-- Yes, we are looking for an increase in CO concentration.

Bearing in mind it's important to have the monitoring location in the panel return?-- The importance of ensuring a representative sample and to understand the limitations on that sample is paramount.

I tender that Minerisk document, Your Worship, relating to a Review of Diagnostic Techniques for Detection and Monitoring of Mine Fires carried out in January 1992.

WARDEN: Exhibit 237.

ADMITTED AND MARKED "EXHIBIT 237"

MR MACSPORRAN: And again for completeness, that's the material in an abridged form, if you like, and including the tabulations, that appeared in various publications thereafter?-- That's correct.

One of which is included in Appendix 5.2(A) as the extract from the Queensland Government Mining Journal from December 1992?-- That's correct.

Could I take you then specifically to the consideration of the Graham's Ratio and its usefulness in detecting a heating? Firstly, can you tell us how you would use a Graham's Ratio before a panel was sealed to detect whether there was a heating possibly present?-- If you were running in a flowing air stream with fresh air as the incident air flow, then I would use - from what I understand and my experience, the Graham's Ratio would establish a background which I believe that .4 or .5, as stated in the normal rule, is more than adequate for and anything above that would indicate to me that there is a heating in progress.

Then you come to the situation where the panel is sealed, and what's your view about the usefulness of the Graham's Ratio figure once the panel has in fact been sealed?-- Graham's Ratio has significant limitations if it's applied blindly to the analysis of sealed areas, and I think David Humphreys has already very adequately detailed the limitations. The point is with those limitations that if you do the analysis, you find that Graham's Ratio will always be underestimated in a sealed situation rather than overestimated and, therefore, the danger is you will not recognise how severe the situation is.

Could the witness see Exhibit 223, please, Your Worship? Dr Cliff, you see that appears to be a representation of the Graham's Ratio at the 512 seals area on Sunday, 7 August last year?-- I do.

And the bottom line is said to be what the Graham's Ratio was

XN: MR MACSPORRAN

WIT: CLIFF D I

showing from the data being displayed on the screen very early on the Sunday through to just before midnight the same day?-- Yes.

Showing the Graham's Ratio going from just under .2 to a maximum which appears to be just over .8?-- Yes.

Can you comment, firstly, on those figures in terms of what they would show, in your opinion, as to whether a heating was present behind the seals in 512?-- It is my opinion that indicates there is a heating behind the seal.

You see the upper line is said to represent the corrected Graham's Ratio trend, the correction being made for what was a deficiency in the - or an error, I should say, in the oxygen analyser reading detected at point 14 pump room initially?-- Yes.

Giving a Graham's Ratio trend starting early on Sunday at just over .4 and trending upwards to what appears to be about 1.1 -----?-- That's correct.

----- at about the time of the incident. Again, that would indicate, in your opinion, the presence of a heating?-- Yes.

Have you looked at some data and compiled a graph in relation to the Graham's Ratio - the behaviour of the Graham's Ratio for the sealing of the 401/402 panel at Moura?-- Yes. BHP supplied us with information from the sealing of 401/402 Panel and we carried out calculations based on what the Graham's Ratio was in 401/402 after sealing.

Would you look at this graph, please? Is that the graph you just referred to?-- It is.

Can you tell us what that displays in significance of the trend indicated there, in your opinion?-- This indicates to me what I have seen from such similar ratios in sealing of panels where there is no evidence of a heating.

Now, this graph represents the trend of Graham's Ratio behind the seals in 401/402 in about February or so of last year; is that so?-- That's correct.

And the bottom axis gives room to plot daily ratios; is that so?-- This graph has daily ratios on it, yes.

So, we have the Graham's Ratio in about the first day increasing in fact from just under .2 to just over .35?-- That's correct.

And the second day increasing, although not as quickly, again before dropping away and steadily decreasing over the next month or so?-- That's correct.

Well, can you tell us, firstly, why you would expect the Graham's Ratio behind a sealed panel to increase at all?-- With the removal of ventilation from a panel, the heat dissipation from that panel will not be carried out and,

therefore, one would expect the coal to become marginally warmer, a few degrees, which will enhance the oxidation process of that coal initially and, therefore, produce a little bit more CO. We are talking probably - my experience and those of overseas workers is 3/4 degrees centigrade rise in the surface temperature of the coal to give such a behaviour, but then the oxygen concentration starts to fall and surface oxidation doesn't become enhanced because there is no heat in the coal, it's just the surface of the coal is a little bit warmer, the air is the same temperature, so it falls away.

So, if there is no other activity present such as a heating, you would expect, would you, in your opinion, for the Graham's Ratio figure to rise in a normal way shortly after sealing?-- To some level, yes, to some background level.

And is the rate of increase in that ratio after sealing a significant feature? Perhaps "rate" is not the right word. Is the absolute level it reaches after sealing on the increase a significant factor?-- It is - compared to what is the norm for such events, that is a significant level, so in this case going to .35 would not be considered - provided one has data from other sealings as well to confirm this, but in general in the absence of any better information it would not be considered a heating, and subsequently because of this the oxidation process falls away.

And the point at which it starts to fall away might depend on a whole host of other factors?-- Yes. Because of the complexity of the sealing operation and the goodness of seals and how active this coal surface is, the temperature of the coal surface, it is hard to estimate or to predict in isolation the rate of decay.

Well, relating that then to the behaviour of Graham's Ratio for the 512 Panel as evidenced in Exhibit 223 - which I think you still have with you - again does that assist you in your opinion that the Graham's Ratio there evidences a heating behind the seals?-- I think that the comparison of the two, especially on the as-received basis at Moura mines, indicates significant differences and, therefore, one would not be wise to assume that there was not a heating in 512.

And are you referring there to both trends on Exhibit 223, that is, the one that would have been seen had it been looked at or the figures looked at on the computer as it then was analysing and those with the corrected figures?-- More particularly the uncorrected figures, I think, to make a direct comparison, but, for example, the rate of change in 402 of increase was approximately .15 in a 24 hour period, whereas we achieved the .15 rate of increase in a matter of three or four hours in 512.

I think you were present for evidence given by Mr Humphreys in relation to the rate of increase of the CO parts per million behind the seals in 512?-- I was.

Is that a similar phenomenon in the sense that the rate of

increase in that gas has the same sort of significance?--
They are obviously closely related, yes.

I tender that graph described as the Graham's Ratio trend
after sealing in 401/402 in February 1994.

WARDEN: Exhibit 238.

ADMITTED AND MARKED "EXHIBIT 238"

MR MACSPORRAN: Dr Cliff, finally, just for my purposes,
mention has been made and you have heard in evidence in
questioning of Mr Humphreys about the tests carried out to
determine integrity of the tube bundle system at Moura No 2?--
Yes.

Again, for my purposes, were you involved in tests on that
system and its integrity carried out in October and December
last year?-- I was.

You have heard reference made here in some detailed
questioning to a potential problem in respect of the
monitoring points of purging and/or leakage of those points?--
I have.

And, indeed, further cognisance may have been evidenced of
solenoid bank leakage, manifold problems, things like that?--
Yes.

You were the one from the SIMTARS organisation who had most
involvement in those tests and that analysis; is that so?--
In October and December certainly.

Are you able to tell us your opinion as to whether or not the
difficulties evidenced generally from that analysis related to
purging or leakage or something else? I realise it may not be
possible to give a very simple answer to that, but generally
speaking at this stage?-- I believe from the information we
had, which is limited, it is not possible to discriminate
between the two, and I think there is evidence from the
limited data we have that suggests both. I would also point
out that the reason that we have suggested things in our
report is based on the experience that both David and I and
others have with similar systems and the potential problems
one often encounters in those systems.

And in respect of that you say both your experience and that of Mr Humphreys with that system - that's the Maihak system, is it?-- The tube bundle systems, not particular the Maihak systems.

And what has been your experience, and indeed, perhaps, your information as well from the supplier of the system as to the likelihood of the system having a purge, or a purging problem, as opposed to a leakage problem?-- I have been informed by Maihak that they would not consider purging a problem because of the design of the sampling times considered adequate to allow the cuvettes or samples cells in the analysers to purge.

I take it though from your earlier response that you don't, from the work you have done, exclude the possibility that purging difficulties did occur in some of these points we have been talking about in this system?-- It is very difficult to categorically - to exclude that possibility.

Finally, in relation to that, can I somehow relate that issue to the oxygen error apparent in point 14, the pump room, which has significance itself, as we have said, in the determination of Graham's Ratio?-- I think it is valid to point out that we - when we acquired the data from the Moura Mine computer, we have taken every reasonable effort to ensure the quality of that data, and therefore we have done every test we can within reason to ensure that we know what is happening on the mine system. It is our opinion - not just mine, but the SIMTARS staff - that the oxygen analysis was slightly out of absolute calibration, within tolerance, and therefore not misbehaving, but it is imperative to ensure that it is reading absolutely correct for the Graham's Ratio to have any real meaning when it is close to fresh air, and therefore we make adjustments in our analysis for things like carbon dioxide content of the air and the fact that the oxygen content may be slightly lower than it actually is.

All right. Could the witness see Exhibit 228, please, Your Worship? Dr Cliff, you will see this is a series of graphs that relate to the behaviour of various gases as trended at point 14, the pump room?-- I do.

The first sheet relates to the carbon monoxide read-out?-- Mine are in a different order, but that's all right.

Well, included are carbon monoxide, methane, carbon dioxide and oxygen?-- Yes.

Can I direct your attention particularly to the graph representing the oxygen-----?-- Yes.

-----values at point 14?-- Yes.

And they are recorded for the period 31 March - I think it is - 1994 - 31 March through to about the time of the incident-----?-- That's correct.

-----in August of last year. Are you able to comment upon the data represented there?-- Yes, I have undertaken a fairly

complex - well not complex, but detailed analysis of the actual data involved. The major downward spikes occur not because the oxygen analyser was malfunctioning. The data is because we have here averages which are calculated on the basis of incomplete data sets and the Maihak computer in calculating those averages does not allow for incomplete data sets. In other words, in a 24-hour period, it assumes that there are 24 hourly averages, but on a given day there may only be 15, so we would divide the sum of 15 numbers by 24, instead of dividing it by 15. I had done an analysis, in fact, on this data set back to July last year, and I have only been able to isolate about 40 episodes like that. If one removes that data or adjusts that data for that correction, one finds - and, in fact, over this period of time, the oxygen analyser was showing a long-term drift from the expected fresh air value of 20.9 to approximately 20.5. Within that long-term drift there were definitely minor oscillations due to other influences, such as the much-banded barometric pressure influences, but these are minor perturbations on this long-term drift.

Is the effect of that the oxygen analyser was functioning within acceptable limits, but drifting between calibrations?-- That is my interpretation, yes.

So, you would have the analyser calibrated properly on the last occasion before the explosion, but then to re-commence its behaviour of drift from that point to reflect the error seen in the material?-- Yes, the absolute error is only 2 per cent of the calibration point and 2 per cent of full scale, which is well within the tolerances of such types of equipment.

And the only relevance it has really is in relation to the ultimate calculation of Graham's Ratio?-- Exactly.

Is that point - that is the behaviour of point 14 - is that reinforced in the other graphs of other gases depicted in that exhibit?-- It is, except to the extent - well, it is not as obvious in those data, although the spikes are there, because most of these gases oscillate about zero rather than having a significant non-zero offset.

So, the behaviour of the oscillations, if you like - the behaviour there is within the acceptable-----?-- Well, certainly, for example, the carbon dioxide analyser is a full scale analyser. 0.8 per cent is a negligible offset.

The carbon monoxide one?-- I would have to check with the range on what the carbon monoxide was, but 1 ppm off-set was well within its tolerances.

Methane - are you able to comment on that?-- The .4 per cent - the low range methane is 5 per cent, so .4 constitutes a higher offset than would normally be acceptable, but given the square wave behaviour, it looks more like an offset than anything else.

Thank you, Your Worship.

MR MARTIN: Does Your Worship wish to take a morning adjournment now?

WARDEN: It might be an appropriate time, subject to how long you are going to be.

MR MARTIN: I am not going to be long.

WARDEN: We will try and finish your cross-examination first and then take a break and go through until about 1 o'clock.

MR MARTIN: Thank you.

CROSS-EXAMINATION:

MR MARTIN: Doctor, could you just tell me to your knowledge whether there was a qualified chemist at Moura No 2, say within the period of two years before 7 August 1994?-- I'm not aware of one being present.

All right. Could I just ask you, please, to go back very briefly to appendix 5.2(A)?-- Yes.

And at the top of page 4, if you wouldn't mind, the sentence commencing, "In stark contrast..."?-- Yes.

Do you have that?-- Yes.

"In stark contrast to the commonly cited US and UK literature, whilst the level of carbon monoxide and carbon dioxide generated are comparable to the literature, virtually no low temperature (less than 200 degrees Celsius) methane, hydrogen or gases other than carbon monoxide and carbon dioxide were found."?-- Yes.

What I wanted to ask you was whether your view is that the CO/CO2 ratio could have been used, or should have been used?-- I believe that the CO/CO2 ratio in the absence of a carbon dioxide seam gas or other extraneous sources of carbon dioxide is an excellent indicator.

And one quite appropriate for Moura No 2?-- That's my opinion, yes.

You may not be able to answer some general questions, but do you understand that the background of SIMTARS to be that it was conceived as a necessity around about the time of - soon after Kiangra blew up in 1975?-- My understanding of the history of SIMTARS and its formation is, yes, it was.

And it struggled into some form of existence by about late 1985 with the funding it was getting from the Government?-- I believe there was a small cadre established within the Department around that time, yes.

XXN: MR MARTIN

WIT: CLIFF D I

Was the initial concept that SIMTARS was going to be an autonomous body, independent of Government?-- That is my understanding. We function virtually that way.

Can you tell us about, say, in the last several years, the shortfall, if any, of funding to do the things that SIMTARS desirably would like to do? I don't want to embarrass you, but obviously I am?-- Goodness. SIMTARS exists in the environment of the financial climate which the State Government operates. We are not subject to unlimited resources or funding. We are subject to constraints on Public Service operation, staffing levels and other competing priorities on our time. We are required to earn money to supplement the money given to us by Treasury. Our actual funding from Treasury in dollar terms since inception has gone down. We have to devote a lot of our energies to raise additional funding both within the industry and outside.

Does that mean you have to go around with cap in hand asking for money from-----?-- We have become adept at being a viable semi-commercial enterprise within the Government area in earning that funding. I cannot say that that has made SIMTARS an optimum organisation.

To tell you one example, Dr Bell, he was a SIMTARS employee?-- He would like to be called that, yes.

Until last year?-- Yes, he did - he was.

And what was his position?-- He was the Manager, Occupational Hygiene, Environment and Chemistry Centre.

When did he leave?-- June the 6th.

All right. And has he been replaced?-- No.

And I take it that the position he occupied is one of importance and integrity?-- I would have to claim privilege since I occupy that position at present. I would like to think it is a responsible position within SIMTARS.

Can I just take you briefly to the dissemination of information, and you have told my learned friend, Mr MacSporran, about that. There is a SIMTARS magazine, isn't there?-- SIMTARS news, yes.

Is that a monthly publication?-- I think it comes out every two months.

And how does this information - whether it be the documents, for example, which you have contained on Exhibit 225 and, say, the SIMTARS magazine - how does that get distributed? Not randomly, I suppose?-- We have a mailing list which consists of all our clients within Queensland, Australia and overseas, and it is automatically mailed to all of those clients.

Is BHP Australia Coal on that mailing list?-- It is.

Only in Queensland, or outside Queensland as well?-- I'm aware of Queensland at the moment.

And what about No 2 Moura?-- Specifically, yes.

And publications that have gone there, say, in the last two years before 7 August 1994, do you know how they were addressed?-- They were addressed to the mine - not to any particular person that I'm aware.

It wasn't to the manager or-----?-- Probably, yes.

And you told the Inquiry of two experiences in 1989, one at Newhope, I think, and one at Cook?-- 1989 was Newhope as well.

Can you tell the Inquiry what happened in relation to the men? Were the panels sealed?-- Once the CO make reached the level of 10 lpm the men were taken off the production and the panel was sealed.

Were they taken out of the mine?-- They were.

Thank you, Dr Cliff.

WARDEN: Thank you, gentlemen. We will take a 10 minute morning break.

THE COURT ADJOURNED AT 10.54 A.M.

THE COURT RESUMED AT 11.19 A.M.

DAVID IAN CLIFF, CONTINUING:

CROSS-EXAMINATION:

MR MORRISON: Dr Cliff, you mentioned in one answer to Mr MacSporran when he asked you about whether the Graham's Ratio is a good indicator of the onset of a heating or what its status was as an indicator, your view was and is that it's a good indicator of the onset of a heating but has significant limitations after sealing; is that a fair summary?-- Yes.

And part of those limitations derive from the complexities of the atmosphere that is being sampled?-- Yes, the correct application of the formula.

And I think - as I made the note, you mentioned it was complicated to do or to perform interpretations on that Graham's in that situation particularly if you don't have - I think you said full resources and background to do the analysis?-- That's correct.

By "full resources and background" you are talking about access to the sort of analytical skills that you and others at SIMTARS might possess and perhaps some training in that field?-- Yes, and the gas chromatograph.

Now, the difficulty there is in terms of doing or performing some interpretative analysis in certain circumstances, namely post sealing?-- Yes.

Of course if one did not suspect that there was a heating going on one may not turn to Graham's at all?-- Yes.

And does that difficulty of interpretation apply also to the other ratios such as the Morris, the Trickett's and so forth?-- Yes, it does.

Now, can I ask you this: in relation to the MineRisk document and the analysis that resulted in that publication you mentioned that the aim of the whole process was to identify rules that could be used in mines with some confidence by actual operators?-- Yes.

Now, that seems to be predicated on the basis that operators may not approach problems or analysis problems with the same sort of approach that you might, that is to say a scientific approach or an approach drawing on the sort of resources SIMTARS has?-- That's correct.

So you were looking for practical and easily applied rules?-- Yes.

XXN: MR MORRISON

WIT: CLIFF D I

Now, it was in that context that a number of people were drawn together and they are mentioned in the report. The purpose of identifying the rules was basically to identify those that as a matter of experience or anecdotal experience were actually applied?-- Yes.

I notice in those rules when one talks about Table 12, haze was not identified as being in some rule that was being applied in mines? You've got sweating and fire stink down at 13 and 14, smoke at 15, but not haze?-- I think the delineation between smoke and haze is difficult. I think that we felt it was better to call it smoke.

Are you saying that in fact when you use the term "smoke" in 15 it in fact was discussed as comprehending haze or is that not the case? I suspect it's not because if haze had been identified separately no doubt it would have got a separate designation?-- I can't disagree with you.

I notice also in that list of rules that heat shimmy doesn't get a mention either?-- No.

Now, when one turns to the CO make rules that were identified, the three levels are mentioned, 10, 15 and 20, the 10 and 20 on German experience or some sort of German information?-- Yes.

The 15 was only put in because of some information from Mr John Brady?-- It was my understanding because of the experience of others in the area and the contact with Mr Brady and Mr McKenna that's where the 15 came from, yes.

Now, they obviously weren't involved in this process, so -----?-- No.

Was that information obtained from them during the course of the process?-- It has been obtained from them over the years in discussions we have had, both myself - more likely Mr Mackenzie-Wood and Terry O'Beirne and people like that.

Now, the modification or at least the result of the consideration of those three rules, leaving aside the identification in differences and so forth, but the recommended change was effectively to delete absolute values, wasn't it?-- Yes.

The modification was to take out absolute values and simply refer to CO make trend rises - that's obviously what the arrow indicates?-- Yes.

Rises over a range set for the specific pit based on background CO then a heating is present. Now, that reflects the view of those participating in this process, doesn't it?-- Yes.

That the absolute - reliance on absolute values ideally should be deleted?-- Yes.

Now, what you say there is in your view then, and probably still is, the appropriate rule to apply, isn't it, is simply that you look at the trend as against the background?-- I believe it is the trend versus background that is more important than the absolute numbers, yes.

Now, consistent with that view then - consistent with the way the rule was modified or said to be modified, if one had the background and watched the trend then there would be no need to resort to the absolute values, would there?-- That is correct.

And if one either had the background - or indeed had determined what was causing a rise in CO make then again resort to absolute values isn't necessary?-- Yes.

Now, whilst you mentioned that nonetheless in the absence of anything else one might have regard to those absolute values, that wasn't suggested as a qualification to the rule, was it?-- We are talking here about ideal rules.

Yes?-- And that is what we were aiming for in the exercise was a future episode where we had the background. There was no - within the summary as written down and as discussed there was no room to put caveats and riders on things.

Well, that's not quite right, I think. I know you mentioned earlier that you only had three options: delete, modify or replace, but if you look down to number 12 you didn't delete, modify or replace anything there. The comment is, "Okay as is."?-- They are the changes that were allowed.

And if you look down at 14 and 15 the qualification was added there, "General rule only. Must use other rules with this." So, it's not quite right to say that you didn't have the option to put in that qualification, is it?-- I believe it is.

Well, it was done elsewhere in the document?-- My recollection of the episode was that by focusing on the ideal we were looking at - we weren't - we were not placing an all embracing statement on existing situation.

Well, let me just take you over to table 13, two pages over, and give you another example where you are there dealing with rule 10. The recommendation was in relation to that rule, "Delete and warn it could be misleading." If that's not a qualification, what is?-- It is a qualification, yes.

Yes. So, it is correct to say, is it not, that the opportunity was not denied to you to put in the sort of qualification I am talking about?-- Yes.

Is that not too many double negatives for you?-- No, it's not.

All right. Now, can I ask you about the information so far as it's recorded in there from Mr Brady, that's the 15 litre figure. Was there any research that you know of that established that?-- I'm not aware of the antecedents of that number other than the theory experience.

Or other than that they have set it?-- Yes.

You don't know precisely on what basis it was set or what led to it?-- No, I don't.

Can I ask you this: I think it would be correct to say - I think you might have made the point yourself that Mr Brady and Mr McKenna are advocates of CO make as an appropriate indicator of a heating?-- Yes.

I think as are yourself - as is yourself?-- As an indicator - as I am, yes.

As you are. Now, can I ask you this: when you were mentioning the New Hope experiences in '89 and '91, you mentioned that there was some discussion about what 10 lpm meant?-- Yes.

You were party to that discussion obviously?-- I was present at the discussion.

So, who was debating what it meant?-- It was an interesting dialogue between management and staff, as I recall.

And was there some discussion, one with the other, about, "What does 10 mean?", or, "Should we do something at 10?", or, "What will happen?" How did it go?-- I believe the discussion focused on the issue of why 10 was dangerous and not 9 or not 11 in this sort of area, as has been alluded to previously.

I see, all right. In any event, the action taken was as a result of simply a decision to accept that 10 was a time to move?-- Yes.

But that by itself doesn't validate 10; you would never suggest that, would you?-- No. What I was suggesting was that because it was successful, it means it's not the wrong thing to do.

Exactly. There is no reason to think it wouldn't necessarily have been successful at 12 either?-- I agree.

All right. Now, can I ask you about Exhibit 238? Do you still have that with you, the Graham's graph for 401/402?-- I do.

Now, you have plotted these points. Can I ask you what the points are? Are they individual values for Graham's Ratio or are they -----?-- These points were plotted by Mr Humphreys. I believe they were daily averages.

Okay. So, is the point for the Graham's Ratio - it's an average?-- I'm not sure, but I believe so.

Well, it's not quite appropriate to use an average for a Graham's Ratio, is it? If you use average figures for a day and use the average figures to calculate the ratio, it's not really appropriate, is it?-- There are limitations.

So, there are limitations on how we should perceive this graph, aren't there?-- I would suggest the limitations are mainly on the first point.

Can I ask you this: has the oxygen been corrected in the construction of this graph?-- No, it hasn't.

So, this graph would in fact reveal, if the other graphs are correct, higher points?-- I would have to do the calculation. I believe the .35 would come up a little bit.

Now, what we can tell in the first two points then certainly is this: that they are 24 hour periods between data points?-- Yes.

So, the first rise we see from something under .2 to something over .35 is in 24 hours?-- That is correct.

And if we applied an oxygen correction, it would be higher than where it is now?-- Yes. I have done the correction. It comes up to .4.

I'm sorry, did you say you have done it for this?-- I have another diagram which I can bring, if you wish.

And does it take it up to .4, does it?-- It does.

That's all I need for my present purposes. Now, that rise, I think you said, was a normal rise, that's what you would expect?-- I have seen similar rises in other sealings, yes.

So, after sealing the fact that the Graham's rises is quite typical?-- Yes.

And would you agree just as it is very complex and hard to estimate or predict the rate of fall away, so too is it hard to predict or estimate just what the rise will be?-- Yes.

So, in that first 24 hour period it's really very difficult to say that any rise you see is other than a normal rise?-- It would depend what it rose to.

Quite, I accept that?-- But the rate - yes, I agree.

Now, just touching on that, this graph is one, as you mentioned, that has been generated by Mr Humphreys and looked at by yourself?-- Yes.

The sort of comparison you were talking about of one panel with another obviously requires that there be such a graph to make a comparison of two points?-- Yes.

And absent the graphs, the comparison is even more difficult because one is then driven to comparing data points with data points?-- Yes.

Now, can I ask you this other question, if I may? In terms of the susceptibility of a panel - leaving aside the coal in it for a moment - of a panel to spontaneous combustion, does the relative humidity have any role to play?-- Yes, it does.

Would the fact that this panel, 512, was drier, in other words, had a lower relative humidity than other panels, mean that it was less susceptible to spontaneous combustion?-- No.

Well, what does it mean if it is lower in relative humidity, therefore, drier?-- If the relative humidity is lower, then as the spontaneous combustion occurs the ability of the coal to drive the moisture out of the coal will be facilitated because of the partial pressure of the moisture - of the water.

Just a moment. Please give this to Dr Cliff?-- It is a complex factor because where there exists -----

For the benefit of others, it says "Please Slow Down". It was left by the stenos for me. I now pass it on. I assign it fully?-- It is a complex issue. Moisture in the air will inhibit the volatilisation of moisture from surfaces and bodies. By the same token, moisture in the air can, by being

absorbed in the coal, generate heat and, therefore, can facilitate spontaneous combustion.

Now, do I understand from what you are saying that the fact that it might have a lower relative humidity than other panels doesn't have particular significance until you get the onset of a heating?-- That is correct.

Now, can I ask you a couple of other things, if I may? Firstly, the oxygen levels do move with movements in the barometer, don't they?-- A little bit, yes.

And leaving aside the actual value of such a movement, those movements affect the denominator in the Graham's Ratio?-- I have seen no evidence to show that the barometric pressure would affect Graham's Ratio significantly.

Well, no, I asked you not to take into account just how much the value would be which is what I mean -----?-- If there are deviations in the oxygen concentration, yes, it affects Graham's Ratio.

So, those movements will in fact have an impact - we can discuss another time what that impact is - but it does have an impact on the denominators?-- Yes.

Now, the denominator also in the Graham's Ratio, would you agree, will also be affected by any miscalibration of the analyser?-- Yes.

Also any drift on the oxygen analyser?-- Yes.

And, likewise, on the other analysers?-- Yes.

The methane and carbon monoxide analysers are relevant because they impact upon the calculation of nitrogen that's left?-- By difference, yes.

All right. Now, can I ask you whether you agree with this then: the Graham's Ratio theory - that is to say, the theory behind it - is that as CO is produced and oxygen falls, if the amount of CO produced is greater than the proportional decrease in oxygen by absorption, then that indicates an increase in temperature; that's the theory?-- Yes.

And to correctly identify what CO is being produced in a panel and what oxygen is being depleted by absorption, you have to adjust for the features that I mentioned: calibration and drift and, to the extent that it matters, barometric pressure changes?-- Yes.

All right. Now, can I just ask you this about the - you were asked some questions by, I think, Mr Martin about the CO/CO₂ ratio and whether it was an indicator that could be used. I think your response was effectively yes, it can be used?-- Yes.

Now, in the End of Grant report for NERDDP I notice that it doesn't include any CO/CO₂ graphs?-- In the 1992 report, no,

it doesn't. It features in the list of ratios that could be used.

Well, we will see that in a moment. Is it right to say the ratio is also not used in the SEGAS program?-- It is in the SEGAS program if you put it there.

It's not in the SEGAS program at the moment, is it?-- We only supply four ratios at present in the equation. It is not one we supply normally.

What are those four, Trickett's, Graham's, Morris'?-- And make - and I think the fourth one is a make. The fourth one can be modified as required for specific use.

The End of Grant report, I think, refers to Trickett's, Graham's, Litton, Morris and Kim?-- It refers to 19 ratios at various stages, including the CO/CO2 ratio.

The graphs that are included in the report are only those five that I mentioned?-- That's correct.

And is it correct to say - I think you will agree with me - that the CO/CO2 ratio is not widely in use in Queensland coal mines?-- I would agree.

And, in fact, that comment might be applied to the whole of Australia, I think?-- I think that's true, yes.

And, likewise, in the UK?-- I can't comment on British experience.

I have nothing further, Your Worship.

MR CLAIR: I have no questions of Dr Cliff, Your Worship.

WARDEN: Thank you.

EXAMINATION:

MR PARKIN: Just one question, Dr Cliff. During cross-examination by Mr Morrison regarding the Graham's Ratio after a panel is sealed, it's certainly not the only parameter that one would look at in order to detect a sealing - in order to detect a heating in a sealed area, is it?-- No, it is not.

I mean, if we look at the smells and hazes that had been observed prior to the incident, we know that the rapid build-up of CO was from 12 to 150 in something like 22 hours. It's when you add the Graham's Ratio to those parameters that causes some concern, would you agree?-- I agree.

And, again, what do those parameters indicate to you?-- I think that on the basis of all the evidence available that

XN: PANEL

WIT: CLIFF D I

220395 D.48 Turn 8 mkg (Warden's Crt)

there has to be a heating in the panel.

Thank you very much.

EXAMINATION:

MR NEILSON: Just on the question of the Graham's Ratio after sealing, Mr Cliff, if you could clarify something for me. I may have misunderstood what you said. When you were asked - sorry, answering questions to Mr MacSporran, you said that the most reliable way to determine the onset of a heating is by using the Graham's Ratio. Was that correct?-- That's correct.

XN: PANEL

WIT: CLIFF D I

I then understood you to say that even after sealing, you would still use the Graham's Ratio?-- I would, yes - are you talking about me personally?

Yes, that's the question?-- I would, yes.

And that's even on the basis that it does have limitations after sealing?-- Yes.

Mr Morrison questioned you about the deletion, if you like, of any mention of haze or heat shimmy in the Minerisk report?-- That's correct.

Does that mean that it has no value to yourself, or - I mean, why wasn't there any reference to it? Do you believe it has no value, or-----?-- I don't think that's true. I mean - sorry - I cannot recollect why that was not raised, but I believe probably because we were focusing on the gas type behaviour - smoke and stink were put in there because stink, of course, is chemical. I think probably also we recognised the limitations of some of these indicators in their own right. I can only say because we focus on certain things - that's my understanding.

Can I ask you in your opinion would the detection of a haze be of any significance to you?-- I can't answer that. I have no experience of presence of hazes or not in mines and their reliability. I have read a lot of literature about it and I believe it is used, and it has an effect, but that's as far as I can say.

You have never actually experienced it yourself?-- Not a haze, no.

Thank you.

EXAMINATION:

PROF ROXBOROUGH: Dr Cliff, just a couple of questions, if I may? I'm interested in the way in which coal produces carbon monoxide. Maybe we can address this by a simple example. If we had two coals, one of which was highly reactive and another one which was of low reactivity, and the highly reactive coal self-heated to a temperature of, say, 100 degrees centigrade, it would give off a certain amount of carbon monoxide; is that correct?-- Yes.

If we took now the non-reactive coal and we artificially heated it to 100 degrees Celsius, would it give off the same amount of carbon monoxide?-- My experience is that it would give off less.

It would give off less CO. So, CO make is not an indication of the temperature of a heating?-- No.

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My second question: how stable is carbon monoxide chemically? How readily is it converted to carbon dioxide?-- In the absence of catalysts and other reactions, my experience in goafs of mines is that it lingers for long periods of time - many weeks. The main source of loss that I've identified from the literature is bacterial action in the presence of water.

Is it true when a spontaneous heating - or when coal is heated up and actually becomes a fire, that the amount of carbon monoxide reduces?-- The amount of carbon monoxide produced by an open fire is very small compared to during a heating.

EXAMINATION:

MR ELLICOTT: Can I ask you to go to page 1 of Appendix 2.1.6(C) of the SIMTARS work?-- Yes.

That's a graph titled "CO Range 1 Calibration Check"; is that correct?-- It is.

My impressions from Mr Hester's evidence was that the output of that analyser is non-linear in terms of voltage as a response to CO concentration; would that be correct?-- That's what Mr Hester said, yes.

So prior to being displayed, there must be some subsequent linearisation of that signal; is that true?-- It is my understanding of the analyser that it is linear output.

It is linear output?-- I believe so. From the tests we carried out in October and December, my understanding is the linearisation occurs within the analyser.

Do you have any understanding of the linearisation?-- It is an electrical circuit they have. You preset a number of potential resistor values to give the right desired response.

Might it be a diode resistor array?-- Could well be.

Would the adjustment of that array affect the linearity of different points of that graph if, say, they weren't properly adjusted or weren't checked?-- My understanding is when they do a calibration on this linearity, they do a three point check over the range to ensure that the curve follows the known behaviour pattern.

What is your understanding about the frequency of the checking of that linearity?-- I believe from my understanding at Moura the Maihak did it every six months.

As part of their normal six monthly service, they would check the linearity of the analyser?-- I believe so.

And taking you back to the SIMTARS symposium of 1989, how long had you been at SIMTARS before that symposium was run?-- The

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symposium, I believe, was in July. I joined in February - January, sorry.

Are you aware that the symposium material was distributed in three volumes?-- I am.

Is it your understanding that volumes 1 and 2 and possibly 3 were pre-distributed prior to the seminar?-- That is - I can't answer that. I think so.

And that volume 3 was entitled a "Day Book" and really represented the working volume for the seminar?-- I believe that could be true.

And the contents of volume 1 and 2 were really treated as pre-reading and to some extent considered assumed knowledge at the seminar?-- I think that would be a fair assumption, yes.

Would you agree that had somebody not preread volumes 1 and 2 prior to the seminar, they could still work with volume 3 during the seminar, leave the seminar, and if they didn't subsequently read volumes 1 and 2, in the worst case they may never have read it?-- That's possible, yes.

And it would be a very much worse case, wouldn't it?-- I believe so.

You hope people look at the stuff?-- We hope so.

Are you aware of any attempt to publish not so much the use of gas analysis results and ratios arising from the SIMTARS seminar, but more what might be called the large body of background material in those seminar volumes?-- You mean the underlying source material to these volumes?

Yes?-- I'm not aware - I'm not quite sure what - you-----

It occurs to me that the particular thrust of your work, and understandably, is the use of gas analyses and results from that in an interpretative mode?-- Yes.

But I think the seminar material contains a large body of background information that may influence an approach to that other information?-- Yes.

And I think it also outlines what might be considered reasonable steps to take in terms of the investigation-----?-- Yes, it does.

-----of outbursts - sorry, of spontaneous combustion signs should they be detected?-- Yes, it does.

So, are you aware of any attempt to publish that large body of background information, and, in particular, what was considered at that time a reasonable approach to the investigation of spon com signs?-- I'm not aware, no.

Okay. That's all, thanks.

MR MacSPORRAN: Your Worship, I have one brief matter.

WARDEN: Thank you, but I have a couple before that.

EXAMINATION:

WARDEN: The basic purpose of SIMTARS is to provide assistance in the form of testing and research to the mining industry. Is it limited to the coal industry, or other non-coal areas?-- We treat all mining industries.

All industries. And do you only respond to industry needs, or do you have your own programs of research and testing?-- We attempt to put in place our own systems of testing and research based on what we perceive industry needs to be.

Then you disseminate that information as far as you can-----?-- To the best of our ability, I believe, yes.

----to the industry. You're currently occupying a position previously occupied by Mr Bell, isn't it?-- I am acting in that capacity, yes.

How long have you been acting for?-- Nine months.

And what's happened to your position? Is somebody acting in your position?-- I am occupying both positions effectively.

If there is more large mines coming on stream in Queensland - I can think of four or five metalliferous and four or five coal mines - is that going to put a greater demand on your time and the facilities that you have got?-- Yes.

So, if you don't get increases in staff or funding, you are not going to be in a very good position to respond to additional requests, are you?-- I agree.

Well, it is going to be somewhat limited. Could SIMTARS get any benefit from exchanges of information and personnel with other overseas institutions, like MSHA?-- I believe we would benefit enormously from being able to do such things.

It hasn't really been done in the past, has it?-- We have attempted to do such a thing, but within the limitations of our structure, it is difficult.

Thank you, I have nothing further. Professor Roxborough has another question.

FURTHER EXAMINATION:

PROF ROXBOROUGH: Dr Cliff, is SIMTARS' a partner in the Cooperative Research Centre for Mining Technology and Equipment located in Canberra?-- We are a minor partner in that.

Do you receive - or do you have a potential to receive funds from that organisation?-- I'm not aware of that potential.

Thank you.

RE-EXAMINATION:

MR MacSPORRAN: Dr Cliff, I think you told Mr Neilson that you personally would use Graham's Ratio after sealing as an indicator of a presence of a heating?-- I would.

Do you mean to distinguish the situation where you, as a scientist, would use it, and ordinary mine personnel would perhaps not?-- I do, because of the limitation - the need to be aware of how to apply it.

And could you tell us briefly how you would be able to apply the Graham's Ratio after sealing - what would have to be taken into account?-- One would have to take into account that you do not have fresh air behind the seal and therefore the ratio - to rely on that ratio, the 0.265, which is the ratio of oxygen to nitrogen in fresh air, is not a valid ratio to use to predict the amount of oxygen that's present. One would also have to be cognisant of the difficulty of having an initial and a final airstream in a seal - behind a seal, and that there were other loss mechanisms for oxygen behind the seal, just by the coal absorbing or being displaced for some reason.

If you bear in mind those variables, is it possible to calculate a valid Graham's Ratio after sealing?-- I think at worst you would calculate an underestimate of Graham's Ratio.

So, you could be misled to the extent where you might not detect a heating behind the seals based on the Graham's Ratio figure being too low?-- The failure to detect an onset of a heating in a sealed area by using Graham's Ratio, in my opinion, would only occur in a sealed area that's been sealed for a length of time where the oxygen level has fallen so that the - you would not see the rise, perhaps.

Finally, can I ask you - I think you told Mr Morrison that - referring to the Minerisk document where the indicators of spon com were reviewed to formulate ideal rules - you told Mr Morrison that - well, you said you agreed with the

proposition that if you had the trend and background for CO make, you would not need to look to the absolute values?-- If I had confidence in the normal behaviour of the CO make in the - in the pit of the seam, yes, that's true.

Now, how would you go about having confidence in the background CO make?-- Statistically I would gather sufficient data until I had confidence that I could understand the variabilities that may exist in the pit of that seam.

And if you were assigning a particular value or increase in value of CO make to, for instance, mining method, how could you possibly investigate that safely to draw a conclusion about the background level of CO make?-- I think one would have to look at correlations in terms of the tonnages, the rate of exposure at the face - a number of things - but more importantly I think the steady state would exist at a different level and that would repeat over time. To find one example where it rises is difficult. I think statistically one would have to acquire a sufficient data set to validate that assumption.

Would that be a quite complex exercise?-- I would suggest one would need to acquire many makes over many panels before one would be really confident of what was normal behaviour - if it varied.

That's what you mean and perhaps what was meant when you talked about having knowledge and confidence in the background level to judge significance of a particular CO make in a panel?-- Yes.

Thank you. Thank you, Your Worship.

WARDEN: Anything out of that?

MR MORRISON: Yes.

CROSS-EXAMINATION:

MR MORRISON: You answered Mr Parkin with a sort of short synopsis of your view that there was a heating in the panel; do you recall that question?-- Yes.

And you mentioned a couple of aspects of evidence - or, at least, some evidence. Your view was, I think, expressly given on the basis of the evidence as you know it now?-- And the calculations I did in our report, yes.

That's right. Not on the basis of what might have been known back at the time of the explosion, but the analysis since?-- It is based on my analysis, yes.

Now, I think you have expressed the view before - in fact, I'm sure you have - that the heating that was there was a

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deep-seated heating - in the report it is referred to as being in a stook or a pillar?-- That is conjecture, but I think in discussion with other members of our group, we based it on, I am aware, heating in other situations in Australia - I believe so.

And one of the factors that - why you believe that is because the jump at 23:49 from 161 parts up to 1,000-plus is an extreme jump and indicating a very sudden onset of events?-- Yes.

And I think you've expressed the view before - you confirmed it for me - that in your view because the heating was deep seated there were few signs of it prior to sealing?-- I believe because it was - if it is a deep seated heating then a lot of the signs would be muted, yes.

Thank you. I have nothing further.

WARDEN: Thank you. This witness can stand down. You are excused, thank you, witness. Please return all the official exhibits.

WITNESS EXCUSED

MR CLAIR: May it please Your Worship, I call Donald Mitchell.

DONALD WILLIAM MITCHELL, SWORN AND EXAMINED:

MR CLAIR: Could you state your full name, please?-- Donald William Mitchell.

Mr Mitchell, you have prepared a report in respect of this matter which is being investigated before the Inquiry at the request of the United Mine Workers Union; is that so?-- That is correct.

Again, Your Worship, in accordance with the practice foreshadowed earlier I will leave Mr Martin to take the evidence-in-chief from this witness.

EXAMINATION-IN-CHIEF:

MR MARTIN: Mr Mitchell, have you prepared for the purposes of this Inquiry a resume of your background, qualifications, work experience, publications and the like?-- I have submitted a resume. It was not prepared directly for this Inquiry.

Do you have a copy with you?-- I do, sir.

I believe, Your Worship, that this document may have been distributed, I'm not certain. In any case, I will go on. Do you have a copy with you?-- I do, sir.

Could I take you to the first page, that's the resume? It may not be your first page, but the resume page. It's the case, is it, that you have a Bachelor of Science in Mining Engineering from Penn State University obtained in 1948?-- Yes, sir.

And you have a Master of Science in Mining Engineering from Columbia University obtained 1951?-- Correct.

You set forth various other qualifications in your education section which I won't deal with. I just want to take you briefly to the professional society participation section of your resume. Do you have that?-- Yes, sir.

Have you kept up-to-date by professional interest and continuation of membership of various organisations over the years?-- I have. I'm active in many organisations and an officer in many of them.

For instance, you are a member of the Professional Engineering Association from 1978 until the present time?-- That's correct.

And just running down, Engineering Standing Committee, National Safety Council 1982 until the present time?-- That's correct, sir.

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National Mine Rescue Association, is it, 1984 to date?--
That's correct.

It's the case, is it, so your resume says, that you have authored and co-authored some 93 papers relating to ventilation, fires, rescue and so forth?-- Yes.

I notice that your resume refers to patents; did you patent a process for quenching incipient gas-air explosions, I notice. Can you tell the Inquiry something about trickle dusting?-- Well, the organisation that I ran, we invented trickle dusting - I've heard it being used here in the Australian mines. It became commercial before our patent applications were made and we did not get patented.

Were you responsible for that?-- My failure to get the patent application?

No, no - were you obviously responsible for that?-- Yes, sir.

The trickle dusting concept, were you responsible for -----?-- Yes, myself and a Mr Ed Kawenski.

If I just might turn to "Significant Accomplishments", from the top, third from the top, Assistant Coordinator, Director's of Bureau of Mines Task Force to implement the Federal Coal Mine Health and Safety Act of 1969, are you looking at that?-- Yes, sir.

What did that effectively do?-- Well, at that time the Bureau of Mines was what is now the Bureau of Mines plus the Mines Safety and Health Administration and some parts of the office of surface mining. In 1969 the Congress passed the Federal Coal Mine Health and Safety Act which was a direct result of a series of major explosions and fires during the 50s and 60s which culminated in the No 9 explosion that I believe was referred to in the presentation given by the MSHA people yesterday. The coordinator was Jack Crawford who subsequently became the head of MSHA, as his assistant coordinator I was responsible, directly responsible for the regulations pertaining to ventilation, dust control, fires, haulage, transportation, blasting and explosives and the miscellaneous portion of the regulations and that would include things like self-rescuers, escape ways and the like.

Can you tell the Inquiry something about your participation if any in tube bundle introduction into the United States?-- Yes, I was sent to Europe to study the work in Great Britain and in Germany with the tube bundle system and in - I believe it was either '71 or '72, under the directorship of Dr Van Dolah we installed the first tube bundle system in the United States in the Somerset coal mine in Colorado.

Then beneath that section "Significant Accomplishments" you deal with your work experience, and just quickly, is all of your work experience primarily related to mine safety, fire, explosions and ventilation?-- Since 1949, yes, since the latter part of 1949. I was in production - solely production

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before that.

Is it the case that you've been in private practice as a consultant since about 1978?-- Well, not private since '78. Since '82 I've been on my own. I was in consulting work with Gates Engineering, in Foster-Miller from '78 until '82.

Thanks. Can I turn, please, to your fire and explosion experience which is part of your resume?-- Yes, sir.

At the outset you say between 1942 and 1978 you were involved in fighting and investigating fires and explosions in more than 50 mines, and in addition many hundreds whilst employed by the Bureau of Mines; is that the case?-- Yes, sir.

You were a member of MSHA yourself, were you? You were an employee of MSHA at one time?-- Yes, sir.

Did you retire from there in 1978?-- That's correct, 1 July 1978.

Your resume lists a number of active underground mine fires that you have been involved in?-- Since retiring from the government.

Since 1978?-- Yes.

Do you wish to make an alteration in some respect?-- Yes, I do, please, sir. This was alphabetised and in alphabetising - if you will look after Firecreek No 1 mine, we have two Jim Walters No 3 mines. That must be deleted. They are down below.

We will take those out. I did a rough count; 37 investigations since 1978 on active underground mine fires?-- Well, the fires weren't investigations, the fires were actually fighting the fires. The explosions were the investigations.

And since 1978 you've been involved, in respect of abandoned mine incidents, in some nine?-- Yes, sir.

You refer to other incidents and some 14 of those; is there any more to be added to that?-- Yes, since last October when - after November - excuse me, I left here in November - I've had two coal silo fires, one in Wisconsin, one in Minnesota, and in Vancouver, British Columbia, the C & P Railroad ballast bed caught on fire. That was a spon com and we had to put that out.

Just looking at the conglomerate of your experience in this respect since 1978, have some included spontaneous combustion?-- Quite a bit, about, I would say - in active mines there must be at least four or five active mine fires involving spontaneous combustion and all the abandoned mine fires are spon com, and the coal silo fires, with the exception of one which was a methane problem, they were all spon com.

May I turn to publications? You have a section which contains only half a dozen or so publications; are they recent publications?-- Yes, those are the most recent publications since the original writing of this resume back some years ago.

If I might turn to the general section of your publications, the first on the list is "Mine Fires - Prevention, Detection and Fighting"?-- Yes, sir.

Is that this document, the volume -----?-- That's the - yes, second edition. We are preparing the third edition now which will be quite different.

I tender that, Your Worship. Was that first published in 1990 or thereabouts?-- Thereabouts.

You are about to go into your second edition?-- Yes.

Have you also produced any film in relation to safety in mines?-- Yes, in the Bureau of Mines back in the 60s we had a - created a number of films for training purposes that are still being used today.

Is one called "Fight that Fire"?-- Yes, sir.

Was another called "Causes and Prevention of Mine Fires and Explosions"?-- Correct, sir.

Did you produce them?-- Yes, I helped write them. I was one of the co-producers and -----

Actor?-- If you call it that.

Demonstrator?-- Thank you.

Your list of publications, does that include a number on spontaneous combustion?-- Yes, sir. Actually in 1971 was our first realisation of spon com being a potential problem in United States coal mines, and I introduced into the United States at that time the Graham's Ratio which we called the Carbon Monoxide Index, as they do in Great Britain, and the tube bundle system, and we presented a paper then in 1972 saying, "Spon Com - a growing hazard". We didn't realise what a true forecast that would be.

I tender the curriculum vitae.

WARDEN: Can I mark first the publication "Mine Fires" Exhibit 239, and the CV will be Exhibit 240.

ADMITTED AND MARKED "EXHIBIT 239"

ADMITTED AND MARKED "EXHIBIT 240"

MR MARTIN: For the purposes of this Inquiry have you prepared a report?-- I have, sir.

Might I take you to that? Do you have a copy?-- Yes, sir.

It bears a date on the first page, I think - when I say the first page, the page which is styled "analysis of Moura No 2 Mine Explosion"?-- Yes.

What date is it? 20 February 1995?-- Yes.

That report reflects your opinions?-- It does.

I tender that report.

WARDEN: Exhibit 241.

ADMITTED AND MARKED "EXHIBIT 241"

MR MARTIN: Mr Mitchell, I will come back to page 1 of your report in due course, that is the summary, but it's the case, isn't it, there are a number of footnotes, not necessarily on each page, but throughout your report which one needs to refer to?-- Yes, sir.

I might take you to, please, page 2. You refer to Figure 1 which is actually the following page of your report?-- Yes, sir.

And the footnote - footnote 3, I think it is, says it is "Based on BHP Australia Coal Pty Ltd drawing No: 45/26."?-- Yes, sir.

Your Worship, that's part of Exhibit 8, already document 146, just so that the Inquiry knows where it's coming from. As you say, that drawing does not show any rib sloughs, bottom heaves and the like, or roof falls?-- That's correct.

Do you have some comment to make about No 2 being the main intake and transport road in relation to ventilation perhaps, or any other feature of the mine?-- Yes.

Well, make it if you would, please?-- For a panel of this type, to have transport in your main intake, one thing you've done is you have effectively eliminated the escape way or the primary escape way for the mine, for the people working in the 512 Panel. One concern I would have with the method of mining that they used with the large vehicles travelling through there, that since this is indeed the main intake these vehicles would introduce a resistance within the panel and it's a resistance that would never be - that would seldom be stationary, so that it's not predictable. The result could be - does not necessarily mean it would be - but one should anticipate or be concerned with the possible redirection of

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air from the No 2 intake into the No 3 and 4 entries and this would cause relatively erratic flows on the intake side. This could cause it. It doesn't necessarily mean it will happen, but these are things we often times encounter.

Mr Mitchell, moving on just a little, the last line or so of that first paragraph the words "...and No 5 was the `bleeder return' despite being on the antibleeder (lowest) side."?-- Yes, sir.

Do you have some comment about that?-- Perhaps the concept of bleeders in Australia is different from the concept we have in the United States. The purpose of a bleeder is to remove from the mined out area or goaf methane which is the primary gas that we have in a normal goaf, and methane being lighter than air would tend to rise, and the tendency therefore would be for methane to want to go to the No 1 entry. No 1 entry in our concept would be the primary bleeder entry. There would be negligible flow, the way they had that place ventilated, of methane towards the No 5 entry.

Well, what am I to take from that? Should there have been mining in the reverse situation, perhaps mine the high side first or what?-- That is a common practice in mines with a gradient such as we see here in the 512 Panel. By mining the high side, say the pillars between 2 and 3, that type of thing first, then the methane is going directly into the No 1 return and as you mine towards 4 and 5 your mining machine and your miners and your equipment will be in fresh air, whereas when you are mining the bottom side first and when you start going into the pillars between, say, No 2 and 3 entry, you have methane and other gases coming from the mined out area beneath you and these gases are coming into the working place which is not considered good practice by some.

The next point I would like to take you to is the

"Ventilation" heading. You have been here for a lot of this Inquiry, haven't you - not all of it but a great deal?-- The whole month of October and the whole month of March to date. Not the whole month of March but March to date.

So, you have heard a lot of the evidence?-- Yes, sir.

So, you say in your report, "Ventilation -- as retreat progressed, stoppings between the Nos 4 and 5 entries from the 13th to the 6th cross-cut were removed." Then a little further down you refer to, "Analyses indicated the likelihood of more openings or leakage paths through many of the other stoppings."?-- Yes, sir.

Now, what analyses?-- I did a series of very simple models of an area such as 512 using as the base the quantity of air as reported by the ventilation survey on - I believe it was July - June - I'll have to check that - either - July 12th I believe it was, but I may be in error. The purpose of those - there were two purposes. The first set of studies was made to ask the question: given this quantity of air flow into the 512 Panel - into a panel such as 512 trying to simulate the cross-sectional areas, perimeters - I had no knowledge of k factors, the friction factors; I did have the lengths. So, in the absence of friction factors that would be the only dominant error, but what I did do is use friction factors that we commonly - we find common in the United States mines and I found that there were areas within the goaf on that date - and if you will excuse me I will check this thing to get the date - yes, 12 July. For that date there was more than enough air to properly ventilate this panel, yet there were areas within the goaf that there would be little to no flow of air. That was one series. The other series I made was looking at the question of what might have caused the reversal of air in No 2 entry. During October when this was brought up we heard it referred to as a reversal. The implication - inference was that it might have been a layer but this had never been thoroughly documented, so I'm asking myself the question: is this a reversal, which is very common, where you have inadequate pressure between the face and the back of your goaf? Reversals, such as they described, that is one of the main causes for such things, and we did hear that there was no knowledge on the part of the people - at least I heard in October - as to the ventilating pressure available in the 512 Panel. So, I looked at that question, and I also looked at the question of layering, and the studies showed that it could be layering because the velocities that - the layering index for the No 2 entry was less than one, and if you followed the work in Great Britain on layering, where the best work has been done, we would know that this - that when you have a layering index less than one there is a high probability that you have methane layering. The study also showed, however, that there must be much more leakage through the stoppings between the No 1 and 2 entries, particularly between cross-cuts 1 through 8 than I had simulated to get the types of flows that were experienced in the mine.

You refer to 12 July '94 and to some information available.

What information, so that the Inquiry can know what you have relied on?-- I took the ventilation officer's data for that date. I give that in footnote 7 on that page, and it shows that we - on 12 July of 1994 the ventilation report records 42 cubic metres per second of air at sampling point 16 and eight and a half at sampling point 5. That is a lot of air.

All right. For the information of the panel, that's Exhibit 91, I believe. Well, you go on in the next paragraph to deal with the effect of that, and in the last paragraph you say - last sentence of that paragraph you say, "This goaf being at a lower elevation than the active faces and main return would tend to cause the rising flows of methane and warmed air to 'suck' in fugitive air as well as form layers.", and that's basically what you have been talking about?-- Yes, sir.

And you summarise that section of your report to the effect that air flows into and through the goaf were sluggish and erratic?-- Yes, sir.

And that spontaneous combustion is initiated and exacerbated by that condition?-- That's our experience.

All right. Now, can I take you to page 4, please? At the top you deal with the common signs or signatures, as you call it, of spontaneous combustion. Then you say those features are often sensed long before carbon monoxide gives warning?-- Yes, sir.

Then you have a footnote relating to haze. That is to the effect that the suspect atmosphere - that's like atmosphere with haze - should be tested for oxides of nitrogen?-- That's correct. That's a standard practice in Europe and in the United States.

And is that to dispel or prove that it's from a diesel or not?-- That is to determine whether there is a potential for spon com and it's not diesel haze.

We have heard much in this Inquiry about incubation time, and you deal with that about one-third of the way down the page, page 4, so I need not take you to that, except is it the case that incubation just depends on many, many variable factors?-- It depends on so many variable factors. The only way we know about incubation time is in a laboratory and a laboratory analysis is an irresistible theory meeting immovable reality too often and we have our experiences within a given mine but within a given mine panel to panel particularly when - the panels are very separated. For example, an experience in this mine, say, at 5 North would not necessarily be anything like you would have, say, in 5 South. These are diverse areas and, therefore, to rely on incubation time on some number, it's not prudent.

We have heard much in this Inquiry about CO and CO make and you deal with this on the balance of the page, and I don't want to take you to every part of this, but you give some examples towards the bottom from the data of 12 July 1994

which you have referred to?-- Yes, sir.

And you say that liberation of about 15 lpm of carbon monoxide might indicate many things?-- It might indicate many things, yes.

Well, it might indicate nothing, you say?-- Yes, it might indicate nothing; that's one thing.

But it may indicate many other things and you cite examples of that?-- Yes, it might indicate a blazing fire, it might indicate the various conditions in between nothing and a blazing fire such as haze, smell, odour, moisture, a lot of things. These are the basic things that we see.

Then in the footnote you give some examples of - for instance, in footnote 10 you refer to one mine. What mine was that?-- The mine in which I refer where the parts per million rose one-quarter ppm in eight hours - one-quarter to 4 ppm in eight hours, that was the Orchard Valley Mine owned by Westmoreland Coal Company in Paonia, Colorado.

There are some Indian names emerging soon. All right. And was that mine destroyed?-- Yes, that mine was sealed that night and it's sealed today and -----

How long after the sealing or after the experience of 4 ppm was the mine lost?-- The mine actually was lost within - we gave up, I would say, within an hour to two hours after the 4 ppm. This was a heating in a pillar between the main intake and the main return and the heating was in the - somewhere in the body of the pillar. When the heating got large enough so that you could start sensing it with the one-quarter and so on, then in that period of time the pillar just collapsed and flames just erupted all over the place. We had flames going down the main entry there for thousands of feet. We lost it very quickly.

Obviously, from what you say, you were on site?-- Yes, sir.

When was that, by the way?-- Orchard Valley -----

Just approximately?-- I lose site of - there has been so many. One second - it will just take a quick second to look at the list of fires to tell you that. Not one second, I'm sorry about that lie.

You need not worry about it, Mr Mitchell. Please don't worry?-- I give up. Say back - Orchard Valley, late 80's, I'd say. It was after Wilberg, yes, so it would be late 80's.

Don't worry. Then you give another example of readings up to 500 ppm?-- Yes, that was in the Powhattan No 1 Mine of North American Coal. That's right on the Ohio River, and that was really our first recognition that we could get very high concentrations of carbon monoxide with absolutely nothing more than oxidisation of large masses of coal, and we then subsequently learned that this is not uncommon in the Pittsburgh coal seam, and this is one of the reasons we

started looking very carefully at the use of Graham's Ratio and the carbon monoxide make at that time as indicators of what was or might be occurring.

Just towards the foot of that page you say, "The rate of increase in the 512 CO make was the fastest in the history of this mine. It was almost twice the rate experienced in 5 North +40, and three times that in 5 North -40?-- Yes, sir.

What was the source of that information?-- That was in Dr - figure 1 in the report submitted by Dr Van Dolah. It was a BHP graph and - that's the source of that information - and all I did was Dr Van Dolah made some very appropriate remarks about it and it caught my interest and I looked at the graph and I just took the trend lines on it and found that those were the rates of increase.

All right. Well, can I take you to page 6 of your report then, please? You say at the top of that, "Any sustained rise in CO make, no matter how rapid or slow, is cause for concern. The depth of concern should depend on experience.", and then you cite as an example the 1991 - September I think it was - September sealing of 5 North-west when Mr Kerr - not Mr Kerr - Mr Reed was managing?-- Yes.

You have produced a graph, haven't you, which is immediately before page 6, which I would like to take you to. That's carbon monoxide litres per minute make from, what, 27 July through to 7 August?-- Yes, sir.

Plotted on, what, a daily basis essentially, isn't it?-- The data are based on a - in the red line taking the Unor readings for a 24 hour period and taking the meaning of those readings and multiplying using the deputies - there were - typically there would be three velocity readings taken by the deputies, not on all days, but a great number of the data gave us three velocity readings for that period. You could not take the Unor readings for the time that the deputy took his velocity readings - I could not - because there was no data as to the time the deputy took his readings. So, I could not do what should have been done, and I just did the best I could with the data that was made available.

Your Worship, the information is really basically part of Exhibit 21, just for the information of the Inquiry - the source documents. So, you have a red line which is the deputies' metres per second and the Unor carbon monoxide -----?-- Yes, as I just explained.

And the blue line is what, is the ventilation officer's report?-- Yes, sir.

On the red line there is a break between 4 and 5 August?-- Yes, sir.

What accounts for that?-- I don't know. There was no data for that period.

That's the Unor data?-- That's correct. The Unor was - it's

blank at that time, during those - I believe it's about a four hour period.

This was a computer print-out provided by BHP?-- Yes, it was the print-out provided towards the latter part of October.

Just for the information of the Inquiry, it's part of Exhibits 33, 35, 36, 37 and 38. It's a whole lot of computer documents, if anybody is looking for it.

WARDEN: Thank you.

MR MARTIN: Well, there is obviously a significant difference between the red and the blue lines on that graph?-- They are different.

Well, tell us whether they are significantly different?-- Well, I don't like to use "significant", that's a statistical term. There is the - the blue line does not show the same - I would not be able to come to the - if I was management, I would not be able to come to the same decisions regarding appropriate measures by looking at the blue line until sometime on 5 August. The red line would have given me much different information and would have given me a basis for a different type of reaction.

What reaction do you have to the red line?-- I would see a rising trend, and in Europe and in the United States we do not look at numbers, we look at trends, and when you have experienced spon com before, or have a suspicion that your mine or portions of your seam may be spon com prone, then a rising trend, no matter what its rate of rise, should be the basis for at least an indepth understanding of what is causing the rise.

All right. Well, in terms of that data, had it been produced, what do you say the proper course of action was?-- What I would say about what, sir?

A proper course of action should have been?-- It is hard to say what a proper course of action would be. I can tell you my course of action. Had I been responsible - if it was my duty and responsibility, I would have either myself or sent competent people into the No 1 and 5 returns for their entire length and taken both velocity and carbon monoxide readings along the length of those entries and also in the back No 13 cross-cut, asking the question, "Is there an area in which we have stability and is there an area zone that is different in this production of carbon monoxide that we are seeing?" Once I identified the location of a difference - a place where I'm seeing more carbon monoxide being made than others, then I would determine what other things I might do. Now, I don't believe in going into goafs. I would, for example, penetrate the stoppings by some means and get sampling tubes by pipes - try to extend pipes as far into the - beyond the stopping as possible.

Excuse me, what stopping are we talking about?-- These would be the stoppings between the No 1 and 2 cross-cuts. They had taken out the stoppings between the No 4 and 5 cross-cuts at that time, I believe, somewhere to maybe 7 or 8 or 9 cross-cut, so you wouldn't have been able to get too much definition there, but we would have to try to get in-goaf sampling and try to determine, "Is this just a normal oxidation of coal, or is this something that might be serious?", and this you do by once you get your zone located, you then monitor that on a relatively continuous basis for a long enough time until a firm decision can be made.

At what point in time would you have conducted this investigation had it been your responsibility?-- Well, based on this curve that we see here on Figure 2 - the red curve - I would say on the 3rd or 4th of August I would have had people back in there looking at what was going on. Now, I'm just looking at this. There happens to have been other data, and had we presented that other data, this would have occurred at an earlier period in time.

What other data do you refer to?-- The CO make during the month of - in the weeks prior to the 28th of July.

You have heard about detection of haze and smell on the 5th and 6th of August, haven't you?-- Yes, sir.

What do they tell you?-- Those things, with this rise, would

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tell me, had I been the responsible officer, that time was not my friend and I had better find out what's going on very quickly.

And you would have then done the things that you have told us about, or would you have done something else?-- Yes, I would have to locate the area and make sure this was not - one of the nice things about normal oxidation - normal oxidation that - will generally have a - as you go along a passageway, you will find it relatively uniform along the length of that passageway. Oxidation associated with spon com - we will find zones where there is a higher CO make than in other zones within that same passageway.

Do you know of the Unor system - the Maihak system?-- Yes. As I've said, we introduced the first one in the United States, and I studied it back in Germany when the Germans first developed the Unor back in '63.

Yes, but the - I'm just really interested in the modern computer with its graphing capacity. All I'm asking is could a Maihak computer have produced your graph, Figure 3, or Figure 2?-- Yes, particularly if they had incorporated within the system the velocity meter which was originally intended for use in this panel - that would have been a very simple thing. In the absence of that, I would expect management would ask the deputy to call out the velocity that he reads when he reads it, and they would then program that into the computer. That's a little more difficult - more hard to do, and less manageable than having a velocity meter.

The next portion of your report discusses the CO and CO2 ratio, doesn't it?-- Yes, sir.

And you heard, I think, just a little while ago from Dr Cliff, so far as he knew, CO/CO2 ratio didn't have much use - I'm not sure precisely - in Australia?-- It is the common technique used in mines in the western part of United States where spon com is a potential - that is, in those mines where CO2 is not likely to be an aberrant gas. That is the one time that this must not ever be used. We use it for a number of reasons, one being that it is simple to use, and we like to keep things as simple as possible. Typically, given everything is equal, if you do Graham's Ratio correctly and sample at the correct place, the Graham's Ratio and the CO - and the CO/CO2 ratio will give you a consistently same answer, but the CO/CO2 ratio is very easy for people - secretaries can calculate that.

What about lawyers?-- I claim privilege.

And does the CO/CO2 ratio, apart from the CO2 gas seam which you have spoken about, have any other restriction or impediment, such as water or-----?-- Well, where blackdamp is being made - but you actually have a worse problem with blackdamp with Graham's Ratio than you do with the CO/CO2 ratio. Where blackdamp is a problem, you have to be very careful with the CO/CO2 ratio, and in those mines where you have a CO2 problem, such as Gordonstone here, we are recommending that we use none of these formulas; rather, we

recommend sampling - getting a history by sampling critical points, and these are well established in the mine once a week, and then plotting all of the gases and observing the rates of change of these gases, and through this type of thing one can very rapidly catch a potential heating or potential fire. There are ways to get fires without heatings.

What's your view as to the CO/CO2 ratio being suitable for Moura No 2?-- I found the CO/CO2 ratio - the Graham's Ratio and the CO make to be quite comparable for Moura No 2. The one thing about the CO/CO2 ratio is that it gave an amplification of the data, so the changes were more - would be more obvious to a casual person.

All right. Now, you have prepared a further diagram or graph, haven't you, figure 3, which is the CO/CO2 ratio for Moura No 2 from 1 June to 7 August?-- Yes, sir.

And what did you base that graphing on?-- This was based on Unor data provided by BHP last October for the sampling point in the No 5 return and the sampling point in the No 1 return.

All right. Well, the No 1 return, from memory, was ventilation station 46, I think it was, and the one at the No 5 heading had a number of 59, I think it was?-- The numbers seemed to get changed quite a bit. I just took the numbers from BHP, knowing where they did identify where those sampling points were, and I took the number that they had on the Unor report.

For consistency?-- And that was 5 and 16.

All right?-- They were 5 and 16.

And you make a comment at the foot of page 6, note 18, I think it is, to the effect that sampling point 5 was erratic compared with 16 and being typical of what happens when major changes are made to ventilation?-- That is our experience with the graphing of - when we observe graphs of the CO make in the United States, where we see a curve such as that for point 5, particularly after the 20th of June, we are seeing very - a lot of changes in the ventilation - in the flow of air reaching the sampling points, that's what I should have said.

Well, you have produced - you have got the blue line as sample point 5 and the red line as sample point 16 over the axis for 1 June to 6 August. What - or how do you interpret that graph?-- How would I use it?

How would you interpret it?-- How would I interpret it?

Yes?-- It is very clear to me that some time around the - let us say the 17th or 18th of June, something was happening and it became very obvious by the 25th of June.

And from that point forward - and where you say something "very obvious", what are you talking about?-- Well, the rise in the graph is extremely rapid. It is abnormally rapid, and

when you see an abnormal rise, then you must be considering the possibility of having an abnormal condition.

Such as?-- Such as a spon com or something else. It could be a fire or it could be a lot of things, but I would sure want to know, and the indications here are spon com.

As far back as about the 25th of June?-- Yes, sir.

Is that a convenient time?

WARDEN: That's a convenient point. We will take the lunch adjournment and resume at 2.15.

THE COURT ADJOURNED AT 12.55 P.M. TILL 2.15 P.M.

THE COURT RESUMED AT 2.16 P.M.

DONALD WILLIAM MITCHELL, CONTINUING:

MR CLAIR: Your Worship, just before Mr Martin proceeds, can I mention that Mr Mackenzie-Wood has arrived, not only in Gladstone, but is apparently present here in the building. I would propose to interpose Mr Mackenzie-Wood at this stage, but rather to wait until Mr Martin has finished the evidence-in-chief of Mr Mitchell, if there is no objection to that course being taken. It may be appropriate, depending on what stage of the afternoon that is, that there be a short break before we call Mr Mackenzie-Wood.

WARDEN: Yes, thank you.

MR CLAIR: Your Worship, in the meantime would there be any objection to Mr Mackenzie-Wood remaining in Court?

WARDEN: I take it there is no objection? He can remain.

MR MARTIN: If it helps I think I will be about an hour. Mr Mitchell, I'm about to move on to spontaneous combustion mitigation referred to in your report. Before I do, I notice from your report that you do not seem to include Graham's Ratio?-- No, I don't.

Well, could you explain why?-- Graham's Ratio is probably the most effective means for monitoring a heating, particularly in it's very earliest stages. This has been proven conclusively in the laboratory of Dr Chamberlain in Great Britain and subsequently in the advancing long walls, the single entry advancing long walls in Great Britain. Actually in Germany they were not able to utilise the carbon monoxide index or Graham's Ratio, two interchangeable phrases for the same thing. We in the United States also found in our laboratories that Graham's Ratio was a most effective means for analysing a developing heating. We have a number of problems with it, however. Dr Cliff gave reference to them - some of them, and that is (1) the location of the sample, and this is a most critical thing. I could make a quick drawing and give you an example showing that you can get all different kinds of numbers depending on where that sample is taken with respect to Graham's Ratio, and this is where one of the problems will lie. The other problem, as he talked about, was the oxygen deficiency. Dr Willett in his very major work about sealing mines, I believe the committee - in 1971 in Great Britain there was a committee on sealing of areas within a mine following the series of bad explosions they had, and Dr Willett in his paper - the committee in their paper pointed out that Graham's Ratio could not be used efficiently where the oxygen deficiency was less than two-tenths per cent, and that applies to much of the data from Moura No 2 in the months of June and July. Of course the problem there is that the data for the main return from the place, and it's mainly fresh

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air and it's kind of hard to calculate Graham's Ratio when you are looking at it from the fresh air. As I mentioned earlier, if you have black damp intrusion, Graham's Ratio is just not usable. I still prefer CO/CO2 because - one thing, it's complete simplicity, totally independent of the oxygen concentration, totally independent of somebody taking a velocity reading and the errors inherent in that. It's a nice, neat simple technique.

For the benefit of the industry in the future I would ask you to draw your diagram?-- Okay.

Would you like to use - there is a magic whiteboard there?-- If you will excuse the expression of what I call a quick and dirty diagram -----

You have already done it, have you?-- I just have a rough draft. It will only take a minute -----

Yes, please take a minute?-- These are very simple networks. This is a heating, and let's say we are producing 500 ppm of CO and 2 per cent CO2, and in this example we will put two cubic metres per second of fresh air. So I'm going to put 20.93 per cent O2 to indicate fresh air, and let's put 38 metres cubic per second here, and if you take Graham's Ratio - if your sample point is right here Graham's Ratio will be equal to roughly 250 - I'll put an approximate sign there, and CO/CO2 will be equal to 244 and your CO make will be equal to 60. Now, if I'm down here in the No 1 return taking a sample then Graham's Ratio here is going to be, in this case, 225, very much the same. CO/CO2 is 244 and CO make is 60, great. Everything looks good, we could learn something from that, but now instead of putting fresh air in here - let us take that same thing, and instead of putting fresh air let us say that we pick up methane, this air going through coming into this heating picks up methane. The numbers are all the same, but here with the two cubic metres per second I have instead 17 - now, here is my methane, CH4, and here I have 17 per cent oxygen and there is my fresh air coming in just like that. Two cubic metres per second, and 20.93 there. Everything is the same except the methane, and then we get over here, we still have - everything is the same and now over here - I'm trying to find my numbers, very good - Graham's Ratio is equal to 81, CO/CO2 is equal to 244 and the CO make is still equal to 60. Now, coming in the return however I have a Graham's Ratio - I wish I could read my own numbers, it would be very lovely - of about 12 and a CO/CO2 of 244 and a CO make of 60. So the influence of that methane or black damp or any other contaminant can have a very major impact on the analysis and the interpretation, and one of the things we must never allow coal miners to do is give them a tool that will give them different answers.

Just to clear something up, should there be a decimal point in your figures when you talk about, for instance, 250?-- When I do numbers I always use a multiplier because decimal points confuse people and I always use a multiplier. It keeps it simple.

Is there anything else you want to add to your demonstration?-- No, I don't think so - believe so.

Could I just turn then, please, to the next part of your report which is spontaneous combustion mitigation?-- Yes, sir.

You say it's "...the canary, the early warning of possible heating."?-- Yes.

I would just like to go on from there. In relation to panel 512 on development, what do you say should have been the monitoring points or the monitoring system?-- It is important when you are monitoring to set up a monitoring system to be able to get a proper distribution, because the air - your air through various parts along your return differs so greatly. Our practice is you set up your monitoring points at your returns, at the regulator points or wherever the junction of the return with the submains would be, and we never allow our points to be more than 1,000 feet apart which is roughly 330 metres. In this case, as you would advance the 512 Panel you would carry a second point, always at the last open cross-cut. Now, when the panel is advanced its full depth, which in this case would be 13 cross-cut, the number 12 cross-cut would become your permanent station - second station in both the No 5 and the No 1 returns. So now we have four sampling points in the 512 Panel at somewhere between the zero and No 1 cross-cut in both 5 and 1 entries and around number 12 cross-cut in the No 5 and 1 entries.

In so far as the most inbye monitoring points are concerned, once retreat starts, does that serve some really basic, useful purpose?-- Very much so, yes.

What is it?-- The question is is the make or the ratio, whichever one of the ratios you use, is there a difference between that one or among that one and any of the others. If, for example, the make in the cross-cut No 1 entry cross-cut 12 - we will just take a number - we get a reading and we will call it - though we are not taking velocity, but let's assume we did, let's keep the CO/CO2 ratio. Let's say my CO/CO2 ratio at 12 cross-cut 1 entry is 20 and my ratio at No 1 - at the No 1 entry, near the mouth of No 1 entry is about 22. This indicates a relatively linear make of carbon monoxide along the length of the entry and I wouldn't be too worried as long as that doesn't change over the life of the extraction, but let us say instead that I have a CO/CO2 ratio of 20 at the No 1 - at my outbye measuring point and I have a ratio of 1 at number 12 cross-cut and No 1 entry. Something is amiss there. The difference is just too great and then I would make the effort to find out where along that length of the No 1 entry am I getting an inflow of carbon monoxide that is appreciably greater than normal.

I tender the whiteboard calculations which I shall call Graham's Ratio calculation by Mr Mitchell.

WARDEN: Exhibit 242.

ADMITTED AND MARKED "EXHIBIT 242"

MR MARTIN: Further down in your report you talk about pressure differential in the case of a goaf or a heating or something of that kind, and where methane may exist you talk about a two-pronged defence, about the middle of the second last paragraph?-- Mmm.

When you talk in the last sentence of caved roof, "To do this only caved roof should restrict air flows through the goaf into the back bleeder", are you talking about stone, sandstone or some rock formation?-- Well, whatever the falls are made of depends on the strata, of course. In Moura No 2 the falls, I understand - I may be wrong - are predominantly a sand rock of some kind.

Is it the case that you are talking about a clean floor and a rock fall on to a clean floor?-- Relatively clean. For spon com to occur you must need a relatively large pile of coal that is - I use the phrase "hidden" - hidden from the main air flow, a sloughed rib where you have the rib sloughing due to - and you get a large sloughing, this is typical, but where you are going to militate against spon com you have to mine cleanly or you've got to design your pillars so that there is minimal loose coal left after you are finished.

At the foot of the page you speak about the opening or removal of stoppings adjoining the No 1 and 5 entries. What do you say about that in terms of practice?-- Between the No 4 and 5 entries?

I was just reading over the next page, Mr Mitchell -----?-- I'm sorry, I'm reading elsewhere. In the No 5 entry they removed the stoppings - if I may refer, please, to my Figure 1, they removed the stoppings as they retreated between the No 4 and 5 entries. As a result air going up the No 2, 3 and 4 entries would have a tendency to move directly over to No 5 entry and not go through the goaf. Now, there will be some going through the goaf, but you now have a distribution of air and you are losing air quantity and air pressure on that side. This is the typical - this loss of air quantity and loss of pressure are the two key factors leading to spon com. This is where you get fugitive air flows. Now we come in and we exacerbate the problem by going to number 12 cross-cut between the No 1 and 2 headings and we open that stopping. Now, this is keeping air from going into the far back through where it should normally go through one or more stoppings between 12 and 13 cross-cuts. Additionally they put a diagonal stopping somewhere in No 2 entry back in the goaf which again moves the air and redirects it away, and all of these things are reducing pressure, increasing resistance, reducing air quantities and exacerbating spon com. So all this messing around is what causes the problem.

You have spoken about pressure differentials. We have heard

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in evidence that there was no Magnahelic at No 2 Moura. Are they a very expensive article?-- Well, a typical Magnahelic - the last one I bought which was zero to a half inch water gauge cost me \$23, but if you don't want to spend that you can get a rubber tube and a glass or plastic U tube and affix a standard water gauge on each one of my - at each one of my ventilation stations or wherever I want to monitor the pressure differential. No big deal.

I take it from what you say that you would place a permanent fixture by way of a pressure differential device at your measurements points, at your ventilation stations?-- Well, with Magnahelics you generally tend to carry around, they tend to break and a lot of mines that I know are going to a permanent U tube at their various places where they are concerned with monitoring. This makes it simple. It gives the section foreman as well as the fire boss and as well as the mine foreman an opportunity to keep an eye on what that pressure differential is doing.

Say in the life of the panel extraction, if there is no pressure differential measurements what's the outcome?-- Well, you really don't know too much about your air flow because pressure - it's like your heart, your heart produces pressure and that makes your blood flow. In a mine a fan produces pressure, this is what makes air flow. Air will always flow from a point of high to low pressure. If you don't have a pressure differential you are not going to get air to flow, and the name of the game in mining, at least in the face area, is to get good air flow.

If I move on, please, to that portion of your report which deals with sealing, you've heard of the Tcrete type stopping in this Court?-- Yes, sir.

Did you get some specifications as to that product?-- Well, the specifications I heard here in the Inquiry are quite different from the specifications one would understand for what I believe are comparable products. I believe I heard someone say that the cure strength of Tcrete in these things that they build here is something - I got three numbers here, 41.5, 48.5, 52.5 millipascals. That's equivalent to 47.5 as a mean. In my language that's roughly 7,000 psi. That's pretty unbelievable concrete. Typical foundation for a bridge or a shaft hoist or something like that, the concrete specification will be for something in the neighbourhood of 30 to 40 megapascals and that looks not at a basically neat cement with fibres in it, but it's the aggregate and the sand which gives the concrete its strength. In the United States we have a product called BlocBond which is not - I don't believe too dissimilar to Tcrete except it has alpha glass fibres rather than the polypropylene fibres, and BlocBond - there are several grades of it. The best grade has a compressive strength in the neighbourhood of 500 psi. We also use a product called Tekseal which I am told by the Tekseal people is the same as - they thought - as Tcrete. They use the Tekseal in Canada and the United States, and their very best product has a compressive strength of 700 psi. Now, for those people who don't want to make the translation that's about

one-tenth the strength that I heard reported in here, and then I understand somebody subsequently gave a higher compressive strength, but regardless of that the strength of a stopping is - of a seal is not a function of the compressive strength of the material, it's a function of its transverse or flexural strength and typically that will be between - if it's real good stuff, between 15 and 30 per cent of the compressive, typically it's more close to 5 to 10.

But did you get actual written specification as to Tecretete?--

No, I've never gotten other than what I heard here in Court.
I do have the specification for Tekseal.

And Tecretete, like any other product, has a curing time?--
Yes, sir.

Well, within 22 hours what's your best estimate of how resistant to forces within the panel it would be?-- Well, on this basis, if I accept the numbers I heard last October of a - roughly 48 - we will call it 48 megapascals as a final cure on a 28 day cure - and I did a typical concrete curve which is not applicable at all because there I am looking at concrete, not a neat cement, but if I'm - that's being very optimistic, very giving, and that puts me at about 15 megapascals under the very best of conditions, if I use very good clean water and had the right curing temperature. So, under the very optimum conditions I'm dealing with about 15 megapascal curing strength which will give me about - if I'm real good - maybe 1 to 2 megapascal flexural strength.

Yes, but in comparison with 345 kilopascals?-- Well, you can't compare. The 345 kilopascals is based on the ability of a structure to withstand an impulsive force of 345 kilopascals. We know from research in the United States, Germany, Great Britain - by the way, I have given Brian Lyne - he has some of the key documents in this area. He made copies of them, and this is work that has been going on, going steady since the 30's, so it's nothing new, and the consensus of all the people who have made these studies is that - if I can read out of my notes because it gets a little complex.

Yes, please?-- Explosion-proofness is a function of a seal's transverse strength and is proportional to the square of the ratio of its thickness to span.

Right. Taking you to the next page of your report, page 10. In the United States, for example, is there testing of the resistance of the final seal product?-- Yes, all - in the United States all companies who wish to use an explosion-proof stopping or bulkhead and all areas in mines that are not ventilated must be sealed with an explosion-proof bulkhead capable of withstanding 20 psi which is about 140 kilopascals. The requirement there is based on tests of the structures by initially the Bureau of Mines. I ran these tests back in 1970 and '71 to define bulkheads at that time. Mr Stephan and his colleagues, in conjunction with the Bureau of Mines, have been doing more recent work, and the mine - the district managers within MSHA are given detailed descriptions of what an acceptable explosion-proof bulkhead - what the design parameters for that must be, and these are what the mine operators must use.

And in terms of - you heard Mr Stephan yesterday talking about - I asked him a question about a 20 foot stopping and how thick it might be. Can you add to that?-- Yes. A stopping made out of a monolithic material such as Tekseal, Tecretete, BlocBond, things like that, must be at least one-third the width of the entry or height, whichever is greater. There

comes - we, fortunately, do not have the excessive widths and heights - not excessive, excuse me - the great widths and heights that we find here at Moura. Our typical entry widths - very seldom will you ever find an entry width greater than 20 feet, mainly because when you go beyond 20 feet width you must use supports in addition to roof bolts, and so that's basically not a practical thing to do. So, 20 feet is a typical width, which means a bulkhead made out of something like Tekseal/Tecrete would be seven feet thick, which is about two metres thick.

Can I just take you to the monitoring situation after a seal has been effected. You deal with that in the report, don't you, and you say, of course, that bad data are worse than no data. Now, what do you say about the - what's your view at least as to the final monitor point or points within a sealed panel - where should they be designed?-- The monitoring point - preferably it is best to have more than one monitoring point. We find it rather cost effective to put two or even 10 monitoring points into a sealed area rather than have something happen to one of our monitoring points and have to drill a borehole from the surface or drill holes through the seal or maybe breach a seal to get monitoring points inbye. That gets a little expensive. The monitoring points - when you have them close to the seal or stopping - I don't want to call these seals - you have this leakage, you have the exchange of air and - air from the open portion of the mine going into the sealed area and the gases from the sealed area going into the open portion of the mine. This is normal to every seal stopping ever built in any mine in the world. This is to be expected. Therefore, to get - you want your sampling point to represent the conditions within the sealed area. Therefore, it should be in deep enough so it's not affected by this exchange or - exchange of air and gases has minimal effect on the quality of the sample. We, as a rule, hold that you must go in at least two cross-cuts inbye the seal location. This is the minimum distance that you should go into, but additionally more important than - almost - no, equally important, excuse me - is that all stoppings between the seal, or whatever you do to close off the area - all stoppings between that and your sampling point must be breached so that you get an equalisation and we don't get pressure differentials within the sealed area, or we reduce the pressure differentials within the sealed area, which differentials exacerbate the exchange of air and gas.

And in terms of the - not so much the type - what nature of sampling tube or pipe would you use?-- The ones that I have been preaching and quite a number of companies are now using is we hang a pipe off of a roof bolt or we wedge it between the roof and the floor and this pipe extends for the full height of the opening. The reason we do this is because of the tendency of methane to be close to the roof and some gases like carbon dioxide, except when it's hot, to be close to the floor, and if you want to get a proper sample within this area, you want to be able to sample the total cross-sectional area or the general body, then you put holes in this pipe and you draw your sample through this and you get a nice - reasonably nice uniform sample.

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Well, we know in this particular case at Moura No 2 that the final monitoring point was some 20 metres inbye the seal in No 3 heading, I think, from memory?-- Yes.

What do you say about that? And we know, I think, that the stoppings that you have referred to weren't breached?-- May I look - open a map very quickly, please?

As long as you tell us what it is?-- Yes, I will.

What is it?-- I'm not very quick. It's BHP drawing No 45/19, document No 148.

Well, look at that if you would?-- Now, if you will look at that document sometime, you will notice that there are double brattice in the 510 outbye the No 2 opening. Most of the air that will go and sweep across the faces of these stoppings is going to go in through the No 3 entry. Therefore, the highest pressure on the stoppings will be on the stopping that is purportedly sealing the No 3 entry. This would mean that - not knowing anything better - that the sample that will be most diluted, if there is any sample diluted with fresh air, will be the sample in the first cross-cut in the No 3 entry, the sample where they had the sampling point, and that would be the least representative sample in the panel, in my judgment.

All right, thank you. I should formally tender that document, Your Worship, if I can extract - what is its description again, Mr Mitchell? Plan 45/19. I'm told, Your Worship, it's Exhibit 112 already but with some markings on, so we probably don't have to have the repeat document.

WARDEN: Thank you. It might be rather handy if we don't have to accommodate that if it's on something else, as long as you are happy it's on something else.

MR MARTIN: Yes.

WARDEN: Thank you then.

MR MARTIN: Mr Mitchell, just turning - you make a footnote, footnote 34, on page 11 to the effect of the comment on the testimony, I think, of - who was it - probably Mr Morieson about the location of the final monitor point and the incapacity to get further inbye because it was dangerous. What do you say about that?-- Well, it would have been a simple thing to have put it in before I robbed the pillars or slabbed the pillars between that one No 1 cross-cut and the point that I wanted my sample point to be inbye. We do this all the time. We install our sample point ahead of time. It's just known as proper planning.

All right. You go on about halfway down the page of page 11 to talk about boreholes. Of course, you are talking about post explosion there, aren't you?-- Yes, sir.

And you say, I believe, that data was collected but apparently

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not studied?-- Well, I have seen no indication that anybody paid any attention to the boreholes sucking in or blowing out other than to make note that they were blowing out. I saw no indication that they understood what those things indicated.

And you have produced a further graph immediately following page 12 which is a - sorry, figure 4, Moura No 2 Mine Borehole Gas Samples; is that the case?-- Yes, sir.

What is the Inquiry to glean from that?-- Looking at the data collected from the boreholes between the first and the second explosion, the evidence supports belief - the data, I'm sorry - the data support belief that there was a - the possibilities were that there was a fire in 510 and there is a good chance that there was an active fire also in 520. There are no major indications - no indications of major activity from the boreholes, the other boreholes.

And you are referring, of course, to post first explosion?-- Yes, sir.

Can I just take you down to two-thirds of the way down the page where you refer to Panel 512, and you - reading, "Pre-explosion data from point 5, 20 metres inbye the seal in the No 3 entry, showed methane rising above 7 per cent." Do you see that comment?-- Yes, sir.

Have you reflected on that?-- I was corrected on that. That was based on data I had before I learned about methane correction and I never corrected the 7 per cent.

You are talking about correction on the Maihak computer?-- That's what I understood, that there was a 5.65 per cent deviation.

Nonetheless, having been corrected, to what extent at all does it affect your report?-- Absolutely none. The fact that I already discussed - and if the people agree with me - that the 512 sampling point showed the - probably the least concentration of methane and fire gases or spon com gases, then somewhere within 512 we had a gas air body or mixture or something containing at least 7 per cent methane. I use that number solely because below 7 per cent methane the probabilities are you will not develop damaging pressures, and the one thing we know is that the first explosion, as well as the second, did generate damaging pressures. Therefore, the probabilities are that somewhere in 512 - were that the area of ignition - somewhere in there there was a methane air body containing at least 7 per cent methane.

And as to the site of the first explosion, your opinion is that it was within 512, I take it?-- Yes, sir.

Now, I would just like to take you, if I could, please, to the following page and you talk about re-entry. Do you see that heading?-- Yes, sir.

Now, you have a variety of subparagraphs (a) to (e) at the top?-- I do.

And should one be ruling a line across there beneath subparagraph (e) because that's the end of that particular subject?-- Yes. The first paragraph starting with the words "Stability" and ending with what we had with (e) is talking about conditions when there is no explosion but it's after the sealing and after we have withdrawn the miners.

And until conditions are safe?-- That's correct.

And then immediately beneath that imaginary line we have been talking about do you then move onto the subject of if there has been an explosion?-- Yes.

And that part of the report under that heading - may I call it that - extends to the bottom of that page?-- That part starting with the, "There had been an explosion...", and ending just before we start the subject "Stability", that refers in total to actions after the first explosion, immediately after.

And down to the end of stability?-- Stability -----

Sorry, and including down to the end of the page or not?-- No, the subject - the section on "Stability" refers to again any condition, whether there be an explosion or no explosion. It's anything after sealing because stability, as I said before, is the key to safe re-entry.

I misunderstood you. Then turning to the next page, 16, you are still talking about stability in the first paragraph. Are you talking there about there having not been an explosion?-- Right.

All right. So that assuming the Panel 512 was sealed, the men withdrawn, what you are saying there is that the proper - well, your practice would be to wait until it was outside the explosive range and indeed 72 hours, if it took 24 hours to reach the non-explosive situation, before you would allow men back in?-- Right, whichever comes last, and where neither - where you don't get stability within 72 hours, many a mine operator will then start pumping inert gas into the sealed area so that he can get back into production after the oxygen concentration gets below 12 per cent.

Mr Mitchell, I just want to take you a little further down the page now, if you would, to your opinions. You have already expressed your view as to the site of the first explosion being within 512. What do you say about signs of heating or the development of a heating prior to the explosion?-- We showed the CO/CO2 curve and that showed in June there was something to call someone's attention, and based on what little studies I did make there seems to be a - should have been a good correlation between CO make and the CO/CO2 curve. The only problem with the CO make is the problems associated with getting air quantity calculations, but when we had this abrupt rise in this CO/CO2 ratio we had people talking about smells, we had people talking about - thinking they saw hazes, and had the condition been investigated back in June, remedial

measures could have been taken then and we wouldn't be here today, in all probability.

Well, you say "remedial measures". What remedial measures?-- If when we did define a probability - we don't have to say that, with certainty, that I have a spon com going on or a heating going on, but if the probabilities are that there is some thermal action going on - and one thing about thermal actions, once you get a thermal action they like to get bigger, very seldom do they go the other way - one of the things they could have done is sealed across with explosion-proof bulkheads across those five entries, dropped down one cross-cut and started mining again.

After appropriate-----?-- That's right, or they could have abandoned the panel, depending on which would be the most cost-effective.

Could I take you back to page 1 of your report? There you summarise your report; is that the case?-- Yes, sir.

Your first opinion is that mining and ventilation practices exacerbated reactions which, in turn, led to spontaneous combustion?-- Yes, sir.

Within panel 512?-- Yes.

And as you have told us, the heating should have been recognised in June about by the 25th?-- Well, some time in June, and the 25th is, I would say - would have been a good time to have done something.

And the third opinion is that the stoppings sealing 512, in your view, didn't comply with the 345 kilopascal resistance?-- Not only in my view, there is no data that supports a belief that those Tecrete stoppings had any important strength with respect to an explosion.

And your fourth opinion is that whatever was being monitored within 512 is relatively meaningless?-- Yes, sir.

And fifthly, your opinion is that there was a rapid growth of a heating during the early hours of Sunday evening; is that right?-- That's correct, sir.

And that there was still adequate time, even then, to observe it and do something about it?-- That's correct. By that time the only prudent thing would have been to withdraw all persons from the mine until the situation could be properly evaluated.

Just excuse me for one moment. Mr Mitchell, I just want to deal as quickly as I can with some other short topics. Could you just tell us, please, so far as you know it - of legislation requirements in the United States - about the acceptance of an alert or an alarm or an acknowledgement of it and a re-setting to any level?-- The Federal Coal Mine - well, it is now the Federal Mine Health and Safety Act of 1977 - they incorporated metal and non-metal in the coal and changed the year - requires - has certain regulations pertaining to fire detection. These are specific to belt entries, as Mr Urosek mentioned yesterday, however there are other regulations that I would like to mention quickly; for example, the per cent methane in the return must not exceed in certain places 1 and a half per cent methane, some places it is 1 per cent methane. Where, for some reason, the mine operator has a real need to modify these, he cannot do this arbitrarily. He must petition for modification. At the present time, the old regulations call for point type sensors - heat sensors - in belt entries. These are on 125 foot centres in most mines. A mine operator will want to put in a carbon monoxide monitoring system. He will make a petition for modification and if this be accepted, it will specify in there a certain alert level and a certain alarm level. Now,

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the reason we have it there is the great majority of our fires are in belt entries. At the alert level - and this ranges - for example, in Enlo Fork mine and Bailey mine, they have an alert at 3 and an alarm at 6. A great majority of the mines have the alert at 5 ppm carbon monoxide and an alarm at 10. When you get an alert, as Mr Urosek mentioned, you have to do something. Typically in the great number of petitions for modification that are approved, all that is required is that at the time of the alert, the people inbye the affected area must be notified and an investigation must proceed without delay to determine what caused this 5 ppm or 3 ppm, or whatever the alert is. Nobody can acknowledge this. Nobody can say, "Gee, I acknowledge it. Now, let's put it up to 10. Let's put it up to 7.", or something like that. If you do that, you will find yourself possibly facing a gaol term.

Well - all right. Go on?-- If and when that goes up to the alarm level, then all persons must be withdrawn from inbye the point of concern, and sometimes this means withdrawal from the mine, except for those people necessary to do something about the situation.

And where does one apply in United States for approval to raise the level?-- You must do this through your petition for modification.

To whom, though?-- Pardon?

To what source?-- This you send initially to the District Manager. In the United States we have 10 districts in which our mines are divided. You send it to your District Manager, he will send an investigation team out to determine the warrantability of your petition. If he concurs with your wishes, he will submit it to the main headquarters in Arlington where another group of people will evaluate it. The union will be notified, as well as other interested parties, and if everyone agrees, then the petition will be approved. If any party disagrees, you go to Court.

All right. Can you just briefly tell the Inquiry something about your view of the 10 litres and 20 lpm make of CO and its applicability, if any, to Australia?-- The Germans were not able to use Graham's Ratio in their long walls, mainly because of the high levels of nitrogen that were generated in their goafs. They also had a lot of CO₂, but their biggest problem was their goafs produced a lot of nitrogen. Professor Lintel Versuchstrecke in Essen, who is part of the World Basin Research Group, he was the head of the ventilation group at that time in the early - in the 50's and early 60's, and he was the first person who I ever read who found that looking at parts per million in those types of things gave an erroneous basis for judgment, and he developed - and his group developed the CO make. In German mines - all of the raw district mines - they found the level of 10 was a good action or alert level and a level of 20 was what people call an alarm level. The British found the same thing, but the British preferred to stick to Graham's. We in the United States found that the CO make was applicable to our work. Again, our problem was this question of getting accurate readings of what the quantity of

air was and the difficulties and the mistakes people made in the calculations. I understand that the CO make is part of the German mining regulations, as is the 10 and 20.

All right, but I'm just saying what applicability has it to Australia?-- Well, to Moura?

Well, yes?-- It would be - in lieu of not having anything else, it is better than nothing. It gives us our alert an alarm.

And it was designed, as we have heard over and over, for long wall mining, but it is still receiving samples from a goaf?-- A goaf is a goaf. A long wall goaf is typically a lot cleaner and less liable to spon com than a bord and pillar goaf.

And coal is coal?-- Pardon?

And coal is coal?-- And coal is coal, yes.

Mr Mitchell, I think this is my final question: having regard to your knowledge and experience, can you tell the Inquiry the likely volume of methane which was within 512 which led to the explosion?-- No.

Why not?-- Well, in an investigation you have to start - the only fact - and that's a debatable thing whether it is a fact - is what people experience - like Mr McCrohon - the people in 1 North-west - those are the only people who can tell us what happened. We see the damage to things such as the fan, and that gives us some information, and we can make an approximation of the pressure range at that point, and now we can go backwards, and we heard yesterday every time you turn 90 degrees you can halve - or let's go backwards and double - and in a place like - assuming 512, if everything was simple - that would be pressure of about eight times greater in 512 than in number - than, say, Mr McCrohon at the fan or any place else - assuming that - assuming that there were no water barriers, and there were - and we assume that there was the explosion propagated down one entry and not four and five entries as they did, and that spreads the pressure out, reducing it even more so, but those are the simplistic parts of it - getting back to the ignition zone. More important than anything else is the homogeneity of the gas air mixture, and we heard people asking about layering which represents the least homogeneous mixture, and that's one facet - the degree of layering - the degree of homogeneity of the gas air body at the point of ignition. Then you have the thing called the "strength of igniting source". The stronger the source, the more powerful the initial pressure development will be. Even more critical is the location of the igniting source. In the old days we had fire bosses. They got that name because they would take a candle and they would ignite the methane at the very tip, if they were lucky, and then the methane would then burn back to the face, all the methane would be gone and the fire boss can walk to the next place and do the same thing again. So, location of igniting source is critical, the location of the gas air point of ignition with respect to a dead end, because the closer it is to a confined space - it

can only expand in one direction - the higher the pressures will be. I can keep going on, but I don't think you all - there are about another dozen things.

Okay. I will leave it there. Thank you, Mr Mitchell.

WARDEN: Thank you, gentlemen. We will take a short adjournment. We will stand you down, but don't go too far away.

THE COURT ADJOURNED AT 3.18 P.M.

THE COURT RESUMED AT 3.50 P.M.

WARDEN: I might just indicate we will finish slightly earlier this afternoon, quarter to five.

MR CLAIR: May it please Your Worship, I call Paul Mackenzie-Wood.

PAUL MACKENZIE-WOOD, SWORN AND EXAMINED:

MR CLAIR: Your full name is Paul Mackenzie-Wood?-- That's correct, yes.

Mr Mackenzie-Wood, you are the manager of Coal Mines Technical Services which is based - which is a division of the Southern Mines Rescue Station based at Russell Vale in New South Wales?-- Yes, that's correct.

Now, you are aware of the accident which is the subject of this Inquiry; is that so?-- Yes, I am.

And in fact at one point, Mr Mackenzie-Wood, had you been approached to be a member of the expert panel to assist the Warden on this Inquiry?-- Yes, I had.

And at some stage after you were approached, a matter of some weeks I think it may have been, did you come to a realisation that a conversation that you had had with a Mr Dave Kerr at some point was a conversation which may well relate to issues that could arise before the Inquiry?-- Yes, that's true, yes.

And under those circumstances did you then form the view that it wouldn't be appropriate for you to be a member of the expert panel assisting the Warden?-- Yes, I advised the Chief Inspector of that and that suggestion came from him.

Now, did you subsequently in fact write a letter relating to the reason for which you saw fit to withdraw?-- Yes, I did.

I wonder if you could look at this letter here. That's a photocopy of it. I do have copies for the members of the panel, Your Worship. Do you recognise that letter there, Mr Mackenzie-Wood?-- Yes, I do.

That's a letter dated 21 September 1994. It's addressed to Mr N Barker, Department of Minerals and Energy, Warden's Court, and signed by yourself; is that right?-- Yes, it is.

In fact did you send that letter by fax to a number which you had for the Department of Minerals and Energy?-- Yes, I think I must have from looking at the top of the letter, so, yes, I would say so.

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Are you able to say in general terms just how long it was after your initial decision that you should withdraw that you wrote this letter?-- Yes, I think I alerted the Chief Inspector, Brian Lyne, some week or two before the date on this letter and then a subsequent phone call suggested a letter would be the appropriate way to proceed.

This letter then was the response?-- Yes, it was.

Okay. Now, in the letter there you set out details of a conversation that you had with Mr Kerr on 25 July 1994; is that so?-- Yes, it is.

Do the contents of the letter accurately represent your recollection of that conversation?-- To the best of my recollection, yes.

Perhaps I should ask you this: when you wrote the letter did you at that point do your best to exhaust your recollection of the conversation that you had with Mr Kerr, at least on this aspect?-- Yes, I attempted to. The incident referred to me was of only small consequence. It was in answer to a number of questions touching on a variety of subjects and I really thought no more about it after the discussion had finished, and I really had to sit down and think about what the content of the conversation was to relate back to the date. I hadn't taken diary records of the conversation.

Now, you obviously do have some independent recollection of having had the conversation with Mr Kerr at this stage?-- Yes.

Can I ask you to recount the conversation as best you recall? You can, if you wish, refresh your memory from the letter there, but perhaps if you could just explain the circumstances under which Mr Kerr contacted you and then recount as best you can the conversation?-- As best that I do recall I did receive a call, I think it was late on the day of the 25th, and the initial part of the conversation was concerned with testing we were carrying out on a new breathing apparatus called a Drager BG4 that was causing quite a bit of interest in Mines Rescue circles, and it then led on to, as I recall, a statement that he was - there was an investigation of an increase in carbon monoxide in the ventilation circuit at the Moura mine, and he really asked me about our procedure, whether a change in mining method, particularly pillar extraction, could change the background, and I think I did relate that I agreed that this would be possible. We certainly teach that if you get a change in the CO level you should resample and check the validity of the concentration and then look for an outside influence that may have caused the change, be it a change in ventilation or a change in mining method, even diesels working in the area or a barometric pressure change, and I think it was pointed out that pillar extraction was going on and this may be exposing more fresh coal to the ventilation circuit and really that - I agreed that a new norm could be a result of this.

Do you remember anything else about the conversation with

Mr Kerr apart from that?-- No, I think that really concluded the conversation, and I thought no more of it till some weeks after the explosion itself.

Okay. Well, now, I might say that basically, as I understand it, the reason for which your presence here was requested was in relation to that conversation, but I might also say that your name has been mentioned more than once during this Inquiry, Mr Mackenzie-Wood, in connection with matters related to CO make and the significance of certain levels, and I do want to ask you some questions about that. Before I go on to do that, though, Your Worship, I will tender that letter that's been referred to by Mr Mackenzie-Wood.

WARDEN: Exhibit 243.

ADMITTED AND MARKED "EXHIBIT 243"

MR CLAIR: Could the witness see Exhibit 183, please, Your Worship? While that's being obtained, Mr Mackenzie-Wood, you published in conjunction with Mr Strang a work in 1985, I think was the first edition, in the course of which there was some discussion of the significance of Graham's Ratio and carbon monoxide make in recognising the existence or otherwise of a heating in a mine?-- Yes, that's right, yes.

Now, that exhibit there in fact is page 257 from the 1985 edition and contains a passage that has come into focus in the course of evidence here. On page 257, about one-third down, there is a reference made to Graham's Ratio being able to be used to differentiate between a fire and a heating and there are certain figures set out there which distinguish between significance of levels of Graham's Ratio in respect of fresh coal and old coal; do you see that there?-- Yes, I do.

I won't go through each of those, but I simply refer to that to put into context what follows. There is then a note there: "The carbon monoxide make is also used as a guide to fire intensity." The next paragraph goes on: "If the carbon monoxide concentration and air quantity is known, then 10 litres of carbon monoxide production per minute requires investigation and 20 litres of carbon monoxide production per minute indicates that considerable danger exists.", and then the text goes on to set out an example. Do you see that there?-- Yes, I do.

Can I ask you, as one of the authors, where the information came from on which that paragraph is based?-- Yes, I was responsible for putting this in the manuscript. In 1983 we invited the then head of the Essen Mines Rescue Station, a man by the name of Franyo Kock, to visit New South Wales and Queensland with a view to giving a series of seminars and talks on inertisation or the use of vaporised liquid nitrogen to treat spontaneous combustion and fight fires, and it was

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during the course of that visit he alerted us to the fact that existing ratios that were in use would become invalid if nitrogen was injected into the area, a suspected area, or even into the ventilation circuit, and particularly ratios that had oxygen deficiency as a denominator, and he really then made these figures available to us. After many years - I think 1974 the German industry started using nitrogen and as a result of much testing and real experience 10 and 20 had been decided on in that country as the triggers as mentioned in this report. I, therefore, included them in this manuscript.

Now, did you - well, that was in 1983 that the information was gained from Mr Kock. Was there any independent assessment of those levels against the Australian experience in any way?-- Yes, we - I suppose to use the term loosely - looked at them in regard to known heating results that we have had in some of the northern coal fields of New South Wales and there was a tie-up, a similarity, but I think it was after a visit to Germany in '86 where two gentlemen from Queensland, myself and a fourth from New South Wales went back to the Essen Rescue Station in Germany and we developed this even further, and following that visit some Queensland mining men were very excited about carbon monoxide make and they applied it to, I think, Cook Colliery, or known Queensland conditions, and they came up with a - what appeared to be a more appropriate lower trigger, and I refer to 15 - in fact, I think 7 and 15 were the figures mentioned as a result of that comparison.

Before we go onto that, can I go back to Mr Kock's 1983 visit? Prior to that were you aware of the formula to calculate the CO make?-- No, I wasn't. I had really not heard of it.

Did Mr Kock pass that formula on in 1983?-- Yes, he did.

And was that formula used to make some assessment at least of the applicability of the figures in respect of some of the mines in northern New South Wales?-- Yes, it was.

Were you involved in the calculations that were made?-- Yes. I hasten to add it was on a small scale as a personal assessment. It wasn't put through any published work.

Okay. Just perhaps pausing a moment and for the sake of accuracy, can I ask you about that formula that's contained in fact on page 257?-- Yes, actually that wasn't the exact formula that Franyo Kock passed on. There was a typing error there. That should be 10 to the power of 6, and in fact when that and a number of other errors were brought forward, another volume of this book was brought out where the corrections were in it, and I'm a bit sad to see you are referring to the first volume.

Unfortunately that's the page that found its way into evidence and it seems as though there are not enough zeros in the result?-- That's correct.

As it stands, but it should read 20 over 10 to the 6th; is that right?-- That's correct, yes.

Now, you say that you personally used the formula as part of the assessment; there was nothing published. The next step really - well, were there any steps taken between 1983 and 1986 to promulgate the notion of using CO make at seminars - that is, promulgated at seminars this notion of using CO make?-- I suppose not really. By the time the book came out it was starting to gain some interest, and I think particularly when quite a lot of undermanagers and managers were starting to use the book for their statutory qualifications the - quite a lot of discussion was being held on it. As I mentioned, it really wasn't until Mr Brady and a colleague in Queensland that anything worthwhile was mentioned in a public forum on the ----

Can we go to that now? You mention that you went to Germany in 1986, you were accompanied by Mr Brady, John Brady. He was one of the Queenslanders?-- No, Mr Allison and a Mr Glazbrook from Queensland.

Mr Allison and Mr -----?-- A Chris Glazbrook.

And on return from Germany in '86 was there - by that time your work had been published; is that so? This is a 1985 edition?-- Well, certainly this book had been published and there were other forums, other seminars, that I was now including that work in those seminars and workshops, and I think it was as a result of that that Mr Brady and Mr McKenna did their investigation.

Now, that was at Cook Colliery, you mentioned?-- I believe it was Cook. They both were associated with Cook at that time.

And you made reference earlier to the results of their work being mentioned at a public seminar in 1989, did you say?-- Yes, that was a training seminar, the official seminar, and was hosted by SIMTARS in Brisbane.

And the figures that were mentioned by Mr Brady, or at least as a result of the work of Mr Brady and Mr McKenna, I think you said, were 7 and 15?-- As I recall, yes, 7 and 15 were suggested.

The significance of 7?-- Well, it was a little bit lower than the German 10, and I think at the time it was thought that coal in this area gives off more CO than the German coal as a reason, but it was an attempt to have a more significant Australian figure than just embracing the German figures per se.

And that level of 7 was regarded as the level which required investigation; is that right?-- Yes, I think that was, as Mr Mitchell described, the alert trigger and they were suggesting that 15, in their investigations, seemed to be about the time the condition showed dramatic change.

That being the level equivalent to the level of 20 which had been mentioned in respect of German coal?-- That's correct, yes.

As indicating some considerable danger exists?-- Yes.

Well, now, that was at the SIMTARS seminar in 1989. Were you aware of the extent to which those figures of 7 and 15 gained any currency amongst -----?-- I was just pleased to see that people were using it and deriving some benefit from it.

At some later stage, then, there was a seminar, or perhaps I should call it a review process, to which you were a party; is that right - looking at diagnostic techniques for detection and monitoring of mine fires?-- Yes, that's right.

Could the witness see Exhibit 237, please, Your Worship? We have been told that the review took place in January 1992. Would that accord with your memory, Mr Mackenzie-Wood?-- Yes, that's correct.

You will see that that document on the second page sets out the members of the review team?-- Yes.

Now, I want to take you to a table. I don't know that I need to take you through the actual process. You have a memory of the purpose of the process and the way in which it was carried out; is that right?-- Yes.

Can I take you over to a table, which is described as table 12, and occurs five pages from the end? The table represents the stages of the review process, and sets out in the second column there what was determined by the reviewers to be the existing rule. Item 6 in that column sets out if CO make rises about 10 lpm, investigate. Now, that seems to reflect the lower parameter that is mentioned in your 1985 work; is that so?-- Yes, that's correct.

And did that reflect the general understanding of the reviewers - that that was a rule that was then in existence?-- Yes, it would have, yes.

The next item, 7, if CO make rises above 15 - or, at least, if CO make reaches 15 lpm, one might read it as - initiate control. Now, do you recall where that came from?-- Yes, that may well have come from myself following the John Brady work - that is, the 15 I referred to earlier.

And then item 8, if CO make reaches 20 lpm, again initiate control?-- Yes, well, that was the German existing rule.

Now, those items 7 and 8 there are expressed in the same terms, "initiate control", as the general rule. I should perhaps refer you back to table 2, which is closer to the front of the document, about page 6, I would think - the 6th page of the document. We will come back to that table in a moment, but go back to table 2 at page 6, and there items 7, 8 and 9 appear. Item 8 - I'm sorry, item 7 and 8 appear - or 6, 7 and 8. Item 6 speaks about 10 lpm requiring investigation. Item 7 talks about if CO make is greater than 15 lpm "then initiate action (Australian origin)"?-- Yes.

Does that reflect what you mention may well have been your input on Mr Brady's-----?-- That's right.

-----earlier information. And then item 8 seems to state it differently. If CO make rises above 20 lpm, "then initiate control measures (German origin)"?-- That's right.

And that is really the parameter that you had earlier placed

in the 1985 work?-- Correct.

Going back to table 12, item 9 in "Existing Rule" - that's the second column which refers to that table 2 earlier - expresses this as a rule: if the CO level rises above the background, "then investigate". Now, again, having regard to the review process, that seems to be a rule which was regarded by the reviewers as reflecting an existing rule?-- It is certainly normal or good practice, yes.

Can you just explain briefly what your understanding of that rule would be - that is, if CO level rises above the background?-- Yes, I think, as I mentioned, referring to the letter that I wrote earlier, you investigate to see if it is actually caused by a - an incorrect sample, or a - an outside influence, and you eliminate those first as part of your investigation before you then put in place a system to monitor the trend to see if it is caused by an oxidation or a heating.

And the reference to "background" is clearly a reference to a background level of carbon monoxide. Was there any understanding at that point as to just how one might establish the background in a particular pit?-- Yes, I think it is a fairly common thing in collieries that are prone to spontaneous combustion. You tend to live with a - what's called a "norm", which is a stable background of CO in the ventilation circuit, and you - most collieries, I would say, would have a norm established, and you then set - if you were doing it automatically - a trigger alarm above this norm - slightly above - and I think that was the intention of that rule.

Should the norm remain at or about the same level for each of the new panels within the same pit?-- I would imagine you would have to constantly redefine it as conditions changed. You would have different norms for different returns, and as mining conditions changed or ventilation changed, you would establish a - or redefine a new norm. I think that would be your common practice.

And was there any common acceptance as to what sort of variation might occur between one panel and another, what might be an acceptable variation in the background norm?-- It wasn't done at this forum. I think this is really a result of brain storming, and it is what's been distilled from that brain storming session. I know that - that level wasn't covered at this forum.

Okay. Can I move to the next column, headed "Differences and Significance of Differences", and look particularly to the items referred to as 6, 7 and 8 which refers back to the 10, 15 and 20 lpm references in the previous column. The item in that column reads, "Are air flows valid? Must consider background. CO make...", and then three dot points, the first, "easy to do", the second, "if done correctly and CO background known", the third, "overseas results, but appear valid". Now, do you recall that there was any discussion about the basis on which it was said the overseas results appear valid?-- Yes, by "valid", I would say in the ballpark

area - whether it's, you know, 7 or 10, 15 or 20, there is a validity there as distinct from 10 or 100. As part of the brain storming, that is a comment that obviously came out.

The reference to overseas results which were regarded as appearing valid is a reference back to the 10 and 20 lpm which derived from the-----?-- That's correct, they are the only overseas results that deal with this.

Can I go to the next column, and again there is an item described as 6 to 8, and this column is the column headed "Required Changes", and in respect of those items 6 to 8 - rule 6 to 8 back in column 2, it says this: "Modify rule to, 'If CO make trend rises over a range set for the specific pit (based on background (CO)), then heating is present '". First, can I ask you whether you can recall what led to that suggested modification?-- Yes, as far as I recall, there seemed to be a need to establish a CO make for each colliery to have something valid, and as the background carbon monoxide would vary from colliery to colliery, so would the CO make. The idea was to establish a norm based on CO make and then you could set a trigger above that, which would require investigation, and you would then trend the CO make - as in the past, the CO concentration had been trended, and an increasing CO make trend would then indicate that a heating was present.

You say an increasing CO make trend. Is that an increase over some specific period of time, or is it envisaged that there may well be an increase up to a point where the background is established and one would expect it to level out?-- I think that's what it does. It does say over a range set for the specific pit, and again it could be affected by outside influences or known activity - known changes and related to those.

In the previous column there is that reference to the overseas results, which you have said refer to the 10 and 20 lpm, "appear valid". The modified rule suggested in the final column there, was that a rule which, in some way, set aside the validity of those overseas results, in terms of the discussions that were had at the time?-- I think as a result of this forum, we were looking - the overseas results had provided a guideline - we were looking to customise that technology - that formula to make it suitable for individual collieries to actually embrace and use.

I see. Perhaps I should just direct your attention, too, to the modified rule 9, which must be looked at against what appears in the previous column - that is, that it must be the right place - that is the panel return - referring to the measurement of the CO level in the panel; is that right?-- Yes, that's right. It was thought that if the monitoring point was in the main return, a slight level in CO concentration - an increase in the CO concentration level may go unnoticed, and if you are going to continue to monitor CO, it should be done in the panel return where the increase would be more significant, or obvious.

I see. Where one is more likely to get results of what's happening in the goaf?-- That's right, without dilution from the main return.

I see. Could the witness see Exhibit 219, Your Worship, and also - while that's being obtained, Exhibit 110, I think it is. If I can ask you to look at 110, first of all? The first page of that 110 is a graph. It is headed, as you will see, CO make 512. It is a graph that was plotted progressively - at least up to the point designated as 5 August - plotted progressively at the mine by the ventilation officer, or somebody acting in his stead from time to time, and purports to represent the CO make calculated at various times. Now, I won't take you through it in detail, but there has been evidence that - although there are equal spaces along the X axis of that graph, nevertheless the actual time jumps between 1 point and the next, not equal periods of time. Do you understand what I mean? So, the graph isn't actually giving a clear representation of the changes in CO make over a period of time on a consistent basis?-- Yes, I do.

Now, can I ask you then to look at 219, which is a graph that takes up, at least on the 27th of April, the points plotted on that first page of Exhibit 110, but spaces them appropriately according to the correct time sequence along the X axis. Do you see that there?-- Yes, I do.

Now, that graph, in fact, continues through to the 6th of August - actually, I think it might be 5 August. Can I ask you this: what would a graph like that indicate to you in terms of the existence of spontaneous combustion or otherwise in that 512 panel?-- Yes, it clearly indicates a - a combustion or a heating that's progressing, I would say.

Why do you say that, can I ask you?-- Yes. Looking at the - it appears to start at around about 2 lpm of make and looking at 219 to 6 August where it is approximately 15 lpm, except for a little hiccup there in June, it does show a steady increase in CO make. It might be the rule that was set at the 1992 forum - it falls into that category. It is trending the results from a known background to a known starting point.

Now, assuming that there was a known starting point at the commencement of extraction of somewhere around two or less than two, first of all would there be a basis on which to expect that the background would change once extraction commenced?-- Yes, I think - I would expect to see a more flattening out after a - if I can use the term, a normal or new norm had been redefined. That really, except for just a couple of occasions there, appears to be generally absent if you sanitise the graph from those points. I would have expected a new norm to be redefined fairly quickly and hence the graph flatten out at that point.

Now, if a panel or if extraction of a panel were to commence with a background level of two and then extraction proceeded over a period of some, say 12 weeks or thereabouts, would it be reasonable to expect that there may be an increase in CO make of 1 lpm per week?-- Yes, it does look as though it's about that.

No, no, but I mean in terms of expectation, without there being any extraneous reasons such as a heating, simply in terms of extraction of a panel could there be any basis on which to expect that there would be an increase in CO make of 1 lpm per week?-- I would have to - if I presume there are other panels at this colliery that have been extracted I would really need to compare to see if something similar occurred in those panels as has occurred here. The beauty of this type of trending is that ventilation changes don't alter the increase as you would expect if you were just monitoring the CO level because the ventilation increase has been taken into consideration as part of the make. I can't think of any reason why there would be a continuing increase if it was just due to exposing more and more new faces of coal. I would like to see a comparison with another panel that had been extracted.

Before we go to that, when the coal is first exposed it experiences a certain rate of oxidisation, is that right - or oxidation?-- There is a theory, particularly in a gassy mine, as the methane comes off it does slow down and sometimes prevents that oxidation. So it's not immediate because the surface is actually protected by the methane that's being given off and it's really only starts after the methane has actually - the coal has given up its methane.

The oxidation of the coal continues then for a time; does that itself slow down?-- Well, I think it does reach a balance, a stability of - based on the history of that mine. I can't - in my experience I haven't seen a continuing increase that has been normal.

I wonder if the witness could see Volume 2 of the appendices to Exhibit 5, please, Your Worship. If you could go in that volume to a position about that far from the back, Mr Mackenzie-Wood, to a page which is headed 5.4(A) in brackets, and you will see there a graph which is headed "CO Make All Panels", and then a reference down the bottom to panels 402/401, 511, 403, 5 North and 512, all represented by the different colours which are plotted on the graph?-- Yes,

I do.

Now, I don't know to what extent you are familiar with events at Moura No 2 over the years, but can I indicate to you that in respect of 5 North that panel was ultimately sealed with a confirmed heating existing in the panel, that's the one that's represented by the yellow graph?-- Yes.

However, the other panels 402/401, 511 and 403 were sealed without there being any suspicions of there being any heating. The red graph represents 512 and should in fact be the same graph that you've seen previously except that there is an addendum on the end which shows it going up in a not quite vertical fashion which wasn't on that graph which I previously showed you. Now you did make the observation a short time ago that - for you to express any concluded view on the question I was asking you, you would really need to compare what was happening in 512 with what had happened in other panels at the mine. Does that graph assist you there?-- Yes, it does. It certainly does appear that - in the early stages of monitoring, certainly even the first 50, 60 days, all of those panels did show an increase in CO make which in all but the 512 did then tend to flatten out, but certainly an increase is evident and if we are comparing the same thing, if that's the start of pillar extraction on day nought, it does appear to be an increase, yes, in all cases.

5 North in fact flattening out at a relatively high level, that's the yellow one?-- Yes.

But nevertheless flattening out over a period of time through until about day 130 or thereabouts; is that so?-- Yes, that's correct.

I take it from what you say the point you make is that 512 Panel continued on its upward rise apart from the valley that occurs -----?-- Yes, that's what the comparison does show.

Perhaps I should ask you to look at one further exhibit, Exhibit 228, please, Your Worship - I'm sorry, Your Worship, that's not in fact the exhibit I wish to refer to the witness' attention. We have so many graphs I think it's a case of almost being graphed out.

WARDEN: We will have to terminate soon, so if you are going to go to that graph in depth it might be -----

MR CLAIR: I don't intend to, Your Worship, that's why I was going to show it to the witness at this stage and then I'll be concluding, Your Worship.

WARDEN: Thank you.

MR CLAIR: Your Worship, it may not be necessary to show it to Mr Mackenzie-Wood. It is really only one that I wish to refer him to to perhaps better illustrate the way in which the kinks in the 512 graph might be ironed out, but if I do need to show it to him I can show it to him before we start in the morning. Exhibit 158, I'm sorry, that's the one, Your Worship. Now, if

XN: MR CLAIR

WIT: MACKENZIE-WOOD

I can ask you to look at the second page of that, Mr Mackenzie-Wood, we have been told that that in fact is a graph which again is properly plotted with the time axis - the time spaces along the X axis being corrected, and it shows amongst other things the CO make based on what is called the BHP data as at 5 August and that's represented by the orange line there. Assuming you don't have any difficulty with fine distinctions in colour you should be able to see the -----?-- No, it's fine.

Now, that graph there again represents the progression in 512 CO make over the period of time mentioned. You will see there is a green line which represents the linear regression at least up to somewhere around 15 July. Do you see that?-- Yes, I can.

Now, does that linear regression there represent what you would refer to as a continuing increase in the CO make?-- Yes, it does.

Over that period of time?-- Yes.

And in your own experience would you, looking at that graph, be able to think of any explanation if you were confronted by this, at that time, 5 August, any explanation for that kind of continuing rise over that period of time?-- I'd really have to go back to my earlier statement. To me it does indicate that there is increasing activity, increasing oxidation which with CO make can be either increasing the extent or making one area more intense, and unless you have other indicators you really can't make a sure or positive judgment.

When you say other indicators -----?-- Well, even in Germany

they realise that there is probably a fault with CO make, that it could be small and intense or extensive and mild, to use that term, and they do sample and do chromatographic analysis for higher hydrocarbons or hydrogen.

When you say "intense", any heating that existed in a panel or at least any event that's producing the CO make may be small and intense?-- Yes, well, I think there is a theory that in bord and pillar it does tend to be small and intense, the heatings, while in the longwall situation you get a more extensive milder form of oxidisation.

Right?-- And, as I say, you really - perhaps to look at all the evidence, all the indicators, to give a proper judgment on a progress of a heating.

What you are saying is if you were confronted with that kind of linear regression that you see on that graph there, or a graph that would produce that kind of linear regression, you would be carrying out some investigation?-- Absolutely, oh, yes.

And you say as part of that investigation you would be looking to take samples and have them analysed by way of gas chromatography for a start; is that right?-- Yes, I would. I would try and look at, as I say, all the ratios and indicators that are available, try and look at all the evidence, all the data, than try to draw a conclusion on one indicator.

Thank you, Your Worship. Thank you, Mr Mackenzie-Wood.

WARDEN: Thank you, Mr Clair. Thank you, gentlemen. Please adjourn the Court. Resume tomorrow, 9 o'clock start.

THE COURT ADJOURNED AT 4.48 P.M. TILL 9 A.M. THE FOLLOWING DAY

WARDEN'S COURT

MR F W WINDRIDGE, Warden and Coroner
MR R J PARKIN, General Manager, Capricorn Coal Pty Ltd
MR P J NEILSON, District Secretary, United Mine Workers' Union
MR C ELLICOTT, Training and Development Officer, Department of
Mineral Resources, New South Wales
PROF F F ROXBOROUGH, Professor of Mining Engineering, School
of Mines, University of New South Wales

IN THE MATTER OF A CORONIAL INQUIRY IN CONJUNCTION WITH
AN INQUIRY (PURSUANT TO SECTION 74 OF THE COAL MINING
ACT 1925) INTO THE NATURE AND CAUSE OF AN ACCIDENT AT
MOURA UNDERGROUND MINE NO 2 ON SUNDAY-MONDAY, 7-8 AUGUST
1994

GLADSTONE

..DATE 23/03/95

..DAY 49

230395 D.49 Turn 1 mkg (Warden's Crt)

THE COURT RESUMED AT 9.07 A.M.

PAUL MACKENZIE-WOOD, CONTINUING:

WARDEN: Thank you, witness, take a seat, you are on the former oath that you took yesterday?-----

CROSS-EXAMINATION:

MR MACSPORRAN: Mr Mackenzie-Wood, can I take you, firstly, to a consideration of the rule which apparently has its origins in German coal of a CO make of 10 to 20 lpm? I think you told us yesterday that that figure came to your attention during the course of a visit by a Mr Kock from the Essen Mines Rescue to Australia?-- That's correct, yes.

And that was in about 1983 or thereabouts?-- Yes.

And from that the process then became one of looking at the applicability of those figures to local pits, local conditions?-- Yes, as I mentioned, a sort of a random test was done, a play with the figures was done, yes.

And in that context I think you said that you looked at results for known heatings in New South Wales?-- That's right, yes.

Can you recall now which districts or perhaps mines that related to?-- Yes, as I say, it was some 12 years ago. At that stage I think Liddell comes to mind and we did have figures from Aberdare North. I think Aberdare North in its heyday used to have about 18 heatings a year, so it did generate good data.

And the data being generated was data, I suppose, at that stage relating to CO parts per million as opposed to litres per minute?-- That's correct, yes.

But were you able to revisit, as it were, the data to calculate what the CO make would have been had it been preserved or monitored?-- Yes, as I recall, we did attempt on a number of occasions to apply figures to it and we did get meaningful results, and that was the idea of the exercise, not to - to publish something but to see if it would be appropriate to - we were looking to include it in the book was the main purpose.

So, you needed some basis to go - to publish those figures as being useful for Australian conditions?-- Well, it was really to include the formula in our book and really draw the mining industry's attention to that technique.

XXN: MR MACSPORRAN

WIT: MACKENZIE-WOOD

In any event, data, particularly from Aberdare North, confirmed the applicability of that range of figures of 10 to 20 lpm?-- It seemed to validate them. They were in that area, as I recall.

As you say, they were known heatings?-- Yes.

Now, then we move to about 1986 when I think you went to Essen yourself with two Queenslanders who you named?-- Yes.

And that was after you actually published the first edition of your book?-- That's correct, yes.

Which included, as you have identified, the guidelines of 10 to 20 lpm and the formula?-- Yes.

Well, you mentioned then having some contact with Mr Brady and Mr McKenna who, I think, at that stage were involved with Cook Colliery here in Queensland?-- That's correct.

And they were advocates, I think you said, of the use of CO make in litres per minute for use in detection of spontaneous combustion?-- Yes. In fact, they were the - to my knowledge, the first ones, the first mining people to look seriously at that method, that technique.

And did you understand it to be the case that they had themselves - that's Brady and McKenna - done some work to validate, if you like, the guidelines of 10 to 20 lpm for their own colliery?-- That's correct, yes.

And in that context they had discovered apparently, or it was their view that the 10 lpm being the bottom guideline, bottom alert figure, was in fact too high?-- They did suggest that it would be possible to have different, maybe slightly lower triggers for coal in their area, and they actually faxed me down some results which showed quite a steady increase up to 15 litres and then it took off very sharply on that particular incident, which was a known heating which did develop, and at that stage the triggers of 7 and 15 were mentioned by John Brady and Ron McKenna as what could be appropriate trigger figures.

Just on that point, it's the case, is it not, that if you trend in CO make in litres per minute and you wait for a point where the make takes off, as it were, increases very rapidly over time, you have quite a dangerous situation potentially?-- I would say so, yes.

Because once it behaves in that manner, it's very difficult to control?-- Yes, I'd say so. The CO make trending upwards was, I believe, designed to be an identification there was a heating there, and how you then monitor its progress is possibly another issue.

The idea being that a CO make trending upwards would give you a very early - hopefully a very early warning of the presence of a spontaneous combustion?-- Yes.

So, if you were to detect it by an upward trend in CO make, you certainly wouldn't be waiting for a very sharp increase in the curve upwards before you took some action?-- I would agree with that, yes.

Well, that was the experience of Brady and McKenna and their view from information they had from Cook Colliery, that a more appropriate bottom figure was about 7 or so litres per minute?-- That was mentioned at the time, yes.

And 20, in their experience, was too high and the upper figure should come back to 15 lpm?-- That was their suggestion, yes.

That was back in about 1986, I think you told us, or thereabouts?-- Yes, in that '86/'87 period. Probably '87, I'd say.

And then in that period between 1987 and the SIMTARS seminar in 1989 was there much discussion, to your knowledge, of this new CO make method of monitoring spon com?-- Very little came back to me. It was - in fact, that was the only occasion, I think, that that method was supported.

Then at the seminar itself in 1989 these figures of Brady and McKenna's were in fact discussed there, as you recollect?-- Oh, yes, very clearly. John Brady in one of his presentations spoke very positively and strongly about the use of the CO make figure.

And at that seminar was there a wide range of parties from mines in Queensland present?-- Yes, very well supported.

And, indeed, I think, as you may have confirmed already, there was literature distributed perhaps even before the seminar commenced relating to these topics?-- That's correct, yes.

Well, after that seminar then between 1989 and the review you have identified as taking place in 1992, did this question of CO make and the use of it to monitor the spon com become more topical?-- Not to my knowledge. It's not a - it's not something I deal with on a - you know, an often basis; it's an as-needs basis. I really hadn't dealt with it much more till that invitation came in 1992 to participate in this Logic Tree analysis.

The purpose of that, as I think you have told us, was to evaluate the existing rules and parameters within those rules to see if an ideal situation could be achieved relative to each particular colliery perhaps?-- Yes, that was one of the objectives.

And in that context the rule so far as CO make was concerned became one ideally to establish some form of background for a pit and to watch for any change or deviation from such a background figure to give you early warning of spon com?-- It was one of the suggestions, yes.

And perhaps a very sensible suggestion if you could establish

a background figure?-- That's correct, yes.

Now, I think you told us yesterday that in the absence of any heating activity you would expect a trend of CO, CO make, to perhaps rise for a time but then to reach some form of equilibrium?-- Yes, I think that's the way it is to establish a normal background. If you have a normal background of CO in a ventilation circuit, you would have a normal CO make in that ventilation circuit.

And in that context you used the words, if I recall them correctly, of a flattening of the CO make trend when that equilibrium or background state was achieved?-- Yes, I think that's the way it happens.

Well, if I could take you then to 25 July last year, the day that you had the conversation with Mr Kerr? He actually rang you about something else, is that the situation?-- Well, he dealt with something else first. Whether that was the prime objective of ringing me, I'm not sure.

In any event, during the course of that conversation he raised the issue of this level of CO at Moura No 2?-- Yes, he did.

Do you recall whether he mentioned to you any particular figure in terms of the CO level he was talking or speaking of?-- As I recall, it was sort of 5 or 6 ppm. It was a fairly low - in my opinion - figure.

Did that have a bearing upon whether you initially, on that information, had some concerns about the situation?-- I certainly didn't - I wasn't asked and didn't express any opinion at all. It was more on the effective outside influences on background levels of CO was the Inquiry.

And indeed Mr Kerr, I think, informed you as part of the discussion that there had been an inspection carried out and there had been no physical signs to support the presence of a heating?-- That's my recollection of that conversation, yes.

Could the witness see Exhibit 219 again, please, Your Worship? I believe this is the graph that was shown to you, or one of the graphs shown to you yesterday which relates to the plotting of the CO make for the 512 Panel between late April and 5 August 1994; is that so?-- Yes, that's correct.

And as Mr Clair told you yesterday, the graph axes were corrected from BHP raw data to reflect a proper spacing of time and the data points?-- That's right, yes.

So, the trend shown there is the actual trend that should have been produced from the data. You commented, I think, that the concern you would have looking at that is it shows an ever increasing CO make over the life of the sealing situation?-- That's right, yes.

And that's the very sign that you look to to give you early warning of the presence of a heating?-- That's correct, yes.

Now, I think you also said that looking at that trend, you then want to investigate very carefully the panel to see whether that trend did, in fact, reflect the presence of a heating?-- Yes, I think that type of trend would require investigation. That would give you an indication that increasing oxidation is taking place and the challenge then is to pull in other indicators - other techniques to either confirm that or to monitor its progress.

Would relevant to that assessment - that investigation - be the detection of things such as smell in the panel?-- Yes. That - you would expect that would follow the - I think contrary to some American reports, the CO does appear in our coals earlier than the characteristic smell of a heating.

Right. Now, if you assume for one moment that on the 17th of June - and you can pinpoint reasonably accurately on the graph in front of you 17 June or the general area of that day - that a very slight tarry smell was detected inside 512?-- I was not aware of that until yesterday.

Certainly. Would that be a relevant factor, combined with the shape of this trend of the CO make, in terms of assessing whether or not a spon com existed inside 512?-- Certainly that would be another indicator that would certainly concern me.

Would it add weight to the shape of that trend on the graph as indicating a spontaneous combustion and nothing else?-- I would have to say yes, yes.

If you coupled with that - if you accept for the moment that a week later on 24 June - and again you can see that point or that area identifiable on the trend?-- Yes.

That a strong Benzene type smell was detected inside the same panel?-- I wasn't aware of that.

Noted in that form on a report, and given in oral evidence here as a strange smell, a bit benzeney - that sort of description - would that be a relevant factor to consider when you are looking at the trend?-- That's a classic description of the smell, so it should have been significant, yes.

When you say a "classic description" of a smell, you mean a smell associated with spontaneous combustion?-- Yes, as described in the literature.

Well, would that reinforce the view that you have expressed that the ever-increasing trend of this CO make in 512 was due to spontaneous combustion inside the panel?-- I would say yes.

Again, if I take you to towards the end of the graph, dated 5 August, if you accept for the moment that on the afternoon shift of 5 August one of the mine deputies reported smelling a very strong tar smell inside the same panel, would that be a relevant factor to consider, coupled with this trend on the graph?-- Coupled with the trend - I have to say I suppose

hydraulic smells underground are fairly common and they do say it takes experience to distinguish between the two, but it would be another indicator, yes. That would add weight to-----

The shape of the graph?-- -----identification of a heating.

Well, then, on the same day, 5 August, that's the Friday, if you had a - if you accept that the mine manager, Mr Schaus, noted in the record book a reading of 8 ppm CO equating to a CO make figure of 19 lpm, would that be a relevant factor to consider what was happening inside the panel?-- The 8 ppm wouldn't hold much significance to me unless it was in a part of a trend or a context. Certainly the make would be of concern.

Why would the make of 19 lpm be of concern?-- In the relationship to the indicators that have been previously established and written about and talked about that we have discussed earlier.

If we move then to Saturday, 6 August, and if you accept there was a report of a haze inside the panel, which persisted to a lesser extent over a period of hours, started off in a - quite a substantial body, and diluted down but was still present in one form or another some hours later inside the panel, would that be a relevant factor to consider amongst the indicators you are looking for?-- It is another physical indicator that's well described, so, yes.

If we move then to Saturday afternoon - late Saturday afternoon - and you accept that the undermanager in charge himself did a calculation relating to CO make inside 512 and also achieved the figure of 19 lpm, would that be a matter of concern?-- Again the figure of 19 in the light of the trigger values that have been established, yes.

Again, then, that evening, the same day, 6 August, the Saturday, a report of a deputy detecting a stink inside the panel and calculating CO make to be 16.25 lpm, would that be a matter of concern, coupled with the other indicators we are talking about?-- Yes, same reason, yes.

A combination of those signs, including the CO make graph trend, do they point fairly significantly in one direction?-- Well, to me, yes, it would point towards the existence of a heating.

Well, then, we have the sealing process completed in the early hours of the Sunday morning, 7 August, and a rate of increase of CO parts per million behind the seals being of the order initially of 6 ppm per hour and then increasing slightly after that to 8, and then I think finally 10 ppm per hour as a rate of increase; does that have any significance in terms of what might have been happening behind the seals in 512?-- Well, it certainly shows that the seal is still oxidising - still making carbon monoxide.

Would the rate of that production be a significant factor to

monitor behind the seals?-- I think the rate - sorry, we are still talking about the CO level, or the CO make?

The CO level at this stage, yes?-- Yes, the build-up of carbon monoxide steadily during that period would be of concern, yes.

And what is your view as to the use that can be made of Graham's Ratio, firstly before sealing, to detect spontaneous combustion?-- Well, it has always been the classical method for the early detection. It does have some flaws. You do need air containing 20.93 per cent oxygen going into the suspect area and you really need to monitor the air coming out of the suspect area, and classically it has stood the test of time over many years - probably since the '20's - and I have seen meaningful results with Graham's Ratio. I think it is another indicator that can be used. It does require more sophisticated analysis. You do need to know the nitrogen figure, and so you really need a laboratory style analysis to do it accurately.

What about the use of the - well, the gas chromatograph for detection of the presence of spontaneous combustion?-- Yes, the chromatograph is a good technique. I certainly prefer another method for doing carbon monoxide. I think of all the gases that you can analyse with a chromatograph - carbon monoxide is one of its worst efforts, I suppose - but all the gases can be covered with a chromatograph and it is quite a preferred technique.

When you say in relation to carbon monoxide, is that because the chromatograph is not particularly useful for low levels of carbon monoxide?-- That's correct, because you are dealing with something that's significant at a very low concentration and that certainly challenges the chromatograph, particularly when carbon monoxide normally doesn't separate very well from methane and tends to come out on the tail of the methane figure. It is quite hard to measure.

Are you aware of the - a modification that can be made relatively easy to a gas chromatograph to enable it to monitor lower levels of carbon monoxide?-- This is the methaniser - there is a technique called the methaniser which does convert carbon monoxide to methane and increases the sensitivity. Yes, that's a way of doing it.

Do you have any view yourself as to the applicability of Graham's Ratio after sealing?-- Again, like a lot of the indices and ratios, they were designed or were described for ventilation circuits, and quite a few workers claim to have still got meaningful results in sealed areas, and I've certainly seen Graham's Ratio used in a sealed area to establish whether there was a fire there or whether a fire has gone out, but specific values of temperature I would have some difficulty with, yes. It is really just as an indicator of what could be happening.

Certainly. So, you would not be able to ascertain with certainty whether - or what the temperature, if any heating

did exist, might be at behind the seals - from Graham's Ratio?-- No, I think that would be difficult for a lot of reasons. The monitoring point is - could be some distance from the source and may not reflect the - could either underestimate or over-rate the hazard. But certainly I would use Graham's Ratio and other indices purely as an indication of progress behind the seals; not specific temperature or currents.

When you say "progress behind the seals", do you mean to indicate, for instance, it could be used to identify the presence of a heating behind the seals?-- Yes, again, I would have to look at all the evidence. I would be monitoring quite a few things, and nearly every ratio or indice has a particular flaw and on an occasion becomes invalid and you would really need to, in the light of all the evidence, if you were interested in progressing a heating behind a seal, it becomes quite a complex process.

Thank you. One further matter, Mr Mackenzie-Wood: were you aware of an explosion occurring at the West Wallsend No 2 Mine in New South Wales?-- Yes, I am.

Was that in about 1979?-- I think it was, yes.

Do you recall the layout of the mine - I mean, generally speaking? Did it have an easy or difficult access?-- I did attend that. I was at a borehole in a mobile laboratory at that stage. I can't really recall - this is the access to the-----

The mine itself?-- The mine site?

Into the mine itself. Was there one access road?-- I can't recall that.

Do you recall it being a gassy mine?-- I think it was, yes, reasonably-----

There was a very significant explosion followed by an active fire?-- Yes.

And steps were taken to recover that mine?-- Yes.

And do you know how long that took, approximately?-- I would be guessing. It took some time.

Some months?-- Yes, I'd say so.

And was that recovery operation carried out safely?-- Yes, appeared to at that stage. A number of mobile laboratories were on site constantly monitoring the gases as the recovery took place.

If we are talking about recovery, a very dangerous stage is soon after the initial explosion; is that so - because of the uncertainty involved in what's happening?-- There is an uncertainty. There was a theory that the explosion does consume the methane and the oxygen and an inert atmosphere

would result, which would then, depending on continuance of ventilation and methane make, start to head back towards an explosive range. So, theoretically there is a period there where it is safe, but the move back towards an explosive atmosphere would make, usually after an explosion, rescue a hazardous venture.

And one way of decreasing the risk is to monitor very carefully any period after the incident, to trend the gases and see what the atmosphere underground is doing?-- Actually nitrogen was used in this incident as well - quite a lot of nitrogen was pumped into the - behind the sealed area.

That was to inertise the atmosphere?-- Yes.

And make it safe for re-entry?-- That's correct.

Again, with careful planning and monitoring, you can be reasonably certain of a point being reached that it will be safe to re-enter - at least you will know whether it is safe or not through monitoring and careful planning?-- Yes, I'd say careful planning and monitoring. There has been many mines filled with methane that have been safely re-entered and recovered.

Thank you. Thank you, Your Worship.

CROSS-EXAMINATION:

MR MARTIN: I want to ask you one thing: we have called it the rule of litres per minute and the parameters of it of 10 to 20 or 7 to 15, as the case may be. Tell us, please, when that was first introduced as a teaching to Mines Rescue members, say at - there is Southern Mines Rescue?-- Yes, I'd say in 1985 or 1986 when the book that I co-authored became the standard text book in New South Wales - that book was used to teach rescue brigadesmen, not only the rescue procedures and processes, but fires, ignitions and explosions, and the methane make was put before brigadesmen and students in those days as another technique for identifying and monitoring spontaneous combustion.

You used the term "station" in the plural sense. Does that include Lithgow, for instance?-- The book was adopted at all four stations as we call them - all four districts in New South Wales in 1986.

I am just taking it one step further, was there some type of specific, ordained course that was laid down for members, teaching -----?-- No, not specifically. It's more formal these days with competency based training where instructors' notes are written. It was - I'd say there wasn't a formal course, it was just gradually introduced at that time when you dealt with spontaneous combustion at that part of the course, mainly because it was in the book.

Thank you very much, Mr Mackenzie-Wood. Thank you, Your Worship.

CROSS-EXAMINATION:

MR MORRISON: Mr Mackenzie-Wood, can I ask you this: you sent that letter to the Court outlining your conversation with Mr Kerr in September last year?-- Yes.

The letter was sent as a result of conversations with Mr Lyne; that's right, isn't it?-- Yes, that's correct, which followed I think, and then a conversation with a Mr Barker followed.

Followed the conversation with Mr Lyne?-- With Mr Lyne, as I recall, yes.

And who suggested the sending of the letter, Mr Lyne or Mr Barker?-- I think it was Mr Barker because I addressed the letter to him.

You would have told Mr Lyne the details such as you remembered them of the conversation with Mr Kerr?-- I may have done, yes.

Well, you must have told him something about the details because it was at that stage that there was a concern in your mind that it might comprise your position?-- Yes, I certainly told him of the conversation with Mr Kerr. Whether I told him the detail that was in the letter I'm not sure.

Now, after that time, after you sent the letter to Mr Barker, did you have any discussions with any officers from the Department - the Inspectorate's department about the contents of the letter or the details of the conversation or any other aspect?-- No, I didn't.

Neither last year nor this year?-- No.

No inspector sought to take a statement from you?-- No, no.

Soon after that is it right to say you did some work for SIMTARS?-- I was invited to SIMTARS, not so much to do some work, but to be a third body - to be a second pair of eyes for their results, and I was in a workshop type situation with them talking about processes and theories.

That's in relation to this investigation?-- Yes, that's correct. That was back in October last year.

So as it were you were on retainer to SIMTARS as a consultant from that time?-- No, I think it was in the spirit of co-operation. I don't think I was there as a consultant. I think it was a freebie.

Now, in the course of that did you have occasion to review any of the materials that have been amassed for this investigation?-- Yes, I did see some. I found it difficult - I'm not even sure whether I added value to their discussion because I had come in cold, and I wasn't - didn't even know whether mining had been going on. I knew none of the ventilation details and my period was short, and most of the time really was on ignitions, heatings, fires, the theories and processes, and the limitations and validity of those processes.

Can you recall what material you have reviewed or is it really none?-- Well, the material I did look at in particular was the ratios that had been calculated leading up to the sealing and then after the sealing, and I certainly talked about the sharp increase in some of those ratios getting towards the time of the explosion and the validity of that information.

What other areas? The ratios is one?-- The ratios was one. Possibly the movement of gases around a sealed area, layering and monitoring points.

Convection currents, that sort of thing?-- Yes, that's right.

That's another area?-- Hot gases rising and -----

Did you review the graphs that were being produced?-- I did see them. There was little time to take it all in and quite a lot of that work had already been done by the engineers there.

And no doubt in the process of that review did you do any of the analysis of data yourself?-- No, I didn't. I didn't take any information away from that workshop with me.

Did you participate in the analysis of data, for instance, the calculation of ratios and so forth?-- I didn't calculate any myself. I reviewed the calculations.

Double checking them?-- Well, really just cast an eye over them.

And no doubt in the course of that involvement you became aware of the conclusions, preliminary or otherwise, that the SIMTARS people were reaching?-- Yes, there seemed to be a strong opinion, I suppose, that the ignition source was in that district.

In the 512 district?-- Yes.

And that opinion was formed fairly early on?-- I couldn't tell. That was the direction it was taking then. I hadn't

been involved in any of the other mechanisms, looking at any other possible sources of ignition or - that wasn't on the agenda for the day. It was more focused on that panel.

When you say "on the agenda for the day", you don't mean your involvement was limited to one day?-- I did go back on a second day just for the same purpose, just to be another pair of eyes.

Nothing you saw or heard from the SIMTARS people suggested they were dealing with any other source; is that right?-- I don't recall any other mechanisms being discussed or analysed.

Certainly no-one solicited your view on any other mechanisms?-- No, no.

And so the opinions, so far as you understood them, from a relatively early stage were centred on a spontaneous combustion incident in 512; is that right?-- Well, that seemed to be the strongest indicator, yes.

Thereafter what continued in terms of amassing data which would demonstrate or detract from that opinion?-- I certainly can't comment on that. I must admit after my two days there I had little contact with the people at SIMTARS from then until this day.

Well, certainly when you come here you haven't come here cold, have you?-- No, I felt as though I had come here cold, but - October is quite a while ago, but I have seen the figures and seen some of the graphs back in October last year, yes.

So when you are asked to look at these graphs and say what would they indicate to you, the view you are giving us is one which has contained within it, inevitably because of the human process, the knowledge that it was in fact an explosion at this mine, probably initiated by spon com in 512?-- I don't think that has influenced me really. I think I'm trying to be objective. We established this type of scenario at that Fault Tree Analysis workshop back in 1992. I think on any occasion if I saw that graph I would possibly indicate the same opinion.

What you would certainly indicate is the rising trend requires some investigation?-- Yes, that's correct.

You wouldn't recommend, would you, as it were, blind adherence to the figures of 10 and 20 litres?-- No, that's right. They are still possibly valid indicators, but not specific things. I wouldn't recommend that specific things happen at those two figures.

There maybe a tendency, given something we have heard at this Inquiry, for people to accept them as being rigid; at 10 you've got a problem, at 20 there is considerable danger, as though they were iron clad rules. It's incorrect to perceive that that way, isn't it?-- Yes, I think it's really - they are purely indicators, not specific -----

Not absolutes -----?-- ----- milestones in an event.

I think you might know from your own researches - or at least some of the researches of Mr Kock that in excess of 20 litres can be exceeded and maintained without there being a spontaneous combustion?-- I did mention yesterday small and intense could be the same as extensive and mild. Both those situations could introduce the same amount of carbon monoxide, and I think your investigation would then have to take into account other indicators.

One of the dangers of adopting these absolute values might be demonstrated by the fact, for instance, 20 doesn't indicate necessarily that there is a spontaneous combustion or a fire?-- There would be occasions where that's true - that statement is true.

Let's just imagine one for a moment that might occur in a lot of mines perhaps. If you had, say, five districts, all producing in each of them constantly, never varying, 6 lpm and then when you come to look at the fan shaft you would see 30 lpm going up the fan shaft, wouldn't you?-- No, not really.

Wouldn't you?-- Your flows - your ventilation quantity would be additive as well as your carbon monoxide.

Except that on a litre per minute basis -----?-- You are just adding your CO, you are not adding your ventilation quantity.

No, I'm giving you a litre per minute which takes into account the ventilation quantities, doesn't it?-- Yes, it does.

It's a litre per minute I'm giving you for each district?-- I see what you mean.

Not parts. Five districts at 6 lpm each, no problem in each district at all?-- Yes.

Up the fan shaft goes 30 lpm. If we stuck to the blind adherence of 20 lpm people would be running around saying, "The mine is on fire.", when truly it wouldn't be?-- I think that's a danger in not fully understanding the technique. A lot of these indices you monitor what's going into the suspected area and what's coming out to find out what's happening in that area.

In truth if people have got the impression from your book in '85 or the '90 edition that these were figures to be viewed in that way as absolutes or trigger points, that is subject to quite significant qualification, isn't it?-- Yes, yes.

No doubt in a future edition of the book we will see that qualification, but for present purposes people should understand, shouldn't they, that it's trends against background that matters?-- I would agree with that, yes.

We can see that danger demonstrated even so far as the analysis went with the experience of Cook Colliery. That seems, from what you've said, to have been based on one

incident?-- That's correct.

For that one I understand from what you say, but you can correct me if I am wrong, that you don't know the details of how those figures were derived?-- No, I don't, no.

It was a comment made by Mr Brady or Mr McKenna or both?-- Yes, I did mention that he did fax me some results at that time again just to cast an eye over them, but they weren't retained.

Do I understand rightly that the results of your own analysis such as it was in relation to Abadere and Liddell also weren't retained?-- No, that's right. It was just to validate the formula, the process.

The formula for CO make is what the concentration was, your own concentration was?-- Yes.

Rather than the empiric levels?-- That's right, yes.

When we talk about validating by that analysis part of this process, what we are talking about is validating the use of the formula for CO make rather than validating that those levels are applicable; isn't that right?-- That's - yes, that's right. I think the levels still play a role in indicating what the Germans have found, but the trend is certainly the important factor.

In terms of what the Germans found, of course their system of mining is different from quite a deal of the mining in Australia?-- Yes, that's right. It was really based on longwall type when nitrogen is used quite excessively.

And not just longwall, but advancing longwall?-- Yes, yes.

Which is not practised in Australia?-- That's correct.

And that advancing versus retreating longwall does have some difference in impact when one considers how ventilation circuits might impact on a goaf?-- I believe so, yes.

Do I assume, I think I do correctly, you wouldn't suggest that one should merely blandly regard all coals across the world as being the same as one another?-- That's right.

That would be a dangerous assumption to make?-- Yes, that's right. This is why it is important to apply this work to your own backyard, your own coal seams.

I didn't mean to cut you off?-- That's all right, to gain meaningful information you need to be specific even for your own coal mine.

And by that comment, as I understand it, you could expect, and it would not be surprising to find that the experiences of one coal mine varied to the next?-- Yes, yes.

And indeed within a coal mine you might find that experiences

in one district varied to the next according to differences in the coal?-- Yes, that's correct.

Because it's a common experience, I think you will agree, that you do get variations within a seam. Moura is working the D seam here, you will get variations within the seam from one area to another, and indeed you can get them in one localised area the body of the seam itself?-- I agree with that, yes.

And those factors that we are discussing, those variations, are variations which impact on the propensity of the coal to spontaneously combust?-- Yes, that's correct. There has been many cases where one area of a seam will - is prone to spontaneous combustion, another area is not, so yes.

So you might find whether it's prone to spontaneous combustion or not. Just in terms of oxidisation, you could easily find one part of a seam oxidising at a greater rate than another part of the seam?-- Yes.

Impacting on that also would be the question of the degree to which methane may have been pre-drained?-- That's correct, yes.

You mentioned, I think yesterday, that the content of the methane in the seam is an early inhibitor of oxidisation?-- Yes, that's been described.

So better methane drainage in a particular area might result in higher oxidation early on?-- If the - yes, I would agree with that, yes.

Now, can I just explore a couple of other things then? In relation to that, obviously oxidisation depends upon opening up coal to fresh air?-- Yes.

So as we expose more coal there is more oxidisation?-- Yes.

That coal which has been exposed, without being definitive about it, oxidises at some particular rate which may then fall off as it becomes sort of older and older in terms of its exposure?-- Yes.

I'm not going to ask you about what the rates are, and I don't need to go into that?-- Thank you for that.

Obviously as one progresses with a panel you have this mixture of coal which might be dropping off in its oxidation, however small and new coal which is started on, that's immediate oxidation?-- Yes, they are likely scenarios, yes.

So if we compared say two panels - let's take two notional panels of the same size, same seam, side by side - and you mined one at twice the rate of the other, you would be exposing more new coal in the faster one than you would in the slower one at any given time?-- Yes.

Would you agree with the process that we have just been discussing, you would expect to see in the faster one more

oxidisation than you do in the slower one?-- That's possible, yes.

So in the one that is extracted faster, just staying with that comparison of these two panels, you may well expect to see a higher CO make than in the slower one?-- That's possible.

So in essence what we have been discussing here is perhaps a trite point, but nevertheless let's just establish it, that production does have an impact on CO make?-- Yes, it would redefine your norm, yes.

And rate of production has an impact on CO make too?-- Yes, I would agree with that.

So in fact if we could see, for instance - let's just stay with these two mythical panels. If we could see at some particular point in one of them when production stopped for a while that the CO make dropped and then the CO make went up again when production resumed, you might well conclude from that that the CO make is reflecting the production levels?-- Again that's possible.

It might be reflected in graphs such as you've been shown where you get a drop and then the graphs resumes after a period of time?-- Yes.

Do you still have 219 with you?-- Yes, I do.

If we look at that period around 17 June - or between 11 and 18, I think they are weekly bites roughly - if we knew in that time a substantial part of the week was non-production then that may not be a surprising thing to see, that is to say production has dropped off significantly, so has CO make?-- Yes, if the hypothetical situation you describe is true, yes, I would agree with that. That's a possibility.

And, likewise, when it goes up again, that may well be

suggestive simply of the fact that production was recommenced, say, between the next weekly bite to the 25th?-- Yes.

From that point on - let's just take this scenario - if in fact going back to that area that we were talking about before, that is to say, these two mythical panels and the rates of production, if in fact the production rate was increasing, then you may well see it reflected in a rising CO make simply because you are constantly exposing more new coal than might otherwise be the case?-- Yes, that's possible.

So, if one looks at such a graph, it may be reasonable - I am not asking you to express a view on a particular fact situation yet - but it may be reasonable to ascribe a rising CO make to the rate of production?-- Yes, that's possible.

Well, certainly, on any view, the rate of production does have an impact on CO make; we can be sure of that?-- Yes, I think we agreed on that.

All right. So, when one compares these two panels that we were discussing, the mythical panels, you may well expect to see in respect of the fast one a CO make with a higher gradient than the CO make for the other one simply by reflection of the rates of production?-- Yes.

And if one then turns to a more general proposition, that may well be reflected in various panels in a mine in terms of looking at their CO make graphs?-- Yes.

It may well be reflected - I am sorry, I will start again. It may well be reflective of the way in which production takes place - we have been discussing the rate, but let me include method of mining?-- Yes.

If we can stay with that thought for a moment. We were mentioning before, and I think you agreed with me, that the oxidisation which produces CO that ultimately is used in the CO make calculation is a product of exposing coal - faces of coal to air or to oxygen?-- Yes.

Now, if one exposed a greater surface area of coal, then you would expect to see a greater production of CO?-- Yes.

So, if we took these mythical panels again, one side by side with the other, and if in one we mined very cleanly with no loose coal and in the other we mined with a lot of loose coal, it is well predictable that in the one with the loose coal you will get higher CO and probably a higher CO make?-- Yes.

That's particularly if there is loose coal of the small size so there is a multitude of faces exposed to oxygen?-- Yes.

So that in comparing or looking at a CO make graph even such as this one, it is relevant to take into account, and may well offer an explanation for what one sees, that there was in fact a lot of loose coal, say, at this panel as compared to others which had a lower CO make graph?-- Yes.

And so if we combined those two features with these - firstly, with these mythical panels, if we had a much higher rate of production in one panel as well as the loose coal compared with the other, then one would well expect to see a much higher CO make increase than in the panel that doesn't have those features?-- Yes.

And from an operator's point of view, that is to say - I don't need to go to an operator's point of view - it is an explanation that might account for what we see on a graph, that is to say, the increasing rate of production and the method of mining leaving lots of loose coal?-- Yes, correct.

And in terms of assessing such a graph, that is, a CO make graph for a panel, it is reasonable - in fact, it's probably necessary - to consider those factors, isn't it?-- They would contribute, yes.

No doubt there are other factors, but certainly it would be necessary to take into account those factors; is that right?-- Yes.

As I understand it - and I think I am right in saying this - that's exactly what Mr Kerr was talking to you about when he rang you up, that there had been a higher CO make and that might be due to the method of mining?-- Yes. In fact, the CO make wasn't mentioned, it was the actual concentration of carbon monoxide, but that was the exact nature of the conversation, yes.

Can I just ask you about that for a moment, if I may? The conversation was initiated by Mr Kerr, obviously he had some knowledge of it?-- Yes.

Of the circumstance and you had none. Now, you recall it in terms of concentration. Is it possible that he did in fact refer to make and you just don't recall that?-- That's a possibility because I - as I mentioned yesterday, the conversation was of little consequence to me and I took no diary notes on that occasion and I was forced to recall the details some time later, so that's a possibility, yes.

And its significance has only been such as to deny you a guernsey in Gladstone for which you may or may not be grateful?-- As it turns out, yes.

What I want to ask you about is this: Mr Kerr, when he spoke to you, could well have spoken in terms of the extraction panel having a CO make running higher than normal; that's a possibility?-- That's a possibility, yes.

But he certainly raised with you the method of extraction being different from before?-- He mentioned that, yes.

Now, I assume that you can inform me that he must have given you some basic details about that?-- As I recall, there were no specific details. It was the general conversation about the norm having to be redefined if a mining method changed

leading to a new norm, and I just agreed that that would be so.

All right. Can I come back to what he may have said to you? Is it possible that he told you that this mining method was exposing more coal faces and leaving loose coal?-- He didn't say that. No, I think that came up in a discussion; that's why a change in mining method may result in an increase or decrease in a normal background on exposing more coal faces.

Sorry, I'm not quite sure I understand. Are you saying it came up in a discussion sort of within that conversation?-- Yes, I think it did. It may have even come from my side. He didn't start the conversation with that or suggest that.

It may well have been a view of yours that if the method of production was exposing more coal faces and leaving more loose coal on the floor, then that could in fact explain a higher - we will call it CO level, to be neutral?-- Yes, certainly more coal faces, yes.

Now, Mr Kerr mentioned to you, I suggest, but you can tell me if you agree or not, that the panel was a shorter one than other panels?-- No, he didn't -----

He didn't use the term "short-term"?-- He didn't mention that, no.

Is that something that you had in your mind anyway or raised with him, that the duration of the panel might be a matter to consider?-- No, that - it didn't come into the conversation. It was the specific panel - the specific mine wasn't the issue. It was just the theory.

Okay. Now, he certainly did mention to you that he had gone down and done some inspection?-- Yes.

Did he give you the details - even though you can't recall them precisely now - of what sort of inspection was carried out?-- No, I think he - as I recall, he just made a statement there were no physical signs.

Of a heating?-- Of a heating.

Now, the fact that he mentioned that there were no physical signs of a heating, did you understand that he had, as it were, gone looking for that?-- Yes, I think he had indicated that it was following that inspection that he made the call to me.

And he mentioned to you the situation he was dealing with - perhaps not identifying the mine or the panel, I accept that - but the situation that he had been faced with was one that had a potential to deteriorate, that's why he had gone to inspect?-- Yes, I could tell by the mere fact of him ringing me there was a concern there, yeah.

But certainly he left you in no doubt that the result of the inspection was there were no physical signs of a heating?--

That's correct, yes.

Now, the conclusion which was reached - perhaps proffered by you but certainly agreed as an explanation between you two - was that the method of extraction could well account for the higher levels of CO?-- That's correct, yes.

And that's really a reflection back then of what we have been discussing here today, that those factors can in fact impact upon oxidisation and CO make?-- Yes.

And when one looks at a CO make graph - I am not directing your attention to any particular one - but in assessing the CO make graph it is relevant, and in fact necessary, to take those factors into account?-- Yes, I would. I think the - it's been mentioned that what you look for is an increase above normal, but you would need to establish what was a norm before you could identify the increase.

Now, if we can turn our attention back to 219 for a moment. In assessing that graph, you had your attention directed to that period in June and were asked to assume that a particular smell had been detected. If one was in the position of not knowing that fact but merely having the graph, but knowing that this panel in fact was the fastest in terms of duration of time, the best in terms of productivity, in terms of rate of production, and had a method of mining which left considerable loose coal, then not knowing of the smell, one may well conclude, would you agree, that the method of mining was accounting for that CO make?-- It's a possibility that - I suppose that graph could be the norm.

It's a view which is open, isn't it?-- Yes, there must be some openness there.

And, likewise, if one then considered the next point that you were asked to deal with which was about the 24th or 25th - 24th - the next report of a smell, exactly the same applies there: if one did not know of that but did know the other features to do with productivity, rate of production, speed of the work, method of mining and loose coal, it is a view that it is open to take that that accounts for the movement in the CO make?-- Yes, I would agree with that.

Now, what we see - staying with 219 for a moment - is that when one gets to about - I can't remember the precise date - say, 2 July - see between 25 June and 9 July, that intermediate point?-- Yes.

Probably 2 July. If one took a - as it might be called - a linear regression between then and 6 August, one might see that in fact the rate had slowed because the spike at 16 July might be just that?-- Yes, there is a - there does appear to be a flattening.

If one then goes back and looks at the graph in entirety, one might end up not with a straight line regression from start to finish but in fact a curve which reflects that in that second part, the part I have just been directing your attention to,

the rate was in fact slowing down?-- Yes, I can see a slight curve after sanitising the graph, yes.

By sanitising, that's a term that you use and others might for the fact if one irons out some of the bumps up and down?-- Sure.

Not sanitised in any other nasty way. Now, as you read that graph, I think I am right in saying from what we have just been discussing that, in your view, the appropriate way to read that graph is to apply to it that curve which shows the slight decreasing rate?-- Yes, that would be a technique, yes.

So, if we turn back then to those persons who might have had to deal with this graph, in the absence of knowledge of the two indicators you were asked to take into account, the smell in those early days, in the absence of that knowledge but with the knowledge of the mining method, the loose coal, the rate of production, the other factors I have mentioned, one may well conclude that not only was the method of mining producing the CO make but that it was starting to level off slightly?-- Yes, that would be the indication. I would add that to get a meaningful result from monitoring and calculating CO make, you would need to be comparing that to a reference which would be what you would expect, otherwise you wouldn't know - the graph would lose its meaning.

Well, let me throw into the equation then this factor: that at the start of extraction, or slightly before, there had been an exercise carried out - to whatever degree of sophistication doesn't presently matter - but people had carried out an exercise and predicted a CO make for the end of this panel of between 12 and 14 lpm, so that was the expectation. Then adding that factor to it one may - it's an open view, looking at that graph, that the method of mining was producing the CO and it was in fact levelling off as expected?-- Yes.

Now, can I go back just briefly to the 10 and 20 argument, if I could put it that way? The results you obtained yourself in the northern New South Wales collieries - I think it's Liddell and Aberdare - they obviously weren't CO make results because CO make wasn't being done?-- No.

They must have then been probably Drager readings of CO parts from various panels or Unor readings?-- I think they were a laboratory analyses carried out by ACIRL at that time. ACIRL had a laboratory at - in that area.

Testing bag samples?-- Yes, or bottle samples which were taken and sent away for analysis, and they would do the full analysis and do a Graham's Ratio.

So, did you obtain information about ventilation too?-- Yes, to get meaningful results the ventilation - other parameters were necessary, otherwise the CO make couldn't be calculated.

I accept that, and I think I must be correct in saying since CO make wasn't in fashion then, that you weren't getting

velocity readings coinciding with the bag samples, you must have been acting off, say, a monthly ventilation survey?-- That's correct, yes.

So, in so far as you could produce the CO make figure, it had some critical deficiencies, didn't it?-- Yes, it did.

Because -----?-- They need to be taken simultaneously to-----

That's exactly the question I was about to ask you?-- In the absence of being able to do that, we were looking at ballpark figures to see if it fell into that 10/20 area or whether it was, you know, 100/200, just to see if it was comparable.

That's a comparison in the sense that you made yesterday also. When you talk about ballpark, we are really understanding that to mean within the general vicinity as opposed to being well removed?-- Yes, that's correct.

The example you gave yesterday, I think, was 10 as to 15 as opposed to 10 as to 100?-- Yes.

So, all the results you obtained from those northern collieries must have followed this sequence: firstly, they could not give you an accurate CO make, could they?-- No.

Not in any shape. Secondly, they could only give you what might be described as a terribly general view as to whether those German standards were within the ballpark of experience here or not?-- That's correct, yes.

But in no way would you suggest, I take it, that the analysis such as you did would lead to a conclusion that the standards were appropriate for Australia or any particular colliery?-- Oh, no, that's right. We were looking to decide whether to include it in our book as another option, another alternative to Graham's Ratio at that time.

You have been shown the page, but no doubt you remember it?-- Very well.

But it's very much a small part of the overall book, isn't it? It's a few lines of a very substantial book?-- Yes.

And may I suggest that - without being disrespectful - that in that edition at least it certainly wasn't being given any prominence?-- No, it was - that was the first mention - I think that was expanded slightly in the second edition of the book, and certainly now it is being adopted if a third edition came out it would have quite a broad coverage.

With appropriate qualifications against the use of the absolute values?-- Yes.

Can I just ask you to have a look at Exhibit 27? This I'll identify for you. I believe it is the second edition?-- That's correct.

Happily provided and not purchased, you will probably be unhappy to hear. On page 311 is the treatment - in the second edition - I think the numbers at the top of the page might indicate 7.45 - do you see that there under the heading "Carbon Monoxide Make"?-- That's right.

It received a little more prominence in that book, but not much?-- Not much. It was given its own section instead of appearing as a note.

An addendum to Graham's?-- Yes.

And in this edition, at least, there were some added words put in specifically to identify it with long wall results; do you see that?-- Yes.

Now, I assume you made that change?-- Yes, that's right.

And that's specifically to reflect the fact that these figures relate to long wall methods of mining?-- Yes, that's correct. It was to be more accurate, because the - that's where these figures had come from.

And absent some appropriate analysis - that's relevant to point out, too, because it may be that the figures aren't transferable to bord and pillar?-- No, that's right, it's - I think I mentioned yesterday there is a perception that in bord and pillar you tend to get smaller heatings that are more intense. These figures tend to apply to maybe more extensive heatings.

All right. Well, I don't think I wish to discuss any further part of that for the moment, so you can leave it to one side with you. Now, if I can go back to those results, then? In so far as you did them - I assume without knowing - perhaps you can tell me if it's true - the very reason the results weren't published was because of their lack of utility in a scientific sense?-- Yes, it was - the aim of the exercise was to put something in here that could be meaningful. If it wasn't going to be meaningful, it wouldn't have gone in, so the attempt was to validate - to see if the ballpark figures were similar.

The meaningful part is the formula, rather than the figures?-- Yes, that's right, and the exercise was in pencil on a pad. It didn't go beyond that.

Now, in relation to the Queensland experience such as you knew it, you weren't really aware of that until 1986, and did I understand you rightly to say that you, in fact, became aware of the Queensland application, such as it was, from Mr Brady or Mr McKenna, or was it from Mr Allison and Mr Glazbrook on

the trip to Germany?-- No, I've had quite a few dealings with Ron McKenna over the years. He was one that had a particular interest in spontaneous combustion and I've had many phone calls from Ron over the years discussing spontaneous combustion, and the year - I'm a bit hazy - it could have been '87 or '88 where I spoke to them both during one of my visits to Queensland.

That's Brady and McKenna?-- Yes, they were talking fairly excitedly about using-----

CO make?-- Using CO make, yes, and the results they were getting, and how they could rely - they felt they could rely a lot more on the CO make than CO concentration.

I understand that. Now, nonetheless, I understood what we were discussing before, as far as they were able to generate a result, which eventually you understood to be 7 and 15-----?-- That's my recollection.

-----that was, in fact, only one particular incident?-- Yes.

Now, do I understand also correctly that you don't know what analysis was done in order to produce that view?-- No, I don't. It was a - just an anecdote type of discussion.

And hardly, you would agree with me I'm sure, evidence which validates the figures one way or the other. It is an anecdotal incident?-- That's right. I was just pleased that somebody was running with it, really.

And no doubt buying the book?-- And that too.

Now, can I ask about both editions of the book; perhaps, more importantly, the second edition? You there use the phrase in relation to the figure of 20 that greater than 20 litres indicates that considerable danger exists. Now, that, I assume, is your phrase?-- Yes, I think it was Franyo Kock's phrase. I'm a great processor of other people's phrases.

Leave aside plagiarism?-- Research, I call it.

We will stay with processing. Now, that's, as you recall a phrase, a phrase he used to you?-- Yes, I took his description of both of those indicators as described to the German users, and I adopted them per se, so-----

Have you had occasion to look at any publications by Mr Kock since?-- Yes, I have. I have a - in my possession a publication. The author is Mr Kock and-----

Mr Funkemeyer?-- Mr Funkemeyer, exactly.

I will spell that later. That phrase that's used - that is, "greater than 20, considerable danger exists" - is not reflected in that article, is it?-- I can't recall.

I think all that's said in that article is that, "At CO flows of 20 lpm (alert value), methods have to be taken to reduce CO

production."?-- That could be. I haven't - I haven't studied it for a while.

Well, I might show it to you shortly, but so far as your recollection of the literature goes, that's certainly not a phrase that Mr Kock has published in his own work?-- No, I would have to agree with that.

And no doubt in the third edition, that also might be taken into account, would you agree?-- It may be now, yes.

Now, can I ask you this: when you did the Minerisk review of which you have been shown some of the documents?-- Yes.

How is it that the 7 didn't make it into the rules?-- Yes, I thought that myself. Maybe the 7 didn't hit the table on that day.

I'm wondering about that myself?-- Certainly the 15 hit the table, but the 7 may not have been mentioned.

Right. Well, may have been later in time?-- Yes, I'm - well, it may have been later in time, but I do recall the 7 with the 15 in the late '80's in the discussion. It may have been overlooked on that '92 occasion.

Now, you mentioned that Mr Brady presented a paper at the '89 seminar?-- Yes.

And talked enthusiastically - "strongly", I think, might have been the term - about CO make as a tool?-- Yes.

Did I understand you to be suggesting that he, in fact, was postulating the 7 and 15 as his numbers, or simply enthusing about the use of CO make as a-----?-- I would say the latter - possibly urging other people in the room to consider the technique.

There was certainly no occasion of an exposition of results or analysis on his part leading to the 7 and 15, for instance?-- Not that I recall.

All right. Now, can I come back to a couple of points? We agreed earlier, when we were discussing in general terms CO production - if I can call it that - that you can't blandly just say coals are coals from one place to another?-- No, I don't say that.

And you have mentioned, I think - and perhaps correct me, if you will - that it is your understanding that coals in Australia give off more CO than the German coals?-- That was a theory, yes. That was a theory that I've heard on a number of occasions - not so much in Australia, because it was more Bowen Basin coals.

Sorry. All right. Certainly Bowen Basin coals, on your understanding, have a higher CO production rate than German coals?-- I have heard that, yes. That's my understanding.

Okay. If that is so, would you agree that that also impacts upon the utility of any absolute German figures?-- Yes, it would. It would - well, I think that - one of the explanations of why it was lower or appeared to be lower than the German figures - part of that reasoning was that fact.

All right. Now, turning to that Minerisk Analysis - and I'm not sure if you have got the document there any longer - do you have that?-- I have?

The review - Exhibit 237. Do you have your own copy?-- I have my own copy of that, yes.

Heavily noted?-- Nothing in it.

Good. I wasn't brave enough to ask to see the notes. In relation to rule 9, can I ask you to go to table 12? You were mentioning to Mr Clair yesterday that rule 9, which is the - expressed in the general form that if the CO level exceeds the background or is greater than the background, then investigate?-- Yes.

The modification of that, as suggested, was modify the rule to say, "If the CO level trends upward, noting the monitoring location importance, then investigate."?-- Yes.

"Then investigate" is not included in the words, but I assume that's the way the rule should read - the modification?-- Yes, that's right.

Now, the way you expressed it yesterday was that if it trended upwards, one should investigate to see if it is caused by an incorrect sample, or else an outside influence. Once having eliminated that, then one would put in place a system of monitoring?-- Yes, that's basically correct, yes.

I understand from you, having said it yesterday and now, that you would regard that as an appropriate procedure to follow in so far as it is expressed?-- Yes.

So that the approach to eliminate what might be called contaminating factors is the first step, and then having done that, one may set up a monitoring system?-- Yes, that's right.

If one did eliminate, in fact - sorry, if one, in fact, concluded - that is to say didn't eliminate the outside influences, but concluded the rise was from a contaminating factor - for instance, an incorrect sample - then it is not necessary to set up the monitoring system?-- No, if you are just - yes, I would agree if you identified an incorrect sample or just redefining a norm due to an outside influence-----

It depends on circumstances, obviously?-- Yes.

But it is not, as it were, a rule?-- Yes.

That at that point you must do something?-- Yes. To - you

must already be monitoring to know that there is - or sampling to know that there had been a change.

Quite?-- But you would re-define your monitoring and your attention to that panel if you eliminated the contaminants.

All right. Now, that, of course, like so many other things, is a matter for judgment?-- Yes.

About which persons with the same information may differ as to the appropriate course?-- Yes. What I'm talking about is just perceived to be good practice. It is not-----

Not an absolute rule?-- Not an absolute rule, no.

About that, different mines might differ as to what was precisely appropriate, what should be put in place?-- Yes, yes.

Equally, at that investigation stage about the incorrect sample, for instance, minds could differ at that stage as to how to go about doing that investigation?-- Yes.

And all these areas - and there will be some others that I may come to later - they are areas where judgments have to be made and there are no absolute rights and no absolute wrongs?-- No, that's right. More guidelines.

Turning back - staying with table 12 but turning back to rules 6, 7 and 8, the modifications suggested there in the right-hand column were, in fact, to delete the absolute figures as an appropriate rule?-- Yes, that's correct.

Now, it was appropriate then; it is obviously still an appropriate way to approach it now?-- Yes, nothing has changed.

Now, Mr Clair drew your attention to the difference in wording yesterday, but I'm not sure that he asked you to express a view about it - between rule 7, as it is expressed there, and as it is expressed in table 2. One is "initiate action", and the other one is "initiate control". Is there any significance in the difference in wording?-- I can't-----

You can't readily-----?-- I can't recall really. During brain storming, sometimes the words change with the intent being the same.

So far as you are aware, we shouldn't read anything into the difference in wording?-- No. No significance.

Now, can I come back to rule 9 - sorry to jump like this, but you mentioned yesterday in relation to that that the importance of noting the monitoring location - and I'm just trying to pick up the way in which you expressed it - sorry, I will have to find it now. You talked about the monitoring occurring in a return rather than the panel's return - in the main return, as opposed to in the panel's return. Do you recall that?-- Yes.

I've actually found it now and I can read it to you. Page 4554 at the bottom of the page, "It was thought that if the monitoring point was in the main return, a slight level in CO concentration - an increase in the CO concentration level may go unnoticed, and if you are going to continue to monitor CO, it should be done in the panel return where the increase would be more significant, or obvious." Now, I'm just not quite sure what the distinction is that you are making between a main return and a panel return. Is the main return something outside the confines of the panel?-- Yes, the total return air flow of the upcast shaft, or-----

I understand?-- As distinct from-----

If we turn around and look at the map there - the relief map, which is the 512 panel on the bottom joining with the 510 drives and 5 South - the big panel at the top - yes, the model is what I'm referring to - then a panel return would be one within the confines of 512 and a main return will be outbye that?-- Yes, I would agree with that, yes.

So, the appropriate monitoring point in your estimation is, for instance, in that case, the drive at the top of the model of 512 - the top return?-- A point in the return in 512 before it joins the main return air.

Thank you, I think I have that right. That is a point which, in your view, is an appropriate point in order to detect increases in CO parts per million?-- Yes, that's considered to be good practice.

If I can stay with the range of figures that were postulated, but now hopefully won't go forward in time, you mentioned in terms of comparisons the ballpark figure and you gave, as it were, three examples; seven is to 10 or 15 is to 20 as opposed to 10 is to 100 by way of a distinction?-- Yes.

But really the ballpark in terms of discussing validity would also include slightly above or below either figure, so seven is out that far removed from 10, neither 10 from 15, neither 15 from 20 neither 20 from 25?-- That's right, yes.

So even on that basis, even seeing levels of 25 don't necessarily mean anything beyond the fact that 25 is higher than 20 and maybe someone should be looking at doing something?-- No, that's right. In that paper you referred to from Funkemeyer and Kock, I think I mentioned yesterday afternoon they recommend looking at other indicators as well as the CO make. As I mention it could be a mild extensive heating.

Let's have a look at that. Can I show you a copy of it? Now, that's the article that we are referring to?-- Yes, it is.

On page 154 which is the second page?-- Yes, the -----

Is the section that I think you might be referring to, and in the right-hand column under "Assessing the extensive oxidation and size of the fire", does this appear in the last six or seven lines: "CO production of more than 10 l/min (warning value) requires a detailed investigation into the cause in any case. At CO flows of 20 l/min (alert value) measures have to be taken to reduce CO production." Is that so?-- Yes.

Now it goes on, "Extensive oxidation sometimes produces CO flows of more than 20 l/min without a fire (spontaneous combustion)"?-- That's right, yes.

Just pausing there - I will complete the sentence - "...without a fire (spontaneous combustion) having occurred." Clearly enough Mr Kock's view was that you could have CO levels of greater than 20 lpm that weren't necessarily the product of spon com?-- That's correct, and he does go on in that paragraph to mention the hydrogen and the higher hydrocarbons as another indicator.

Let's read on - and he is there talking about CO flows of more than 20 lpm?-- Yes.

"In these cases the assessment requires additional parameters like the behaviour of CO make on days without coal production..." Can I just pause there? That's the point that you and I were discussing before, wasn't it?-- That's correct, yes.

If CO make in fact drops in production that may be consistent with the fact that the higher CO make is production driven?-- Agreed, yes.

And not spontaneous combustion driven?-- Yes.

Let's continue with it. "... or increases and reductions of the daily output...", and that again is the same point I think we are making in a different way?-- Yes.

"...the pyrolysis products hydrogen and higher hydrocarbons, in particular unsaturated hydrocarbons, as well as the Graham fire coefficient." So what Mr Kock is saying there is if you are tracking CO makes at greater than 20 then you may bring in these factors to investigate?-- Yes.

Indeed the first bits mentioned in terms of those that might be brought in is to see whether in fact on non-production days CO make tracks the production?-- Yes, correct.

If we go over the page - I'm sorry, at the bottom of that page 154, "Reduced CO make on days without coal production or reduced output is a clear indication for an extensive oxidation." Do you see that? You would agree with that comment?-- Yes.

Can we just go back to 219 for a moment? If what I postulate to you is correct, that is to say that we see in the middle of June CO make tracking production, then would you agree that that's a clear indication of an extensive oxidation in accordance with what Mr Kock says?-- Yes, I would.

He then goes on to complete that thought by saying: "In analogy the CO flows have to increase with increasing output or face advance as well as on weekends." In other words, if it's a spon com it has to keep going up even though you are not working?-- That's correct, yes.

And can we go down page 155 to about 20 lines from the bottom? It's a passage commencing, "The fire coefficient is a dimensionless figure..." do you see that?-- Yes, I do.

The fire coefficient, as would know from the article, is the Graham's Ratio?-- Yes.

"The fire coefficient is a dimensionless figure indicating a ratio of CO content produced by a fire to the oxygen content consumed by the oxidation source and changes with the temperature at the fire source. Contrary to the results of laboratory examinations the fire coefficient can, however, hardly be used under practical conditions to draw a reliable conclusion on the temperature at the oxidation source." You would agree with that comment?-- Well, I don't know whether I agree. I have read that, and I must admit, thought about it. The authors haven't really confirmed that with data or justified the statement in the paper and it seemed a strange one in light of the historical meaningful results that have been obtained with this ratio around the world.

Except that we have to draw a distinction between the use of the Graham's Ratio in terms of indicating the onset of a heating and then perhaps tracking it with what he is talking about which is the use of the Graham's Ratio to indicate a particular temperature?-- That's correct, yes.

That's all he is talking about, that you can't translate laboratory results to a real panel by way of saying, "Well, there must have been that temperature there because this is." The ratio ----?-- Yes, I would agree with that.

To that extent you certainly do agree?-- Yes.

And really, as you will see if we read through to the conclusion of that paragraph, at the top of the next column he gives some details about that, but that's all the point that he is making in the last sentence of that paragraph. "In contrast to laboratories examinations the fire coefficient can hardly be related directly to the temperature in the goaf."?-- Yes.

That's the point that he is making and one with which you agree?-- Yes, yes.

But clearly enough what Mr Kock is saying is that you can get and run with CO make levels above 20?-- Yes.

And those CO make levels may be consistent with general oxidisation as opposed to a spontaneous combustion?-- Yes.

And one of the first indicators of that will be if you see CO make tracking production and not ignoring it?-- That's correct, and he does also recommend that other indicators come into play.

Yes, if one was tracking at some figure well above 20 one may well wish to bring in account other factors?-- Sure.

That's really the point that he is making?-- Yes.

Indeed I think later on in the article, as you remember, he even discusses CO production levels at greater than or between 20 and 30 litres?-- Yes.

I tender that article by Mr Kock. Can I ask you before it's handed over, I think you might agree, certainly on the copy I have given you, there doesn't seem to be a date. Do you know the approximate date of that article?-- No, I don't. My article is in a different context to yours, it was part of a greater publication. I would be able to establish that, but not today unfortunately.

We will see if we can. At the moment it can simply be described, I think, as an article by Mr Funkemeyer and Mr Kock, "Fire prevention in workings with rider seams prone to spontaneous combustion.". We will arrange for copies to be done.

WARDEN: We will mark that Exhibit 244.

ADMITTED AND MARKED "EXHIBIT 244"

MR MORRISON: I have received the note that I should tell Your Worship this is a convenient time.

WARDEN: I did want to mention a couple of questions we have for the witness. We require him to read a few pages of a document. I would ask him to do that during the adjournment to save time after. Thank you.

THE COURT ADJOURNED AT 10.51 A.M.

THE COURT RESUMED AT 11.12 A.M.

PAUL MACKENZIE-WOOD, CONTINUING:

MR MORRISON: Now, Mr Mackenzie-Wood, can I just go to another point but allied to what we have been talking about? We have been discussing, amongst other things, oxidation rates and oxidation of coal over time. What can happen, I think you will agree, is that with coal that's been exposed to oxygen, the oxidation - the oxidation in a particular panel can increase over time with the increasing length of exposure to air?-- Yes, that's right.

And that is particularly so if there is loose coal and even more so if the loose coal is of a small size, for the reasons we discussed earlier?-- Yes, I would agree with that.

So that if they were features of a panel, you could well comprehend that over time you may see not just higher CO than in other panels but prolonged CO at a higher rate?-- Yes.

If we turn to this particular panel for a moment, I am going to ask you to assume a number of things that have been referred to at the Inquiry - not the layout so much, so you may not need to turn around. This panel had, on the evidence of a number of people, more loose coal in it than other panels at the mine and the method of mining was one which created loose coal sitting in the bottom of ramps. It was also the shortest duration panel by comparison with recent panels and the highest production rate of any panel in the mine. Given those features of this particular panel, would you not agree that they are likely to show one an increased CO production and an increased CO make by comparison with other panels?-- Yes, I would agree with that.

So that when we compare the CO make graph for this extraction panel with other extraction panels, those features are something which may well account for the difference in rate?-- In the light of that information, yes, yes, it could.

Mr Kerr may not have given you this sort of detail but that was the situation as he found it or he had to deal with it on 22 July which is when he made the inspection. By then the panel was substantially extracted by a system which meant that there were ramps along the bottoms where bottoms were taken over a considerable portion of the panel and in those ramps were a substantial degree of loose coal - sorry, a substantial degree of loose coal - I am not suggesting we can be precise about tonnage and so forth - but by comparison with other panels a substantial degree of loose coal, and as well at the end of the ramps exposed stubs which wouldn't be there other than if one put bottoms in a different way. Those features would confirm, would they not, the proposition I put to you, that they could well account for a higher CO production and a higher CO make than other panels?-- Yes, that's possible.

And by virtue of those features that we discussed earlier and then just a moment ago, that is to say, the increasing rate of exposure of coal, new coal, to oxygen and the oxidation that one sees over time, one could well see prolonged high CO production and prolonged high CO make for such a panel which has those mining features and is extracted rapidly?-- Yes, I would agree with that.

Conversely, if we go back to those mythical panels, the two side by side, and the other one was extracted over, say, double the duration, you may well see for that panel the flattening effect that you referred to simply because of the longer duration of extraction?-- Yes, that's possible.

Now, in that sense when we turn back to the graph for this panel, knowing those features about the panel, that may well account for the CO graph that we see in Exhibit 219?-- Yes. As I say, what you say is possible and, as I said before, without being able to relate it to a norm, it's hard to make a proper assessment.

Now, two features that I want to talk about which follow from that is: in terms of one's assessment of that graph, it's certainly a view that is open that the features I've mentioned result in the production we see; would you agree with that?-- Yes.

Secondly, that if what I suggested to you is so - and I ask you to assume it's so - if this mining method and this degree of loose coal and so forth is not reflected in other panels, then this may well be establishing a new norm for that mining method and system?-- Yes, that's possible.

So that comparisons such as one might make saying that the rate of increase was greater than any other panel, given what I told you, is not particularly helpful, is it?-- No, that's right.

All it will tell you is that it had a greater rate, but there may be reasons for that greater rate?-- Yes.

And the reasons that I have outlined to you may well account for it?-- Yes.

Now, when one is assessing what might be a background - you can recall expressing the view both in the literature and here that one would try in some way to assess a background make either for a colliery or for a panel?-- Yes.

In doing that one may well have regard to what happened in other panels, I think you said?-- Yes, they would provide a basis.

Like a start point?-- Yes.

But then the degree to which the mining method varied from those other panels would necessitate an adjustment - a review of background?-- Yes, a redefining of the background.

Yes, a redefining is the best way to put it. In relation to that, it is, I assume, in your view - tell me if I am wrong - appropriate to take into account one's experience in the mine?-- Yes.

So that one may not turn simply to absolute data for another panel, one could legitimately take into account one's experience with the other panel, how it operated, how it performed, difficulties with mining and so forth?-- Yes, I agree.

So that from that point of view, if one knew that for this panel, for instance, one was about to embark upon a mining method with all the features that I have mentioned before that I have asked you to assume, one may well take the view that you are likely to see higher CO make for that panel than other panels?-- Yes.

And the experience that one has with the other panels generally may form a basis for establishing a background CO make?-- That's correct, yes.

Though, as you point out, it's something that may have to be re-assessed from time to time or redefined according to the progress?-- Yes.

Now, knowing now the things that I have asked you to assume, would it be right to say that the comparison one can make between 219 and those other panels that you were asked to look at really is affected by those assumptions?-- Yes, in the light of that information I'd agree with that.

And at the end of the day perhaps all we can legitimately assume on the assumptions that I have given to you is that this rate was higher because of the way in which the panel was mined?-- Yes.

Now, you pointed out yesterday - and I think we may - I will give you the document back - I don't think you have it. It's Volume 2 of the SIMTARS material. It's Appendix 5.4(A). Now, you were asked to look at this yesterday, I think, by Mr Clair, and this is, as it were, a version - a reasonably close version of 219 as against other panels?-- Yes.

And you expressed the view yesterday that the rate was steeper but I think you put some qualifications on how you would finally assess this, you would need to know the features in other panels and so forth?-- That's correct, yes.

Even though - sorry, I will start again. Now knowing some of the features of the mining that were features of this panel as opposed to other panels, all other panels, the only comparison, I suggest, that can be legitimately made is simply that it exhibited a greater rate of increase perhaps due to the mining method?-- Yes, that could be an explanation. The steepness, the difference, would still give me some concern that would require or suggest further investigation.

But one couldn't make the leap, now knowing what you know from this graph - with this graph, I'm sorry, you couldn't make the leap, knowing what you now know, to say that this graph necessarily indicates spontaneous combustion. It may indicate the method of mining?-- That's possible.

We see from Appendix 5.4(A) that, in fact, some other panels had as steep a rise, and maybe steeper, in their CO makes in their early days, as you rightly pointed out yesterday?-- That's correct.

5 North, which is the uppermost line, certainly seems to have exhibited a steeper rise in its first 50-odd days of life than any other panel?-- Yes.

Now, Mr Clair mentioned to you yesterday that that was a panel which, when sealed, had an identified heating in it?-- Yes, that's right.

But we don't know when that heating commenced in the life of 5 North, and so not knowing that point, would you agree that you can't say that - over, say, the first 50 days, that jump in 5 North was due to spontaneous combustion either, as opposed to mining method?-- They all do look similar in that period.

And if one takes that first 50-odd days, and perhaps a little longer in the case of 511, the green line - perhaps something up closer to 60 days - knowing now that 512 had a greater rate of production than any other panel, that may well account for the fact that it continued with a rise where the others might have dropped off slightly?-- As I say, that's a possibility.

And in terms of one viewing the graph and its impact and perhaps not having the opportunity to make the sort of comparison that we are making now, that is a view that is certainly open?-- Yes.

Just before I ask you to hand that back, it follows, I think from what we have been discussing, that if one wanted to make a valid comparison in relation to those graphs, one would - it would be necessary to make a valid comparison in order to have the information about mining method, degree of loose coal and the other features that I have mentioned for all the other panels?-- Yes, it would be important to have all the evidence.

Keep the volume with you for a moment because you may need it, but not right now. When one considers the panel in its pre-sealing and post-sealing state, one of the things that one sees, would you agree, is that during sealing, CO parts are likely to go up?-- Yes.

Because ventilation is being affected?-- Yes, that's correct.

And similarly at the next step after sealing, one would also see CO parts going up because ventilation is now cut-off?-- Yes.

And one has then a confined - or defined amount of oxygen available in the panel, but nonetheless oxidation is continuing?-- Yes.

So, the fact that there is an increase in CO parts after sealing is entirely predictable and normal?-- Yes, you could expect that.

And it may be, would you agree, that the rate at which CO will go up in terms of its parts after sealing is necessarily - I started off to say it may be, but I'll put it on this basis - it is necessarily related to the rate at which there was oxidation before sealing?-- There would be a relation, yes.

So, if one saw, for instance, a higher production of CO or a higher CO make between our two mythical panels prior to sealing, one being higher than the other, post-sealing with the two mythical panels one might expect to see parts in the higher one going up at a greater rate than parts in the other?-- Yes.

And likewise one would expect to see certain of the ratios performing in a similar way - Graham's, for instance, will show a rise after sealing?-- Yes, that's possible.

And that is a routine thing upon the sealing of a panel such as these panels - that is to say, in a mine that generates CO and seals off and oxygen reduces?-- Yes, as I mentioned before, with sealing and the loss of the defined air flow, some of the ratio's indices would behave differently.

Now, there is - can I ask you this: in terms of what one sees about the production of CO prior to sealing, if one saw a steady linear rise in parts, that would not be a matter for undue concern?-- Again, I'd have to say that to me it would require investigation.

We're talking parts here, not make?-- Yes.

But it obviously depends on the level?-- It depends on quite a number of influences and on the level, yes.

Can I ask you to look in that volume? If you can turn back to find appendix 2.1.13(b)? Do you have that now?-- Yes, I do.

It should be a graph, "Point 16, 512 Top Return"?-- Yes.

And down the bottom left-hand side it should have in a shaded area "Moura #2, 27/7/94 - 8/8/94"?-- Yes.

Now, this is a graphic representation of the movement of the three gases mentioned in the legend up to and just after sealing - or up to - until the time of the explosion. If you look to the right-hand side, you will see the two dates, 6 August and 8 August?-- Yes.

Now, there are 12 periods covering that time, so that the 7th of August falls half-way?-- Yes.

I would like you to assume that four periods in is when sealing commenced - four periods in from the 6th?-- Yes.

Now, what we see there is a line in CO parts that moves from about 6, and up to the 6th of August to about 9 at a total?-- Yes.

Can I ask you: over that time period, that is not an extraordinary rise, would you agree?-- I'd agree, yes.

Then when we come to that time period I asked you to look at - that is four periods in on the designated bottom line - we see that about the time that sealing starts, CO starts to rise in terms of parts?-- Yes.

Now, that's an entirely - as we agreed, an entirely predictable and normal thing?-- Yes.

Now, if we look at the methane levels at the bottom - the green line - we will see that they have been extraordinarily low all the way through?-- Yes, they have.

Nothing that would cause anyone any concern about either the methane levels or, for that matter, the CO levels; would you agree?-- I'd agree, yes.

Thereafter, of course - after sealing, you have to deal with what happened thereafter - that will be another question later. Now, can I ask you to look at the next page which will be the same point, but dealing with carbon monoxide - carbon dioxide, sorry - CO₂ - same time period, 27 July through to 8 August, and would you agree with me that the carbon dioxide level is again very low - about .03, perhaps, consistently?-- Yes.

Now, carbon dioxide is a gas that might indicate fire?-- Yes.

This would not indicate fire, would it - a steady level at .03?-- No, it's not - no, it wouldn't.

Likewise, CO₂ might be a gas that might indicate spontaneous combustion at a certain level?-- Yes.

Now, this would not do that either, would it?-- It doesn't appear to, no.

Now, could I ask you to go to appendix 5.9(D), and the second page of that should be, "Point 16, 512 Top Return". It is a graph for the same time period relating to Graham's Ratio and Morris' ratio - Graham's in the red; do you see that?-- Yes, I do.

As we look at that, between 27 July and - let's take it up to the same period we are talking about when sealing commenced - four periods in?-- Yes.

Is it right to say that on that graph, the Graham's never got above point 2?-- That's correct.

In fact, was closer to .15 the whole time?-- Yes.

And only after - or about - or slightly after that time of sealing that we have identified does it rise 2.2, and then drops away?-- That's correct.

Now, Graham's Ratio is a ratio that's used to indicate potential onset of a heating?-- Yes.

Would you agree with me that anyone looking at that graph of the Graham's Ratio would not conclude that there is a heating?-- That's true.

Now, without necessarily going back to those other graphs - but, of course, you may if you wish - if those three graphs were what people had available to see prior to sealing, would you agree with me that none of those three graphs would lead anyone to conclude that there was spontaneous combustion or a fire in the panel?-- No, it's not strong evidence, no.

In fact, one may reasonably take the contrary view, in fact?-- Yes.

Now, can I ask you, then - you can close up that volume, if you like. I just have to extract a - an exhibit number. I'll find the exhibit number eventually. Can I ask you to look at this? This shows these three graphs, as they appeared on the Maihak screen after sealing, and it is cut off a little at the left, but it goes methane, CO and O2?-- Yes.

Now, at least one of these graphs was, in fact, called up by a person after the sealing and bore this appearance. Had they all been called up, this is the appearance they would have had. Would you agree with me in relation to methane that what it shows is a steady linear rise - no jumps?-- That's right.

You can accept for present purposes that the spikes downwards in each case were caused by a period of span gas testing?-- Yes, yes.

Now, would you agree with me also that the CO graph shows the same thing - a steady linear rise?-- Yes, I'd agree with that.

And comparably, if I can put it that way, the O2 shows a very steady linear decrease?-- Yes.

Now, would you agree with me that those graphs don't exhibit any cause for concern on any person's part, showing, as they do, just steady procedure?-- It certainly is a steady procedure. I'd still have some concern, I think, with the CO.

In terms of its absolute values?-- Yes, just the continuing increase. I would have thought that it may have levelled out and even started to flatten down a little bit.

Accepting this is only over 22 hours?-- Yes.

Then it's not surprising that it's still going up, is it?-- No, I would accept that, yes.

That's Exhibit 185, we finally managed to find the number. Thank you. You can put that to one side - in fact I better have that back, that copy. Would you confirm for me that what you have in fact been looking at is Exhibit 185 from the Court exhibits?-- Sure, thank you.

That is so, isn't it? That's 185?-- Yes, it is.

Can I deal with a related but more general proposition? I think you would agree with me, and I'm sure you will, that there are no absolutes in terms of absolute values in terms of rates of rise of either CO parts or CO make prior to a sealing in the panel?-- Not that I know of, no.

And would you agree with me also that likewise, and it necessarily follows, that after sealing there are no absolutes in terms of rates of rise?-- I agree, yes.

You mentioned yesterday, I think - no, today, you were asked to make some assumptions about smells and one of them was a strong tar smell on the Friday, 5 August, and your response to that first off was that hydraulic smells underground are common?-- Yes.

That is the case, isn't it?-- Yes, I believe so.

And would your experience suggest to you that one may pick up an hydraulic smell and describe it by "tar"?-- That's an opinion that I have been given, yes.

And if we know that in fact grease drums were thrown into this goaf from time to time, that would suggest the possibility - I don't say certainty, the possibility that that's the source of such a smell?-- It's possible, yes.

I read this in some of the literature, and I'm sure you will say the same thing. In relation to smells there is no question that it takes experience to distinguish what they are and to distinguish what they are from other things?-- I believe so, yes.

It's not unknown at all for persons to perceive a smell which is incorrect?-- That's possible.

We have an instance in this case of someone identifying a - as either a tar or benzene smell, but in fact another person identifying the same smell as unquestionably roof bolt chemical. Have you had that experience yourself?-- I haven't heard that, no.

You have some experience though that smells can be confused one with the other?-- Yes, I've heard that. I personally haven't had that experience.

Well, maybe not. Perhaps you haven't been confronted with an opposing opinion?-- That's right.

Now, in relation to the onset of such signs of smells there are matters to be taken into account, would you agree, in terms of assessing the weight of that indicator?-- Yes, there are.

An obvious one, and perhaps the most trite, is whether in fact the smell was there, whether it's a -----?-- It's subjective, yes.

Whether it's - the veracity of the report, I suppose?-- Yes.

Another factor might be in terms of assessing the weight of that report the experience of the person who detected it. As we know, inexperienced persons may not detect the correct thing?-- That's correct.

When we talk about experience here, I think I'm right in saying that what you mean is not just experience globally, but indeed experience with a particular mine or a particular part of a mine?-- I believe that's correct, yes.

Mines have their own - or parts of mines have their own characteristics?-- I believe so.

So for instance, if we took our mythical panels, just because you are familiar with the sort of smell in the return of one wouldn't necessarily mean that you could translate that experience as being entirely valid for the other?-- That's possible.

So in terms of weighing up the report of a smell, not only do we have those features, but another feature would be, would you agree, whether the smell was repeated?-- Yes, that's true.

So if one received a report of a smell - and let's take it in a number of stages, if I may - experienced persons went to investigate and could detect no such smell, that would be a matter to take into account?-- Yes.

And likewise to take a different step, a similar step, if a smell was reported or experienced but then on subsequent shifts over an extended period the same smell was not encountered at all by any person down the mine, that's a matter to take into account also?-- Yes, it would be.

And it would be a view that is open, that either the smell was wrongly assessed or not there or alternatively whatever caused it is gone?-- That's possible.

And in terms of making such an assessment, that is to say assessment of an investigation of such an indicator,

experienced persons like yourself may well carry out a personal investigation and not rely on investigations by others?-- Yes, I would like to think an experienced person would be given the opportunity to verify the smell, yes.

And I'm sure it's your experience - or at least your view, as with others, that if you are in that position and you make your own personal examination or investigation you tend to rely pretty heavily on your own findings?-- That's correct, yes.

And that's a perfectly reasonable thing to do and in fact it's a common thing to find, isn't it?-- I would say so.

I'm sure that you would do the same thing yourself?-- Possibly, yes.

So, for instance, if we go back to the smell proposition, if there had been a report of a smell and then you made your own personal investigation and could detect nothing of the kind, that's a matter that you would take into account in assessing the weight to be attributed to that indicator?-- Yes.

I don't mean to say that it rules it out or rules it in, but it's a matter of weight?-- Yes.

It's getting back to the question that we discussed earlier, that is to say these are matters of judgment about which persons have to make judgments and take into account various conflicting factors?-- Yes, I agree.

Another one may be, would you agree, that if you were in a position of having to make that judgment you have on the one hand a report of a particular sign, an indicator of some sort, be it haze or smell, let's stick with those, and very experienced persons who are at the same place at the same time can detect no such thing, that's another matter that one would weigh in assessing the weight to be attributed to the original report?-- Yes, I agree.

And if one placed great faith in the experience of those who investigated or who were there, one could well give greater weight to their view than the other view. That's open?-- Possibly, yes.

And if one then combined those two things that we have been discussing, that is to say experienced persons in whom one relies give one view and your own personal investigation concurs exactly with that view, it's certainly open to give that great weight, isn't it?-- Yes.

Now, can I ask you in relation to those indicators, one that was mentioned to you was haze, and I think Mr MacSporran might have mentioned that to you. There are varying sorts of hazes, aren't there?-- I would have to say yes.

You can have a haze that's generated by fine particles of dust?-- Yes.

You can have a haze generated by diesel fumes?-- Correct.

And haze may or may not be generated by heat. Could you respond verbally?-- Yes.

Do you have some experience with heat hazes?-- Not personally, no.

We have heard some evidence in the course of the Inquiry that a heat haze layers. Does that accord with your experience, not personal but perhaps through Mines Rescue?-- I haven't to tell you the truth, no. I could imagine that being possible.

It's likely though because if it's generated by heat it's probably warm?-- Yes, of course.

Whereas a dust haze, for instance, or even indeed a diesel fume haze, is more likely to be general body in its appearance?-- Yes, the diesel may be warmer than the air body as well, but -----

I accept that. Now, in assessing the weight to be attributed to that indicator, that is to say perception of a haze, obviously amongst the other things that have to be taken into account are those that we have discussed about smell, veracity of report, confirmation, non-repetition and that sort of thing, but also what might have to be taken into account with haze particularly is whether it's caused by diesels?-- Yes.

And if one experienced a haze in close proximity to the area where a number of diesel machines were operating it's an open view, a view that one might take that the diesels at the likely cause?-- Yes.

And depending upon the ventilation current, and I'll come back to this in a moment in more detail, but depending on the ventilation current that haze might hang there - even though it's diesel caused - might hang there for a while even after the diesels are gone?-- That's possible.

So that the mere fact that a haze continues after diesels depart the scene doesn't mean that it's not diesels, does it?-- No, no.

We discussed earlier the question of the production of this panel, and I am now turning not to the mythical panels, but to 512. Can I ask you to look at this document, please?

Mr Mackenzie-Wood, these, as you can see, are the weekly tonnages for 512 Panel during its extraction life. If you assume that to be so, what's behind the graph is the data that the graph is based on?-- Yes.

That shows increasing production over time for 512, doesn't it?-- It does, yes.

Particularly in the later parts of the panel?-- Yes.

And if we look at that period that I was talking about before in June where the dip is, and you turn to a page - I think I

will just have to ask you to go through by date on the data pages for the one ending 19 June. It's page 8, I think the designations are at the top, page 8. We can see from that page, and by reference to the previous one, there has been a significant drop off in production from about 14 and a half thousand tons down to nine and a half and we can also see on page 8 that Monday was the Queen's Birthday holiday and there was no production?-- Yes.

Tuesday was a maintenance day and there was no production, and then on Wednesday production resumed and there was only effectively three days of production in that entire week?-- Correct, yes.

When one turns back to the graph, that is why we have a dip in the graph clearly enough?-- Yes, they appear to match, yes.

And I think, if you have still got 219 with you, you will see that that exactly matches the drop in CO production in 219?-- Yes, it does.

Referring then to what Mr Kock said in his article, this is a case of CO make tracking production?-- Yes, it is.

And not ignoring production?-- Yes.

And consistent with what he said, it's not a sign of spontaneous combustion at that point, is it? If it ignored production it may be, but it is here tracking production?-- It appears to be, yes.

I tender that document. It is probably entitled "Graph for 512 Panel weekly tonnages."

WARDEN: Exhibit 245.

ADMITTED AND MARKED "EXHIBIT 245"

MR MORRISON: You don't have that with you now, but I think you will agree just from your memory of it that in fact we can see the CO make tracking production right to the end?-- I agree it appears to do that, yes.

So right through to the last dates of this graph in early August what we see in terms of what Mr Kock wrote about in his article is CO make tracking production and not ignoring it?-- Yes.

That's so, isn't it?-- That's correct.

Can I ask you to look at this document, please? This is part of document 168, and just while I'm handing it to you, it's called, "Production Analysis Summary of Mining Sections". So this is a production analysis of the various sections in 512, the various panels in 512, and as I give it to you and you

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have a look at it I think you will confirm for me that in terms of production 512 was by quite a measure ahead of the others?-- Yes, it was according to this document.

In tonnages per unit shift, significantly higher?-- Yes.

I will make copies available of that, but I tender that as a separate exhibit.

WARDEN: Exhibit 246.

ADMITTED AND MARKED "EXHIBIT 246"

MR MORRISON: For identification it's part of document 168 in the Inspectorate's documents. So that it can be identified, the designation is, "Production Analysis Summary of Mining Sections", dated 24 August 1994. Having seen those documents which I've shown you, that is to say the production figures which show 512 was tracking production in terms of its CO make, and also that comparison of 512 with the other panels, would you agree that those are matters that weigh heavily on how one would interpret the CO make graph for 512?-- Yes, I would agree with that.

And now knowing not only those things, but what I've told you before or asked you to assume before about the features of the mining method in 512, would you agree with me that one assessing that graph, the 512 make graph, it's certainly a view that is open that that is produced by the method of mining and the production in the panel?-- Yes, I would agree with that.

Now, can I ask one other matter, please? That is this: you were asked some questions about - I'm sorry, if you will just excuse me for a moment. Sorry, I was going to go onto one point but I won't for the moment, but I will go onto another. You mentioned in your evidence before - I think it was today - that a heating in a bord and pillar mine is more likely to be small and intensive, or that's a view that you know about?-- Yes.

Now, when you say small and intensive, that's consistent with deep-seated, that is, buried in a pillar?-- Yes.

And it follows from that, would you agree, generally speaking, hard to detect?-- Yes, that's correct.

And the signals or the signs that might be generated by such a small, intense, deep-seated heating could well be muted and hard to detect?-- I agree with that, yes.

Now, you have mentioned previously that - I think it's in one of your pieces of literature, but you will perhaps confirm the comment without resort to it - that analysis and interpretation of gas mixtures is quite a complex and demanding science?-- I have said that, yes.

And often, in your experience, gas facilities at a mine and the knowledge of mine officials themselves is insufficient to conduct a full-scale analysis?-- I've said that, yes.

And that's the point you made, I think, before, that that will - is difficult - it's here at 4567 - that analysis in that context - the Graham's Ratio requires sophisticated analysis and you really need a laboratory style analysis to do it accurately?-- Yes, I agree with that.

It's been suggested before in the course of these proceedings that a part of your publication - happily the second edition - I think you have got that with you. Could you turn to page - I'm sorry, I don't have the page number. 7.50 is the top number on the page. I want to direct your attention to the passage under (ii), "Final Sealing". Do you see that?-- Yes, I do, yes.

I think if you turn back a page you will see that the context of this discussion is where there is an identified fire that is being combated?-- Yes.

So, the comments under "Final Sealing" about, "Generally, all men are withdrawn from the mine.", are made in the context that one is there dealing with an identified fire that is being fought?-- Yes, a known ignition source, yes.

I have nothing further, Your Worship.

RE-EXAMINATION:

MR CLAIR: Thank you, Your Worship. Mr Mackenzie-Wood, Mr Morrison has asked you to consider the position where - he has taken you through it in some detail - where there is an increased production in this panel, 512 Panel, compared with other panels and where there is a different mining method which has left so much loose coal about in the panel, and he asked you at one point in your evidence to look at that Exhibit 219 - and I take it you still have that there?-- Yes, I have.

And to express a view as to what that graph would indicate at certain times, and he drew your attention, first of all, to the point of time being 17 June and he asked you to - or asked you whether at that time, looking at the graph, it might be said that what was happening was that, in effect, the norm was still being established, that is, that the graph represented a norm for that point of time. Do you remember him asking you that?-- Yes, I do.

And you expressed the view that it could possibly be a norm; do you remember that?-- Yes, I do.

He drew your attention also to 24 June and asked you again for an opinion, and you agreed again that looking at the graph as at 24 June - and having regard to these other factors which he has drawn to your attention - whether that could represent the norm and I think you said that it could possibly be the norm?-- Yes.

Well, now, of course, as he explained to you, the reason he asked you about the situation on 17 June was that there had been some reports perhaps relative to how one might interpret the graph at that time. Now, I take it from what you say - and you recall that you were asked some questions by Mr MacSporran about certain events that had been reported in the panel - I take it from what you say that if in fact a person was aware on 17 June that there had been a report of a tarry smell, a slight tarry smell, that that would, of course, have some bearing on how you might interpret the CO make graph; is that right?-- Yes, that's correct.

In fact, I think you told Mr MacSporran that that would reinforce the concerns that you would have simply looking at the rate of increase in production of CO make?-- It would be another indicator I think I said, yes.

And, of course, when Mr Morrison was putting the position to you he said, "Well, assume that whoever was interpreting the graph was unaware of that and didn't have that feature to consider."; is that so?-- Yes.

And the view that you expressed to Mr Morrison that it could possibly be a graph representing the norm was on that basis, that is, that the person looking at the graph was unaware of any report of a slight tarry smell?-- That's correct.

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Now, still looking at that point in time, 17 June, if in fact a person was aware that not only had there been a report of a slight tarry smell on that occasion, or at that time, but was aware also that there had been some investigation carried out of, in effect, a recirculation in the No 2 heading, which was one of the intake headings, under these circumstances - and I will describe them to you - at 7 cross-cut where mining was being carried out it was found that proceeding inbye on No 2 heading and down the ramp into the goaf area that there was a change in atmosphere as one proceeded down the ramp, that is, a change from a higher layer of air that was moving outward in that intake panel and carrying with it, or at least a layer which felt warmer than the layer of air beneath it, first of all, and that a slight tarry smell was able to be detected in that higher layer of air, but that as one proceeded down the ramp one moved out of that higher layer and then into a layer of air below it which was proceeding inbye down No 2 heading. Now, would that set of circumstances be a feature which would also bear on the opinion that a person could reasonably form as to the CO make or the significance of the CO make in the panel as represented on that graph, 219?-- I would have to agree that was possible.

And what features about that situation would you think would carry some significance?-- The warmer air near the roof would indicate it may be coming from a combustion source. If it did have a tarry smell, as I say, that could be significant.

Putting aside whether or not it had a slight tarry smell to it, the mere fact that there was a warmer layer recirculating outbye in the intake panel going, in effect, in an opposite direction to the lower layer of air, would that by itself also be a matter of concern?-- It appears that a natural ventilation had occurred with warmer air rising up the dip and cooler air coming down. That usually occurs when you have warmer air at the bottom, sure.

Well, would that by itself - putting aside any question of it carrying a slight tarry smell with it - would that situation still be a matter that would have some bearing on how you might interpret the CO make?-- Yes, it could. It should be taken into consideration.

Now, the views that you expressed about the position looking at that graph on 17 June and 24 June - you expressed, as I recall your evidence, it as being a - or expressed in this way: that is, that the graph could possibly represent the norm, could possibly represent the norm at that time, having regard to the method of mining and the amount of coal and the rate of production of coal?-- Yes.

Now, that's against the background that you have said: that simply looking at that graph represented in 219, you would be concerned about the apparent rate of increase of CO production in the panel?-- Yes.

Now, when you say that it could possibly indicate a norm

taking into account the additional information, are you saying that you would look at the graph bearing in mind that additional information and simply form the view that it could possibly be establishing a norm and leave it at that or would you, in the circumstances, because of the rate of increase in production of CO make, and even taking into account these other factors of rate of production of coal and loose coal left in the panel, would you still consider that it's a situation that needed some investigation, casting your mind back to the 17th and the 24th, or at least applying yourself to that position as represented on the 17th and the 24th?-- The CO make certainly does appear to track the mining, but as I said really from the word go, the amount of CO being made would be of concern still. I'd feel inclined to investigate it, to be concerned about it. It still does - if it is a norm, it does appear to be quite a high one.

Now, what sort of investigation would you consider appropriate?-- Possibly looking at other indicators to see if anything meaningful could be gleaned from them.

Such as?-- Other ratios, Graham's Ratio, other temperature indicators, maybe some bag samples for chromatographic analysis for higher hydrocarbons or hydrogen, maybe an examination of the area with an infra-red viewer, that type of thing.

Those steps that you suggest, examination of the area with an infra-red viewer, is that an unusual step to take where one is wanting to ascertain whether there is some suspicious explanation, as it were, for an increased CO make?-- Yes, we actually have three of them in New South Wales in the Mines Rescue organisation that quite often go out to collieries that are having a - experiencing an increase in background CO, and suspect areas are examined and -----

Is it difficult to carry out that step?-- No, it's not. The particular Probeye I refer to can pick up temperature changes down to .1 of a degree, and you can use it from a transport to survey an area.

How do you mean "from a transport"?-- As distinct from walking and doing it slowly, being driven.

Now, assuming that there was a Probeye available to the staff at Moura No 2, would you expect that that would be the kind of step that would be carried out in light of a graph like that, even taking into account these features of increased production of coal, etc?-- Well, I'm sure that would have been an option that people could have considered if there was a concern that the make was a little bit higher than it should have been or if anyone was not comfortable. There are other checks you can carry out and I would have been inclined to think about that.

Now, you mentioned the Probeye. You mentioned also taking a bag sample and putting it through the gas chromatograph. Is there any difficulty attached to taking that step?-- Well, certainly by putting it through the chromatograph, I would

like to perhaps send it away for - maybe not so much a bag sample but a more permanent container and send it away for a full analysis.

And you would see no difficulty in a sample being taken either through the Unor system or a sample being taken on the spot with a view to it being put through a gas chromatograph?-- The Unor system doesn't give you other indicators.

No, I appreciate that, but when I say taking a sample through the Unor system, either taking a sample out of the Unor samples that are being produced from the particular monitor point or even taking a sample on the spot, a bag sample or some other permanent - more permanent container for analysis through a gas chromatograph either at the mine or somewhere else?-- Yes, or taking them manually at strategic locations in an attempt to see if the CO is general throughout the panel or high in certain areas.

I think you mentioned earlier in your evidence that one of the significant things would be the possible difference in CO levels and perhaps even levels of other gas contents from different positions around the panel?-- Yes, that's correct.

Such a difference being indicative that there is more CO being produced from one area perhaps than might be - or significantly more CO being produced from one area in the panel as opposed to some general production or more general production of CO throughout the panel?-- Yes, that's correct.

Now, I know you have made the point that low levels of CO can be more difficult to detect on the gas chromatograph, but the level of other hydrocarbons is quite significant, I gather from what you say and what we have heard otherwise, quite significant in determining whether in fact a heating exists in a panel; is that right?-- Again, provided there was some previous knowledge of when those hydrocarbons would appear in the ventilation circuit.

When you say "when they would appear in the ventilation circuit", you mean whether there has been some background established?-- Yes, that's right.

Again the level of those other hydrocarbons at different points throughout the panel may well have some significance in determining whether there is a heating or whether it's just a general production of the other hydrocarbons?-- Yes, the appearance of other hydrocarbons would be another indicator. It depends on whether you are establishing a heating is advanced or you are trying to locate it to a certain area.

But the presence of those other hydrocarbons is still a valuable tool, is it not, in establishing whether or not a heating exists?-- In many cases that's a prime indicator in many countries.

I want to come back in time to what you have said about the correlation between CO make and rate of production, but just for the moment can I ask if you could look at Exhibit 158, please? It is the elusive graph that I couldn't readily identify yesterday afternoon. You will remember this one, Mr Mackenzie-Wood. Have a look at the second page of that document, if you would. Now, just before I ask you specifically about that graph, you did make answer to some questions from Mr Morrison about the appearance of the graph in 219, which you still have in front of you there, as possibly indicating that there was some new norm being established through to about the 15th or thereabouts of July, and then appearing to level out. Do you see that?-- Yes, that's correct.

Well, with that in mind, I would like you to look at that graph in 158, and before I ask you a question about it, I will explain something to you that won't be readily apparent from the graph. The more closely plotted section of the graph from 23 July through to 6 August is described on the legend as being, "CO Make, All Data", and that, in fact, represents points that are plotted using, for the most part, velocities reported by deputies on each shift during that period of time and combining that with a CO make average - sorry, not a CO make, a CO in parts per million average over each of those shifts taken from the Unor. So, it is an average of the Unor readings for each shift - that being combined with the deputy's measurement of velocity and those points then being plotted. You see, that's the dark blue ones-----?-- Yes.

-----that appear as a continuation of the graph of 23 July through to 6 August?-- Yes.

Continuation of the blue graph - 23 July to 6 August. Now, before I go on, you will see that that - at least in broad terms - is represented also by the following graph, which is done in more detail and actually makes reference to each of the shift reports by number. Now, come back to that second page, figure 1. If we were to look at - perhaps I should tell you this also: that the second or third last point that's plotted on that graph which shows a point at 20.28 lpm - in fact, that's the one just above the 20?-- Yes.

That was calculated for the night shift on the 6th of August, being then in the very early hours of the 7th of August?-- Mmm.

The next point, which is plotted at 17.62, is the day shift on the 6th of August, which was the shift immediately before sealing commenced. Now, for the purpose of this exercise, I'd ask you then to ignore the following reading, which is up at 25, and plotted for the afternoon shift, because by that time sealing had commenced, you see, and perhaps the CO in parts per million might well have been affected, thus affecting the CO make?-- Yes.

I would also ask you to ignore the night shift one, simply because it is a reading which appears to be well out of the - at least for these purposes, out of the more general run

through to the day shift reading; do you understand what I mean?-- Yes, I do.

Now, if you were to, in effect, be doing a linear regression over that blue graph, ignoring the two points I've mentioned, it is the case, is it not, that what you get is that green line, which represents the linear regression up to the 15th of July - see the green - pale green line that runs up to 15 July?-- Yes.

That would, in effect, continue to a point somewhere near the day shift reading for 6 August; is that so?-- Right, yes.

And somebody who was to look at the graph at that time - the day shift of 6 August - but against the background of all that information in the deputies' reports being plotted, as it were, into the graph, they would really be looking at a graph that just continued on its upward trend right through to that time from 30 April through to 6 August?-- Yes, that's what it shows. Did I hear you - these - the ventilation and the readings weren't taken simultaneously; they were taken from the records?

The ventilation readings were taken simultaneously with Drager readings?-- Yes.

And I think, to put you in the picture, if the Drager readings were calculated with the ventilation readings that were taken at the time, you would, in fact, end up with some higher points on the Saturday. In fact, if the witness could see Exhibit 21, Your Worship, just so that it is clear that I'm not relying on data that might be said to be in some way over estimating the CO makes. If you can look at the first page of 21, you will see that, in fact, the first line there represents - I'll take you to the third line, in fact. The third line in that table represents the night shift for 6 August, and if that were to be calculated using the velocity and the Drager reading, taken simultaneously by the deputy, you will see that that, in fact, would calculate through to a litres per minute make of 18.94; do you see that?-- Yes, I do.

Whereas on the graph, using the Unor shift average, that's been plotted as 17.62 - sorry, the night shift one has been plotted as 20.28, and I think I've suggested that you ignore that one for the purposes of what I was asking you before?-- Yes.

And the next one, the day shift reading for 6 August, you will see that that calculates through to - using again the velocity and the CO in parts per million, which was estimated at 9 to 10, and the figure of 10 was taken - that calculates through to 21.04, but, in fact, that's the one that's represented on the graph using the Unor shift average as 17.62?-- Yes.

You will see, if anything - doing it the way in which it is done - it produces a lower overall level than using the actual simultaneous measurements of velocity and parts per million measured on the Drager. Now, I think I was asking you

whether, in fact, somebody looking at it - at the day shift - but using the information available from the shift by shift readings over that period of time - would see, in effect, an increase that continues from 30 April and, in reality, continues on its upward trend to a point approximating that day shift reading?-- Yes, the graph does show that.

So that, in fact, there wouldn't be that presentation of what's been described as a levelling off around the 15th of July that's showing in Exhibit 219?-- That's right, yes.

Now, I want to ask you some questions briefly about the document that you looked at before, Exhibit 245, which is the weekly tonnes in 512 panel calculated on to a graph. Keep 219 in front of you. You were asked to compare those two graphs, and I think what was put to you was that the - is that the CO make, in effect, tracks the rate of production - the weekly tonnage - that's the rate of production of coal in the panel?-- Yes, there is a general match.

I just want to take you to one particular date, though, and that's - or period. That's the period from 4 June to 11 June?-- Yes.

Or even 5 June to the 11th of June, which might be a bit easier to look at. It says the 5th of the 12th on the weekly tonnes, but perhaps the 4th of the 11th on the CO make graph, and, in effect, what you find there, if you are simply to look at the information in each of the respective graphs, is that over the period - over that period on the CO make graph, you get quite a significant rise; is that so?-- Yes.

But, in fact, on the weekly tonnage graph, you get very little rise?-- Yes, in that portion of the graph the tracking is not - it doesn't match.

And, of course, if one is to talk about this tracking process as being significant in somehow trying to explain what appears to be a fairly steep rate of increase in CO make, then it is also necessary to have regard to the fact that there might well be a period when there was a significant increase in CO make that's not in some way reflected by the increase in tonnage; is that so?-- That's so; in that period, yes.

In this connection, is it the case - I don't know that this is clear to me, at least, from your evidence - is it the case that if there is this increase in CO make resulting from increased production and if, at the same time, there is a heating occurring in the panel, perhaps in the early stages, or even, you know, moving on from early stages, is it the case that one is superimposed on the other; that is, that you may have a certain level of CO make that results from the heating, and that superimposed on that is the additional CO make that comes in a more general way from the production of coal?-- That's a possibility, yes.

So that this tracking, which has been referred to - that is, the CO make tracking production - may well still occur, but occurs against the background that there is - there is, there,

in the background, an increase in CO make resulting from the heating?-- I would agree with that, yes.

So that if you got an increase in CO make resulting from the heating, then the fact that there is a decrease in CO make when there is a decrease in production doesn't really give you any comfort; is that so?-- It would lead to - maybe even disguising the presence of the heating.

Yes. If you had, in some way, ignored some earlier inexplicable increase in CO make?-- Yes.

The downwards tracking - when you decline in production, you say may well disguise it - may well disguise the possibility of a heating in the panel?-- Yes, that's possible.

But, nevertheless, the mere fact that there is a downward track in the CO make when there is a downward trend in production by itself wouldn't be any reason to draw comfort in terms of whether or not there is a heating in the panel?-- No, perhaps not.

Okay. Just one brief question on a point that you touched on when I was asking you questions, and, again, when Mr Morrison was asking you questions - and I'm not sure that I again, at least, understand it. You mentioned that you - one of the factors that you took into account in trying to determine what might be regarded as appropriate limits of - for CO make - or appropriate parameters for CO make in looking at the Australian situation, or even the Bowen Basin situation as opposed to the German situation, was that, as you understood it, or at least in your opinion, the Bowen Basin coals give off more CO than German coals, and, as I understood your evidence, you said that that led you to - when you were fixing parameters - suggesting parameters for CO make, it caused you to fix lower ones in respect of Bowen Basin coals?-- Not so much myself. That became apparent, I think, from the research work that was done at SIMTARS through David Cliff and Terry O'Beirne. I think they found lower levels and it appeared in the classic literature, including Morris' Ratio, and Graham's Ratio - they found a higher level - and this seemed to lead to the perception that Bowen Basin coals seemed to produce more CO, all things being equal, than the coal that was used in the classic research.

Now, if Bowen Basin coals produced more CO than, say, the German coals, did I understand you to say that that led you to therefore suggest that those limits of 10 and 20 that had been suggested for the German coals, as you understood it - that those limits were a bit higher and that you should fix lower limits for Australian coal? I'm just trying to work out what effect that has on the fixing of-----?-- Yes, it really wasn't a matter of redefining limits. It was some evidence that came out by applying that formula and that procedure to an incident at Cook Colliery where lower levels in that particular instance seemed to be appropriate. Even in 1992 during the Fault Tree Analysis, those levels were discussed and put aside where the recommendation was that trending would be a more appropriate way of monitoring a heating.

Yes?-- And not use the defined limits.

The point I'm asking you about in this connection is really a very narrow one. Did I understand that what you said is that if you were looking to fix some limits, that the fact that the Bowen Basin coal produced more CO would cause you then to fix lower limits, or would you it cause you to fix higher limits?-- At the time it was to redefine lower limits, but when the technique was taken further with all parties in 1992, as I said, it was decided that limits weren't appropriate for a number of reasons.

Yes, I appreciate that. Okay, I must say the reason I was asking the question was that I thought that if coals naturally produced more CO, then you may well expect that here limits would be-----?-- I see.

You see, it is a narrow point I'm trying to clear up in my own mind?-- I see what you mean, yes. That's confusing, yes.

Am I right in saying that?-- You are right, yes.

Because there would be more natural production of carbon monoxide, you would expect that higher limits could be tolerated?-- That's correct, you could have higher limits, yes.

Okay. Finally, I want to ask you about the events at the SIMTARS seminar in 1989, and in that connection I'll ask you to have a look at this Volume 3 of the manuals that were used on that occasion. Volume 3 is referred to as the seminar "Day Book", so it would seem to represent not the pre-reading area, but rather more the area that was used at the seminar - that's the area of the material which was used at the seminar from day-to-day; is that right?-- The background information, yes.

I have opened that at a section which it appears you were responsible for. I have copies available for the panel, Your Worship. It's a section described with the following title, "Spontaneous Combustion - certain technical aspects ". The seminar was in September 1989, I think we have been told; is that so?-- I believe so, yes.

Now, at the time of that seminar you express certain views in respect of this interpretation of gas analysis; is that right? It appears at page 15 of that section?-- Yes, that's right.

You referred in 2.1 to the carbon monoxide analysis and you spoke about the background and if it rises above the background investigation should commence, and then in 2.2 you went on to deal with the carbon monoxide make?-- That's correct.

You referred to that as being a useful indicator to identify a heating and to monitor its progress, and in the second paragraph in 2.2 you said, "Experience in Germany has shown that carbon monoxide makes of more than 10 lpm require investigation and more than 20 lpm indicates that a heating is well developed and that urgent action must be taken."?-- Yes.

You go on to say, "These figures have held up both in New South Wales and Queensland when applied to previous heatings." Now, you had that prior to actually going to the seminar on that occasion, I take it you produced this paper for the purposes of the seminar?-- Yes, that's right.

So prior to going to the seminar you had formed the view that the figures had held up both in New South Wales and in Queensland at that time?-- Yes, again in that ballpark area was the intent of that wording.

As far as you are aware the material that was presented at the seminar wasn't disputed in the course of the day-to-day proceedings of the seminar; is that so?-- No, it wasn't.

In this text at least?-- No.

And as far as you know this information was disseminated to the industry?-- That's correct. That was the idea, yes.

Without it being undermined in any way?-- That's correct.

Just briefly, over the page you also go on to deal with Graham's Ratio?-- Yes.

And you indicate in respect of that that that ratio has been generally accepted since the early 1920s as a scale for the presence of a heating or a fire?-- Yes.

In other words, to determine whether or not a heating exists in a panel?-- Yes.

I tender that volume, Your Worship. It can join its brother Volume 1 and perhaps I will just place inside that a photocopy of the relevant pages so that if members of the panel need to

extract the relevant pages they can do so without taking the whole volume.

WARDEN: Exhibit 247.

ADMITTED AND MARKED "EXHIBIT 247"

MR CLAIR: You've been asked quite a number of questions about whether what appears on that graph 219 can simply be explained by way of reference to the method of mining and the loose coal being left in the panel and you've been asked quite a number of questions about what your view is now about the use of these parameters in respect of CO make, and also what might be apparent from the various indicators that have been referred to you in the graphs that have been placed before you. But in fact we have, of course, the benefit at this stage, this point where we are conducting an Inquiry, of being able to look back on what happened. I think you said in your evidence that you are going to be publishing another edition of your book in due course?-- That was a perhaps or an if.

And no doubt in the context of that you will need to address questions as to what the significance of certain levels of CO make might be, what factors might be looked at in order to determine the appropriate background against which to read absolute values of CO make. All of those things you would have to take into account?-- Yes, I think this Inquiry is really the first time that this technique has really been put under the microscope and certainly some thinking may need to be modified.

Of course if there were in fact a finding that the explosion which occurred approximately 24 hours - or not quite 24 hours after the sealing of 512 Panel on 7 August last year occurred as a result of a spontaneous combustion in the 512 Panel, or even if that was advanced as the most probable cause, that's no doubt a piece of information that would be - would add to your general sum of knowledge in determining what kinds of thing you might be saying about matters that should be taken into account in the future?-- Indeed.

Is that so? You are probably in a position where you can answer this as well as any witness that's been here: the information that may come out of this Inquiry is information that will add to the sum of knowledge not just for Queensland, not just for Australia, but on a world-wide basis; is that so?-- I would like to think that that would be the case, yes.

For instance, Mr Kock and his co-writer would no doubt have regard to the information that's available from this particular incident, from the findings in respect of the incident when they are looking at the significance of CO make in mines in Germany; would that be likely do you think?-- Yes, I would say they would be very interested in the way that this Inquiry has reworked this technique.

RXN: MR CLAIR

WIT: MACKENZIE-WOOD P

And the sorts of expressions of opinion that have been referred to you from their writings today might well be expressions of opinion that could well be modified in light of the particular experience in respect of this mine?-- Yes, that's possible.

So while on the one hand it might be said that the graph in 219 could have some basis of explanation in terms of the rate of production of coal and the mining method, that kind of suggestion would have to be viewed against the background that in fact within 24 hours of the panel being sealed there was an explosion; is that so?-- Yes, yes, that's correct.

And that that explosion could very well have been caused by a heating in the panel?-- A possibility, yes.

And in those circumstances then the question arises as to whether a heating which could so quickly after sealing provide an ignition source for the explosion on 7 August, whether a heating of that kind could develop rapidly within the panel or whether it necessarily was one that was there for some considerable time?-- Yes, historically it seems to have happened very quickly compared to history, but -yes.

When you say "historically" you mean to say that the explosion occurred within a short time after the sealing?-- Yes, it would appear.

Would you expect that a heating in the panel such as 512 could develop rapidly over a period of a matter of days or would you expect that if there was a heating it had to be there for some considerable period of time?-- I would have thought it would need to have been there for some time, and I think we established if it was deep seated they are very hard to detect.

I have no further questions, Your Worship. Thank you, Mr Mackenzie-Wood.

WARDEN: Thank you, gentlemen. I think we will take the lunch adjournment for one hour only, please. Can we resume at two o'clock? We intend to finish at three o'clock today. I did want to indicate that I would like to have this witness concluded today rather than bring him back on Monday. The panel have some questions for him. Thank you, witness. You may stand down.

THE COURT ADJOURNED AT 12.51 P.M. UNTIL 2 P.M.

THE COURT RESUMED AT 2 P.M.

PAUL MACKENZIE-WOOD, CONTINUING:

WARDEN: Yes, thank you, Mr Parkin.

EXAMINATION:

MR PARKIN: Mr Mackenzie-Wood, just a few questions. During your discussions with Dave Kerr with the information available, what would your actions have been had you been made aware of a benzene-type smell or a slight tarry smell?-- I think at the time I would have given him the advice of going the next step to put in place something to monitor perhaps the progress of the heating. I may have decided then or advised him that there quite possibly was a heating if it was accompanied by that tarry smell and perhaps a monitoring strategy should be considered to monitor the progress.

It certainly would have caused you some concern?-- It would have put it in a different light at that time, yes.

Just regarding litres per minute, on 5 August the CO make of 19 lpm had been recorded. Would that level give you some concern?-- Yes, it would have, it would have, yes.

Again, what would you do, or what would you initiate with a reading like that?-- Possibly more testing certainly to confirm it and certainly to put that reading in a trend. I think we have a principle you look at the trends, not individual results, and in the light of the earlier triggers that we were looking at, 19 would have seemed quite high.

You remember yesterday Mr MacSporran cross-examined you in some detail with regards to aspects of smells and hazes that had been reported; you remember that?-- Yes, I do.

He also mentioned the 19 lpm that was in the mine record book. I guess what I would like to do is to spend a bit of time on the situation after sealing. Now, we have heard - it's been discussed in some detail this morning certainly, but if you have got a CO in parts per million increasing from - and let's use approximate figures here rather than being too precise - but let's say from 12 ppm to 150 ppm in something less than 22 hours, would that give you some cause for concern?-- Yes, I think I mentioned all along that would give me some concern, and I would need to see if that was above what you would expect. I would try and relate that to something that was normal or acceptable, but, yes, on just the bare face of that increase I would be concerned.

Could the witness be shown this graph, and there is copies for the Bar table. This is just a graph, point 5 on 512 seals, 7/8/94, and on the base of the graph is the time period from just after - from after sealing to the time of the incident, and you see that if you look at the CO plot it starts off just over 12 to something like approaching 150 in just under 22 hours. Now, I think early in your evidence you did indicate that when a panel is sealed, the CO level will increase, and I don't think anybody would argue with that. I think here we are talking about a very rapid increase in a very short period of time, and I am asking you what's your views on that?-- Again, as I said, that would be of some concern and I would need to investigate it further to see if it was an abnormal reading compared to maybe other panels. I know panels can vary, but you would need a reference point.

How would you do that?-- Well, possibly historically, the previous panel that was dealt with.

Well - sorry, I didn't mean to cut you off?-- I said comparing it to the previous panel or previous panels that had been extracted and sealed.

Well, I understand that it was many times higher than, say, 401/402 panel, certainly the rate of the build-up after sealing?-- And I think, as was mentioned, it came to light that the rapidity of the extraction was faster in the 512 which would lend some reason to the increase.

Let me ask you another question then and it's related to the same subject and it's one that's very important to us, and that's - could the witness be shown Exhibit 223, please? This is a plot of the Graham's Ratio over the same time period, and if you take the bottom graph, take the best case scenario, then you can see that at 22 hours after the explosion - I beg your pardon, 22 hours after the sealing that the Graham's Ratio is in excess - well in excess of .7 and it's risen from just under .2 at the time of sealing. Now, in combination - we will forget the CH₄ because we do know that the CH₄ has risen from approximately just under 1 per cent to nearly 5 per cent in the same period of time and one would expect that to be the case, but I am interested in your comments regarding the rapid build-up of CO and indeed the reflection of the Graham's Ratio?-- Yes, as I mentioned before, I'm a little uncomfortable with Graham's Ratio in a sealed area. I think the classical work was done in the ventilation circuit, air going into a suspected area compared to air coming out, but researchers and workers have had meaningful results with Graham's Ratio in a sealed area. All I'm in possession of is the classical, you know, less than .4 - .5 to 1 a heating, 2 to 10 a fire, and that certainly would give me concern rising up to 1. It would fit into that presence of a heating and along that classical ladder that came from British coal.

What would you do about that? Would you take - in terms of monitoring?-- Yes, I suppose there would be - certainly increase the frequency, maybe do more detailed monitoring, other points, continuous monitoring. Certainly that type of investigation, more detailed analysis.

Would you advocate the use of a gas chromatograph after sealing in order to determine what's going on behind those seals?-- Yes, I would. I've mentioned before the appearance of other indicators may be significant particularly if there is existing data on this seam, and I believe there is based on laboratory experiments at SIMTARS.

Okay. So, I guess when we look at the fact of the CO, the rapid build-up and indeed the Graham's Ratio, would those two indicators give you some real cause for concern?-- Yes, I think Graham's would lend some weight to the concern, and it certainly would to me. It would be another indication.

Thank you.

EXAMINATION:

MR NEILSON: Mr Mackenzie-Wood, can I take you to Exhibit 247 which is your paper to the SIMTARS seminar? On the first page - actually it's page 15 marked in the - it's the first one flagged?-- Yes.

Where you refer to in 2.1 carbon monoxide analysis. You say there that heatings can be detected by an increase in the concentration level of carbon monoxide above the normal background peculiar to that particular colliery or panel. Now, you have had quite a lot of questioning this morning by both Mr Clair and Mr Morrison in respect to the possibility of CO make tracking production levels?-- Yes.

To the effect that as production rates do rise, then you could expect a rise in the CO make?-- Yes.

The question I would like to take you to is how and when in a panel would you establish the background in terms of CO make, in your view, or in your experience?-- Yes, I think for many, many years norms have been established for CO really all round the world in coal mining, that decision-makers are aware of normal background levels during mining, during non-mining periods, and these are established for panels and main returns, and an increase above that norm, so it's something that's established over a period of time. As I mentioned, if something dramatically changes, you would redefine your norm. Your norm may even be on a pattern of varying on a day-to-day basis, but you become aware, so I believe, of a normal background, and it's a trend away from this that would raise your concern.

Okay. Well, if we go to the 512 Panel at Moura No 2 Mine where people were aware that there was going to be a change in the normal method of mining, that it would result in a number of variances from the normal procedure, one of which being that it could be reasonably expected that there would be more coal exposed and left?-- Yes.

So, more surface area. The question I want to ask is: in terms of 512, accepting that it may vary from the norm of other panels in that mine, when and how would you establish the norm for 512 Panel? Would it be during development or at a certain stage back during extraction?-- Yes, in the light of today's proceedings it's obviously not as simple as the classical theory suggests. Pillar extraction certainly seems to give you an almost constantly changing norm, and I find that very difficult to answer in the light of I haven't a great deal of experience or seen this type of evidence in the past to give me a basis.

Well, that's the very reason that I am asking you this question?-- Yes.

Because if you take - if I can just take you back to some of the questions put to you by Mr Morrison in respect to Exhibit 245, which is an attempt to show the carbon monoxide make tracking the trends in production as well?-- Yes.

It would assume - or it could be assumed that you have an ever changing norm?-- Yes, that's right. That's - I would agree with that. That is a confusing part of it, and whether that ever changing norm actually would disguise an emerging heating or a developing heating, it's - I find that difficult to pigeonhole.

Do you think that after this discussion we are having now that maybe there should be no real reliance upon putting values on carbon monoxide make probably at all and maybe just relying on trends themselves?-- Do you mean on the actual litres per minute, the actual value?

Let's go to the German experience, the 10 and 20, for example. I mean, we already know that at one colliery in Queensland they have developed their own parameters, as I understand it, 7 and 15?-- Yes.

But isn't that then still under question if we assume now that we may be learning something different: depending on the method of mining that the 7 and 15 might go out the window tomorrow if they do something different?-- Yes, that's right. I think we established in 1992 at that workshop at SIMTARS that the actual values were best put aside and trending was suggested in that Logic Tree analysis for that reason. In the light of - or in the absence of other indicators we have established, you couldn't really tell between a small, intense or a large or extensive oxidation. So, trending was considered to be the best method, but to get value from your trending you would need to know your norm, and this is the difficulty because that trend would then have to go above the norm, otherwise there is no value in the results.

But now we have difficulty in establishing a norm?-- Yes.

Can I take you to Exhibit 158, please? Do you still have that?-- What was that?

That's the big multi-coloured graph?-- Yes, I have it.

Before I refer you to that, when we talk about trending and looking at trending to try and ascertain whether or not we may have some instance of spontaneous combustion, exactly what is it you believe trending - I mean, what would you look for in a trend?-- An upward trend away from the normal trend, the normally expected trend, or the trend that had been established as a normal and something that was trending upwards and away from that.

Well, we have -----?-- I think -----

Sorry, go on?-- The idea of trending - you can look at a page of figures and nothing really leaps out at you or catches your eye, but it's when you trend that change becomes apparent, and I think the use of the term "trend" was to get people that are responsible for this thinking of trending and the graphical programs that are available, so you don't look at the figures, you look at the trends.

Well, we have heard quite a deal of evidence before this Inquiry - and I appreciate that you weren't here to hear it - but there seems to be some belief at least from some people that when looking at trends in terms of spontaneous combustion, that it's quite acceptable to have an ever increasing trend, but what you really need to look for is an exponential rise. Do you subscribe to that theory?-- I certainly have heard that. I have nothing to support it as far as its validity goes.

Do you know if it is contained in any literature anywhere?-- I can't nominate any source at this point.

Have you ever known it to be part of any teachings, for example, in Mines Rescue?-- No, no, I haven't. It hasn't been part of the curriculum.

Okay. So, what you are saying - and I ask you - is that what you would look for is just an ever-increasing trend somewhere away from what you would expect to be the normal circumstances?-- Yes, that's the opinion that I've come to on reading papers and seeing past case histories.

Okay. Can I take you, then, to that graph I referred to, Exhibit 158? It is the 512 CO make from the 27th of the 4th, '94 to 20:30 on 6th of the 8th, '94; do you see that?-- Yes, I do.

If you look at the "CO Make, All Data" marked in the dark blue line?-- Yes.

You see there that that represents an ever-increasing trend - it does have some flattening out and some hollows - I'll admit that - but-----?-- I'm just wondering if I'm on the right page. That's the-----

No, you have got the wrong one. It's that one there. Show me that. That's it. We could have got all sorts of answers out of that one?-- That's right. In the "CO Make, All Data"-----

Yes, the dark blue, yes?-- Yes, that's a - looks like a linear increasing trend, or a trend that's increasing linearly.

Okay. The question I want to ask you, and it is most probably a difficult one, given what we have been talking about, but if you had established a norm for that panel, and - I don't know, let's just say the norm may have been on the beginning of extraction, say, 3 or 4 ppm, which related to, you know, maybe 5 or 6 lpm, whatever it may have been?-- Yes.

And you were satisfied that that was about the norm, what then would that trend tell you?-- This trend would tell me that oxidation is increasing in the area being sampled, for some reason, and in my opinion would require further investigation.

So, can we now put into that equation the fact that we may be concerned that increased production may also have some effect on that trend?-- Yes, that's right. If that was the case, you would have to try and balance the two, somehow - try and get some handle on what increase you would expect to be produced by an increase in production based on historical figures or experience to see whether there was a match.

You realise I'm sort of asking this question so we may have some feel for where we go in the future. Do you agree there probably does need to be a lot of work done in this area to try and bear some relationship between what you would expect a CO make to be from oxidation as opposed to what the CO make

would be from any increases you may find in production levels?-- In the light of today, yes, very much so. I think that's a very important step.

Thanks, Mr Mackenzie-Wood.

EXAMINATION:

WARDEN: Thank you, witness. Those documents I gave you to read just for background - do they have refuge chambers in New South Wales?-- No, they don't. Not at this stage. This particular one is being considered and the rescue service has a person on some committee looking at whether we support this or not, and it has been discussed at management level in rescue whether we see value in this chamber.

I just want to point out to you there has been evidence that some men were down working in that area - 1 North-west - and after the first explosion made it to a phone and passed the message on coming out, and also managed to get into two vehicles and they then proceeded out. Now, if there had been no vehicles and the phones had been taken out, somebody on the surface might realise that they are somewhere between there and there - where they were working and where they can come out at the portals. If there was a refuse chamber located at a strategic spot along there, you would know where to go and look first and they would know where to go to get some help first?-- Yes.

Otherwise it is a guess where they might be?-- That's right. That's a valid point. But you then have to still deal with the fact that rescue teams would then be expected to go in to go to that point.

I appreciate that. I appreciate that. In this particular case, if it hadn't been for the vehicles, there may well have been problems down there for them further outbye. I'm talking about getting to a point of safety and extracting them from the point of safety?-- Yes, that's a strong argument for this type of device.

They are not generally used in metalliferous mines in Queensland; do you know that?-- They are not, or they are?

They are not?-- No, I didn't know that.

Thank you. That's all I have.

EXAMINATION:

PROF ROXBOROUGH: Mr Mackenzie-Wood, I hope I'm not going to disappoint you because I'm not going to ask you to do any detective work on 512. Rather, listening to your evidence, I think I am getting a somewhat different slant on things to what I had before. Do I understand you correctly, all else being equal, that a continuous steady increase in CO make is indicative of increasing activity in the goaf - all else being equal; in other words, I'm asking you to take out such perturbations that have been suggested to you, like different rates of production, different methods of working?-- I think-----

Not necessarily even, but things are developing?-- Yes, I think you would expect an increase in CO in a - we are talking about the sealed area, sorry-----

No, no, talking about in the operating panel, and I said "continuous"?-- To me - the impression that I gained before I came here was that a continuous increase in CO make would be indicative of oxidation of coal.

I suppose-----?-- Increasing.

Sorry, I suppose where I'm coming from, I guess common sense would tell us that a linear increase or a steady increase can't go on forever?-- Yes, that's right.

And it can't progress indefinitely. Something is going to happen, and it will eventually reach a stage, presumably, where we have a fire?-- Yes, that's - I agree with that.

And I think what you said to Mr Neilson, if I understood you correctly, you don't necessarily have to have an exponential rise in CO make or parts per million immediately preceding a fire; is that true?-- I certainly haven't been aware of that in any published papers.

You are not aware of it being a pre-requisite or being an-----?-- No, I have heard - I'm even trying to think of the source. I have heard that somewhere along the line.

Sorry, I'm not - you have heard?-- I have heard that theory.

That an exponential increase is a feature that precedes an actual fire?-- Yes, someone has mentioned that to me at some stage.

That's something you couldn't clarify?-- That's right.

Okay. Are you suggesting that we could possibly have a fire without an exponential increase?-- That was my understanding. I have to qualify that by saying that may or may not be the case.

So, we have an air of uncertainty there?-- Yes.

You have also suggested that what we might describe as an inactive panel, it is a working panel, but I'm talking about non-active in terms of there being a heating in progression. Would the CO make, after some time, reach a plateau value?-- That's my understanding - that-----

Of a more or less constant CO make?-- Yes, that's right, and my understanding is that in the past that's been taken as the norm and the alarm has been set some point just above that for periods where men haven't been underground.

And I think that implies - and I think we have heard something similar in earlier evidence - that the coal that is left in the goaf is reacting for a limited period of time; is that correct? In other words, I think it has been suggested that the products of oxidation can coke the coal and inhibit further oxidation?-- Yes, I have heard that. I have heard that they can actually be absorbed to the surface of the coal and be released later if the conditions are right.

If it were not the case, then we would get a continuous increase as background, wouldn't we?-- Yes, you would expect that, yes.

If that is the case, it is implying you have a region of coal immediately behind the working area, which is active, which is producing carbon monoxide and moving forward, or retreating with the retreat of the panel?-- Yes.

And, for example, in panel 512, or a panel like it, towards the back of the panel you might reach a stage where there is no carbon monoxide being produced. It would have to happen, otherwise you would continue to get an increase?-- That's right, yes.

So, is it therefore a possibility that you should be able to detect a norm by sampling down a return to find a position where there is no, or very low carbon monoxide produced and track the development of carbon monoxide as the face is retreating?-- Yes, that - that would be an option.

You understand what I'm saying?-- I think so.

Now, you have said - and we have had some discussion on the CO make figures, 10, 20, 7, 15, whatever they may be, and I think you suggested previously that these values could and probably would vary according to the type of coal. I think you obviously said that coals in Queensland - Bowen Basin particularly - produce more CO than some other coals for the same state of heating?-- Yes.

Is the CO make not affected by the size of the goaf? I mean, intuitively I would feel that if you have, for example, a 50,000 square metre goaf as distinct from a 10,000 square metre goaf, you get a great deal more carbon monoxide make within the larger goaf than the smaller one - I hesitate to say five times, but substantially more?-- That is the case.

That is the case, is it?-- I believe so.

So, CO make - if you have the same ventilation quantity for two large goafs, CO make could have very different values for the same state or the same conditions of heating, or absence of heating in the goaf, you could get two quite distinct levels, different levels of carbon monoxide?-- Yes, I think that's been known for some time as a flaw with using actual figures of make.

Okay, I think we have covered that. Of course, if the ventilation doesn't change, then the carbon monoxide parts per million follows precisely the same sort of trends and moves?-- Yes.

I think, as you said to Mr Morrison, you recognise that seams - coal seams are made of banded constituents and different subsections and a seam can have different propensities to heating?-- Yes.

It might be a substantial part of the seam has little liability, whereas there is one subsection that is very re-active?-- That's the case.

It is often the case?-- I would say yes, often the case.

And I think you have also said that it is possible, perhaps going even a step further than Mr Morrison took you, that there can be spontaneous combustion developing in the goaf without any outward signs; would that be true?-- By "outward signs", physical signs?

By "outward signs", there could be a heating where you have had no smell or no indication from carbon monoxide production, where you have had no haze, where you have had no positive indication at the places where we can - at the places where we can see them. Those things may be happening deep in the goaf, but it could very well be that a heating could be going on without getting any signs of it whatsoever?-- Yes, that's possible.

Following on from a point that you - or the answers that you gave to Mr Neilson, perhaps putting you a bit further behind the 8-ball, what would you say about our state of knowledge with regard to spontaneous combustion and its control in coal mining? I mean, are there any great areas of ignorance at the moment that prevent us from putting effective monitoring systems and controls in place?-- I suppose there has been little research on a large scale done in Australia. Over the years we have tended to borrow research from overseas, and there has been very few Australian authors on any large scale testing of coal, and I think that's led to a paucity of local knowledge.

Is that the emphasis - you are not suggesting that we haven't made our contribution, but that what knowledge that we do need to gain further relates specifically to Australian conditions?-- Yes, that's right.

One final question on a somewhat different point - it may be outside your purview, but I don't think so: in your opinion could water barriers have an effect on the propagation or spread of a methane explosion?-- Would the explosive mixture be up and past the water barriers, or-----

No, I should qualify it by saying depending on the course, and, you know, the course of the ignition and the location of the barriers and the size of the barriers in relation to the point of origin. I mean, is it possible - can water barriers be effective?-- I believe so, yes. They are almost exclusively used in-----

A methane explosion. I'm not talking about coal dust?-- Yes. Yes, to stop the propagation of a methane explosion on the inbye side, if they are strategically placed, yes.

Okay. Thank you. No more questions.

EXAMINATION:

MR ELLICOTT: What was the primary purpose of your tour in 1986 in the company of Mr Allison and Mr Glazbrook and one other so far unnamed person?-- The unnamed person is Ken Enwright who is currently the superintendent of the Hunter Valley Rescue Station. In 1985 the New South Wales Mines Rescue Board spent \$1 million on an inertisation plant which is capable of vaporising liquid nitrogen to gaseous nitrogen, and it's, I suppose, putting the cart before the horse - after the purchase, it was thought that certainly Ken Enwright and myself were chosen to go to another - a number of countries that did use inertisation to treat spontaneous combustion and fires to increase our knowledge, and when the trip became advertised, we got a request if two Queensland mining men could join us, so it was purely a study tour of inertisation.

Was the composition of the party in some way a response to the 1986 explosion at Moura?-- It -----

In other words, did Mr Glazbrook and Mr Allison join you as a result of that experience?-- I believe that may have influenced the choice of those two gentlemen, yes.

We have heard a fair bit of mention of a paper by a Mr Kock and colleague?-- Funkemeyer.

Is Mr Kock a friend or a colleague?-- Excuse me? Mr Funkemeyer has actually replaced Mr Kock as the superintendent of the Mines Rescue station.

So they are both friends of yours?-- Yes, I know them both.

Would you describe that as a fairly key paper in making sense of CO make?-- Yes, I would have to say - I would have to say it would be. The pioneers are from that region of this technique and it was, certainly to me, an enhancement of the understanding of the method, the formula.

Can you describe the broader context of that paper? I understood that it may have been as part of the proceedings of a seminar or symposium?-- Yes, I can't really answer that. I can't even recall how it came into my possession. People pass things on to me or I find things and it just appeared into my large file.

You haven't recalled its year of publication at all?-- Not since this morning, no.

In your opinion how well known would that work be in Australia?-- Yes, I'm not sure. I'm sure it's gone noticed. It's a field that I'm not - I don't work in as a rule. I tend to work in other technologies, but it certainly came into my possession so I presume it's reasonably well circulated, but I can't -----

You don't remember the source at all?-- No, I can't.

Would you suspect that it's fairly well known to the fraternity of gas chemists who are associated with the industry?-- I would think so, yes.

Would you suspect that it would be known to SIMTARS personnel?-- Yes, I would expect it would be.

Do you have Volume 2 of the SIMTARS appendices with you?-- I have, yes.

It's the big thick one.

PROF ROXBOROUGH: One of the big think ones.

MR ELLICOTT: Can you turn to appendix 5.2(A) of that volume, please?-- Yes.

That is a copy of a paper entitled "The Early Detection and

Monitoring of Fires and Heatings in Underground Coal Mines" by Dr Cliff and others; is that correct?-- Yes.

Can you turn to the references section of that paper, please? Can you see mention of that paper by Mr Kock and colleague in those references?-- No, I can't.

Can the witness have Exhibit 28, please? Would you agree that that list of references is fairly exhaustive in terms of these things, the list you just looked at?-- At a quick glance, yes.

We should in some way be indebted to Dr Cliff and his colleagues for the compilation of that?-- Yes, yes.

I believe part of Exhibit 28 is a copy of a SIMTARS magazine dated May/June 1994; do you have that?-- I've got November/December 1993 -----

I think I am about to lose mine. Could you have a look at this document, please? Do you agree that that is a copy of a SIMTARS magazine dated May/June 1994? Feel free to look at the front cover?-- Yes, it is.

That's an article again by Dr Cliff and associates?-- Yes.

And again to do, I think, with the interpretation of gas analyses, results and heatings and fires and making sense of all that?-- Yes.

In broad terms?-- Yes.

Can you turn to the references for that paper, please? Does the paper by Mr Kock and colleague appear in that list?-- No, it doesn't, no.

To your knowledge has the information contained in that paper by Mr Kock and friend been separately published or otherwise promulgated in Australia apart from the copy that appears in the paper you have?-- I would have thought that it would have been fairly widely distributed seeing I have a copy, but I'm surprised it's not referred to here. In fact I think the reference to CO make has come from the book.

So would you see this as evidence that perhaps it wasn't widely distributed and probably wasn't widely known?-- Well, that certainly - if it hadn't reached the SIMTARS people that may be the case.

Might the original paper have been delivered and published in Germany?-- It could have been. My copy and the copy I saw today was certainly clearly in English, but -----

Given all that what would you say was the likelihood that the contents of that paper were known at a coal mine where the personnel at best had a sketchy knowledge of CO make and its interpretation in terms of 10 and 20 lpm figures, and that the predominant basis of that knowledge was the first volume of your book that you co-authored with Mr Strang? What would you

say that the likelihood is that such a mine would know the contents of that paper by Mr Kock?-- It was very unlikely, I would say.

So you would in turn, I would take it, consider it very unlikely that the mine could then use the content of that to rationalise what was happening at the mine?-- Yes, I would agree with that.

During your phone call from Dave Kerr that we have heard of earlier, did you at any time suggest that perhaps Mr Kerr or in fact Moura No 2 Mine might approach SIMTARS for some comfort in the matters that were being discussed?-- No, I didn't.

We have heard you provided some advice to SIMTARS re, as I understood it, ratios derived from gas analysis information in a period before the first explosion at Moura?-- No, that - I would say that's not correct.

What would you say is correct?-- At some time after the second explosion in October was the time that I -----

Sorry, the ratios I think apply to a period before the first explosion. I'm not saying that that's when you did it, I'm sorry?-- Yes, I certainly have liaised with certainly Dr Cliff and Mr O'Beirne during their research period on Bowen Basin coals with regard to ratios.

I took that to mean that you were providing some assistance in interpretation of conditions thought to be present prior to the first explosion at Moura?-- No, that's not the case.

You were just providing interpretation as to the applicability of ratios?-- Yes, per se.

So that was really the substance of your advice?-- To SIMTARS or to -----

To those people, yes?-- Yes, I would - it was sharing information, yes.

Probably outlining the strengths and weaknesses of the various ratios?-- As I saw them, yes.

Their applicability or otherwise depending on the circumstances?-- Yes, including that.

Do you have any feel for whether your advice was heeded?-- Yes, I suppose I've worked particularly with Dr Cliff on many occasions. He has had a real interest in monitoring and identifying spontaneous combustion using gas analysis and gas interpretation, and I've hit heads with him a number of times on the process and the weaknesses and strengths, and we have often said that there is too few people working in this field, there are too few people you can turn to and ask, "What does this mean?"

So do you think your advice was heeded on this occasion?--

Yes, I think Dr Cliff and I have agreed on nearly all matters

You reached a consensus view?-- Yes, yes.

These ratios, as I understand them, relate very much to the state of combustion of a body of coal?-- Yes.

And interpreting that state?-- Yes.

Did any of your discussion with Dr Cliff relate to the potential effect of there being a second source of combustion and in particular something like a hanging flame in a methane layer?-- No, that wasn't discussed.

What would you think would be the likely effect on those ratios and conclusions arising from them of the presence of such a thing, briefly?-- I'm wondering where I can start. I find that hard to say. Certainly there are ratios that deal with the burning of methane like Trickett's ratio where Trickett's ratio would clearly identify methane being consumed or the carbon hydrogen -----

Would it be fair to say that the situation may be fairly greatly confounded by such a thing?-- Yes, it would confuse it certainly.

We have heard mention of the Probeye, is it your understanding that the Probeye is really a line of sight instrument?-- Yes, it is.

And if you had the light you would be able to see whatever a Probeye could see?-- Yes, it's a -----

In a sense?-- Yes, it's a night vision device.

What level of maintenance does the Probeye require?-- It requires, I suppose, argon cylinders pumped to a fairly high pressure.

Would that be part of the preparation for use of the thing?-- Yes, a high pressure argon bottle will give you four hours of use.

If you didn't happen to have a high pressure argon bottle you probably wouldn't go far with the Probeye, would you?-- No, that's correct.

You are no doubt aware of the significant body of work that was presented at the SIMTARS seminar in 1989?-- The train the officials seminar?

Yes?-- Yes, I was involved in that.

Would you agree that there is very significant and extensive background information contained in those volumes?-- Yes, yes, very much so.

And in particular extensive and relevant background

information related to spon com?-- Yes, it seemed to be the underlying theme of the seminar.

To the best of your knowledge has SIMTARS, or for that matter any other agency sought either published or by other means promulgated the contents of those volumes?-- I haven't seen them in any other form except the copies that I received from that seminar.

We have seen a couple of graphs in one instance relating CO make in 512 Panel versus time?-- Yes.

And in another instance relating tonnage production versus time?-- Yes.

And a comparison made between those?-- Yes.

The implication being that CO make was by some thought to be production dependent?-- Yes, I think we established there was a general tracking agreement.

Would you see it as being of value to perhaps plot CO make versus production?-- In the light of today's happenings I certainly would, yes.

It might be a rather handy tool for mines in the future?-- Absolutely, yes.

And it might help prevent potential obfuscation in trying to interpret two graphs at the same time?-- Yes.

I think we have reached a stage where we are having a revision of our definition of what is normal or what constitutes a norm; would you agree with that?-- Yes, indeed.

Would you agree that the conventional wisdom might have thought a norm to be a constant thing?-- To be honest that was my perception.

Would your perception now have broadened to perhaps include - to perhaps allow the term "norm" to include the concept of a constant increase?-- Yes, certainly something that would involve a general increase, yes.

A constant increase?-- A constant increase if that suits you, yes.

You are not here to please me, Mr Mackenzie-Wood. Thank you very much. That's all.

FURTHER RE-EXAMINATION:

MR CLAIR: Mr Mackenzie-Wood, do you still have there that document that Mr Parkin had delivered to you, that's this one here. It may well have found its way towards the bottom of the pile, but I think I see it there?-- Yes.

Your Worship, I will tender that.

WARDEN: Exhibit 248.

ADMITTED AND MARKED "EXHIBIT 248"

MR CLAIR: I have no further questions.

WARDEN: Thank you. Mr Morrison, something arising out of that?

MR MORRISON: I am very conscious of the time, Your Worship, very conscious of Mr Mackenzie-Wood being kept here too.

FURTHER CROSS-EXAMINATION:

MR MORRISON: Just a couple of things, Mr Mackenzie-Wood. You were asked by Professor Roxborough whether it might be possible to get a norm by sampling down the return of an extraction panel thereby the theory or potential theory being that you might move into those areas in which oxidation had been occurring for some time and may have reached those plateaus that were being discussed?-- Yes, that's right.

One, of course, would have to take into account, particularly in a short panel, the time duration involved, that is to say the length of time that that coal had been exposed?-- Yes, yes.

Particularly considering that the return is almost certain to have been developed or driven on advance and not touched on retreat?-- Yes.

And you would have to take into account a number of features, no doubt, and I'm not saying this can't be done, but you would have to take into account fracturing in pillars which might expose more coal, rib spall that might expose more coal, floor heaves, flaws in the roof and all sorts of things?-- Yes.

There are likely to be a number of variables which impact upon the utility of doing that?-- Yes.

No doubt someone might do some work to see if it can be done, but a lot of things have to be taken into account?-- I agree.

You were asked by Mr Ellicott about whether someone - the likelihood of the Kock and friend article having come to the knowledge of operators and whether it might impact on their attempts to rationalise what was going on. I think basically you said that you didn't think it was likely it will come to their attention?-- I did make that statement, yes.

One doesn't need the article necessarily to get the answer right, you can get the answer right without it, can't you?-- Yes, that's right.

If we can see in the mine record book examples of the manager linking method of mining and production to CO increases that might be an indication that they got the answer right even though Mr Kock's article wasn't there?-- Yes.

Can I ask you this: you were asked to look at Exhibit 158 and do you still have that with you?-- Yes, I have.

Could the witness have 152 and 220, please? You were asked to look at 158, particularly that portion where you have the multiple data points by Mr Clair and he told you a number of things which all centered around the fact that if the Drager readings were calculated with the ventilation readings - 158 does not include Drager readings with ventilation readings - it's averages from the Unor, 158, the multi-coloured graph?-- This one here?

Yes. Not Dragers, they are Unor averages of varying kinds with ventilation readings that don't match in time. If you understand the distinction he was drawing saying that data is different from the Drager readings that the deputies took on shifts?-- Yes.

Did match velocities and what he said to you was if you took the Drager readings you would get some higher points on the Saturday and then demonstrated one or two, I think, that might have been higher and then asked you whether in view of that there wouldn't be the levelling off that I had suggested or that albeit in fact I thought agreed upon in the latter part of 158?-- Yes.

152 which I've given you - is that 152? If you turn over a couple of pages you will in fact see all the data that are the Drager readings shift by shift with the velocity readings shift by shift, and I don't wish to take you through them because we can make the comparison ourselves, but can I just hand you a document which I'm going to ask you to look briefly at. On that document what we have done is compared 152 and 158 and only gone back a week as you see it. Now, in fact the majority of readings in 158 are higher than 152, aren't they?-- That's correct, yes.

In fact it's about four out of 19 readings, I think, in 152 which means however you look at it 75 per cent of the readings in 158 are higher than 152?-- Yes.

Can I ask you to accept that if we go back another week - I haven't got it on the printed form, we didn't have time - go back another week you end up with 26 out of 35 readings in 158 being higher than 152. So can we just accept that for the moment, if you will, the combination of the document I've given you and now look at 220? 220 is in fact, as we are told, the Draggers matched with the velocities. Now, if you look at that period of multiple data points to the end?-- Yes.

And you started to take a line of regression through those would you not have a flattening out?-- There is a flattening out, yes.

Thank you. I tender the comparison figures for CO make between 152 and 158.

WARDEN: Thank you. Exhibit 249.

ADMITTED AND MARKED "EXHIBIT 249"

MR MORRISON: That's all I have.

WARDEN: Thank you.

MR CLAIR: Your Worship, there was another document passed over to the witness. I think it was the SIMTARS magazine that didn't constitute part of the exhibit that was passed over to Mr Mackenzie-Wood. The magazine in your right hand, is that the one that was handed to you by Mr Ellicott?-- Yes.

I think described as the SIMTARS magazine May/June 1994; is that so?-- That's correct.

I tender that also, Your Worship.

WARDEN: Exhibit 250.

ADMITTED AND MARKED "EXHIBIT 250"

MR CLAIR: Your Worship also referred to some material that the witness read over the lunch period.

WARDEN: Yes.

MR CLAIR: Is that material that needs to constitute part of the evidence?

WARDEN: Not yet, I don't think. I want to put it to another witness. It is marked "Commercial in Confidence", so I didn't

FXXN: MR MORRISON

WIT: MACKENZIE-WOOD P

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want it tabled at this stage. They haven't got that consent, but I do want to refer another witness to it. Will all parties please adjourn and meet back here Monday at 11 a.m.? I'm getting a little bit concerned about our timeframes. You might have to be prepared to run on an hour Monday afternoon to try and pick up a bit of time.

WITNESS EXCUSED

THE COURT ADJOURNED AT 3.05 P.M. UNTIL 11 A.M. MONDAY,
27 MARCH 1995

WARDEN'S COURT

MR F W WINDRIDGE, Warden and Coroner
MR R J PARKIN, General Manager, Capricorn Coal Pty Ltd
MR P J NEILSON, District Secretary, United Mine Workers' Union
MR C ELLICOTT, Training and Development Officer, Department of
Mineral Resources, New South Wales
PROF F F ROXBOROUGH, Professor of Mining Engineering, School
of Mines, University of New South Wales

IN THE MATTER OF A CORONIAL INQUIRY IN CONJUNCTION WITH
AN INQUIRY (PURSUANT TO SECTION 74 OF THE COAL MINING
ACT 1925) INTO THE NATURE AND CAUSE OF AN ACCIDENT AT
MOURA UNDERGROUND MINE NO 2 ON SUNDAY-MONDAY, 7-8 AUGUST
1994

GLADSTONE

..DATE 27/03/95

..DAY 50

270395 D.50 Turn 1 sbd (Warden's Crt)

THE COURT RESUMED AT 11.06 A.M.

DONALD WILLIAM MITCHELL, CONTINUING:

WARDEN: Mr Martin?

MR MARTIN: I understand Mr Mitchell wanted to correct his diagram in certain respects. I'm not sure in which respects. Exhibit 242, I think it was from memory.

WARDEN: Perhaps we can have him put his explanation on the record and go through it again if he feels the need to. Before we do that - witness, you took an oath the other day before we stood you down and interposed another witness. You are still bound by that oath; do you understand that?-- I understand that, sir.

MR MARTIN: Mr Mitchell, you have drawn another Graham's Ratio set of diagrams on the board. Can you tell us why?-- The other day I was rushing because I was thinking I took too long and I wrote - I had three diagrams on my sheet of paper and I intelligently took the diagram numbers for the third and I believe I put 81 here, and it is 127, and Graham's Ratio coming down in the return is 80 and not the 12. The main thing is, as it shows, CO make, CO/CO2 are unaffected by all of these factors such as the methane dilution and the difference in quantities of air, and Graham's Ratio is, as we know, very sensitive to its location, and here we have Graham's Ratio of 127, 80, 250, 225, we get all kinds of numbers depending on where you look at it, and I want to apologise to the Inquiry for rushing the other day and putting the wrong numbers. The wrong numbers were here and here.

For the record, on the right-hand side of the diagram, that's Graham's Ratio 80 at the bottom, 127 at the top?-- Yes, sir.

Right. And are those the only corrections?-- Yes, sir.

All right. And otherwise the explanation which you gave on Thursday, perhaps Wednesday, remains the same?-- Still holds. Just put two numbers down, and I apologise to the group.

Thank you, Your Worship. I tender that - 242A, I think it should be.

WARDEN: Exhibit 242A.

ADMITTED AND MARKED "EXHIBIT 242A"

WARDEN: We might copy it a bit later unless somebody wants it instantly.

XN: MR MARTIN

WIT: MITCHELL D W

MR MORRISON: Can you print it up, because we can't see it clearly from here.

WARDEN: You want a copy straightaway? Okay. Can we carry on while that's being copied?

CROSS-EXAMINATION:

MR MacSPORRAN: Mr Mitchell, can I take you - you have your report with you, do you?-- I do, sir.

Could I take you to page 2 of that report, firstly? You have a heading about half-way down the page that deals with ventilation; is that so?-- Yes, sir.

And you describe there what you perceive to be some difficulties in the ventilation set-up inside 512; is that right?-- That's correct, sir.

And is the effect of that section on ventilation really this: that having looked at it, you would expect that there would be parts of 512 that would be not properly ventilated from time to time?-- I would not use the word "properly" with the exception of I would agree with you there are areas that might not be ventilated.

And one of the effects of that could be the development in one or more of those areas of a spontaneous combustion or heating?-- Typically that's what occurs in coals that have a liability for spontaneous heating. Where there are erratic, sluggish air flows, you will get what we call fugitive air flows, where the amount of air flowing through the zone is sufficient to cause oxidation with the resultant generation of heat, but there is not enough air flow to remove the heat as fast as it is being generated.

And I think on that same page, page 2, in the footnote numbered 8, you identify two such areas for those fugitive air flows; is that so?-- That's correct.

Just for the record, you say, "in areas adjoining the inbye ribs of the large pillars between the numbers 4 and 5 entries and between the 9th and 10th cross-cuts in the numbers 1 and 2 entries"; is that so?-- That is correct.

Now, if, for instance, a heating did develop in any of those sites and you had poor or no ventilation of those sites, you could have a build-up of the products of combustion which were not coming into the return; is that so?-- If there is a short circuit of the air such as might occur if one would install the diagonal - diagonal stopping somewhere in the No 2 entry inbye the working face, this could lead to a short-circuiting of the air. I did not consider that, but that would worsen the situation, yes, and we would have what we call a hidden

heating where the outflow of your gases from the heating - they flow out through osmosis or diffusion rather than dilution.

So, there are two effects of that: one is that it can exacerbate the state of the heating, for a start, and secondly, it can make detection of it very difficult - that is, the heating can be developing and initially there be no signs of it, such as the products of combustion entering the return?-- That's correct, and you would also experience the possible - possibly experience erratic outflows - erratic outflows of smell, erratic outflows of gases, that type of thing, which would - does tend to cause confusion if you are not aware that you must be looking for something.

That was the next point I was coming to. If you have that situation developing and then you have changes in the ventilation system, which may mean alterations to ventilation appliances, you can have some of those products of combustion entering the return?-- That's correct.

But, as you say, potentially erratically?-- That's what we typically experience with this type of situation.

That would mean, of course, that you would have some evidence of, for instance, increasing CO in parts per million, but perhaps not consistently?-- You could get - actually when you have hidden heatings, unless you make an intensive survey, these things will give false alarms and then everything seems perfectly fine.

In addition to the appearance and disappearance of carbon monoxide in significant concentrations, the same argument would apply to smell, wouldn't it?-- Yes.

The smell could come and go?-- The smells would come and go because they, too, are associated - I mean, the smells and the gases and the haze all - which is moisture coming off the coal - these are all things that are interrelated.

And related to that again would be the extent and size of the area of heating? Perhaps I can add this to the proposition: if you had a large heating at a relatively low temperature, you might have certain signs appearing?-- That's correct, the temperature is a critical parameter. The size of the hot material - you must consider a heating of - like a fire - as a fan, and if you consider it as such, when the fan is just moving slowly, it produces very little air, it produces very little pressure, and you may not notice any of the influence of the fan. Put a bigger fan in there, put a bigger heating, a larger pile of coal heating, a higher temperature, the fan gets larger, and that's one way I would like to explain it, because it is something most people can understand, I hope.

On the other hand, you can have a small area of coal at a higher temperature producing something similar in terms of detectable signs?-- Yes, it is a function of the - it is a relationship - the total mass flow and the temperature of the mass flow - like, that may be a little complex word. It is a

combination of the size and the heat, or the total heat output, which is a function of the amount of material being consumed or liberating heat.

Those features really indicate that you have to be very vigilant when monitoring CO, and CO make for that matter, to determine whether there is a heating present?-- That's correct. As Mr Martin and I discussed the other day, a CO make such as the numbers we were seeing here could represent a very major fire, or it might represent nothing of any consequence whatever to the health and safety of the people in the mine, and that's a dichotomy that I believe is unacceptable.

Could I ask you to look at quickly on this same point Exhibit 29, and you will see, I think, that that's volume 1 of the material relating to the SIMTARS seminar from 1989. Could I ask you to turn to module No 1 within that volume, unit No 2. It is the unit that deals with spontaneous combustion?-- Got it.

If you could turn then to page 7-11. It is the bottom right-hand corner, the page number?-- Got it.

You will see a section there, 7.6, which deals with the topic of "Location of Heatings"?-- Yes, sir.

Well, that deals with this question of - if you look about half-way through the first paragraph, a sentence commencing, "Often a heating is first detected by an examining official detecting a faint smell for a fleeting instant. Further detailed examination of the area reveals no detectable CO or any further smell or other indication. This process may be repeated on several occasions until detectable concentrations of CO begin to appear on a continuous basis, and these can be traced to the source and action taken to control the heating." Now, does that - firstly, does that represent what we have been discussing - that if you have areas that aren't ventilated, then changes in ventilation appliances, perhaps, can have a fleeting appearance of the products giving rise to the smell being detected from time to time?-- Exactly. This is quite well written and representative of most common occurrence.

So, it is important, if a smell is detected, and it can't be repeated readily - that is, it can't be detected straight after again - it is important that vigilance be exercised and monitoring be carefully watched?-- It is not only important, it is essential, because a heating in that stage is readily reversible, and this is at the time when a mine operator needs to get after it and cure the problem, and there are a number of ways to do that.

The last paragraph on that same page, "Fluctuations in the ventilating pressure and flow caused by factors such as rapid barometric pressure changes, opening of doors, starting up of conveyers, movement of machinery, etc, may cause small quantities of CO (and smell) to flow back to the intake, and this is the cause of intermittent signs of a heating in this

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area." It is the same point, isn't it?-- Yes, sir.

So, if you have signs appearing, but not readily repeated, it doesn't give you much cause for comfort, does it?-- No, if you insist on closing your eyes and closing your mind, you will have a problem.

It's certainly not the case that if a smell once detected can't be repeated, it's certainly not the case you could say with confidence that a smell was not detected or it didn't relate to a heating. You couldn't dismiss it?-- No, this is - you just can't dismiss it and - I rephrase that, you should not dismiss it.

You go on to say, I think, at page 6, and you've mentioned it to some extent already this morning, that the CO make trend is an important tool to use. Page 6 of your report, top of the page you said, "Any sustained rise in CO make, no matter how rapid or slow, is cause for concern. The depth of concern should depend on experience, for example, in a mine having a heating in the past, an increase in CO, no matter how slight, warns it can happen again." Is that so?-- That's correct, sir.

You know here, I think, and you quote in the same section of your report, that this mine, Moura No 2, had a confirmed heating in 1986 in 5 North?-- That's correct.

I think you've been present for the evidence that relates to the detection and measures taken in respect of that heating?-- Yes.

It was a very rapid rise in CO parts per million on the day that the mine was actually sealed - the panel was sealed?-- Yes, sir.

Does the fact of that having occurred at No 2 have some significance, in your view, to the vigilance with which mine management should have looked at the situation in 512?-- That and other events that were not too dissimilar.

Do you mean by that the event in 1991, the sealing of that 5 North panel?-- Yes, sir, and also the more recent event in Moura No 4 at the Acky portal.

That's the matter that's detailed in the summary of record book entries, I think?-- I believe so.

What do those features tell you or should they tell you in terms of how you look at the situation in 512?-- Well, it would say we have a potentially spon com prone coal and there have been signs, even though they are not definitive, but they are signs typical of spon com. We have had people report haze, we have had people report various smells that were unlike any smells they had ever smelled before or recently. They were different. So therefore they should be able to differentiate between what they were smelling and the diesel exhausts in the normal working place. So here was something different and, "Gee whiz, they are related to spon com. Maybe I have a problem."

Those factors then, that is the history of the area and in particular this mine, have some relevance to how you would treat signs appearing inside 512?-- I would be more sensitive to that than I would, say, to signs in a mine that had no potential - no history of spon com and where we had - through

proper analyses we determined the self-heating temperatures of the various portions of the strata and we were familiar with the gases that were common in the goafs, particularly the sealed goafs of that mine. There I would still ask the question what if, but the criticality would not be as great as it would be in a mine such as Moura No 2.

Can I take you then to the CO make itself and could you look at Exhibit 219? If you accept that's the CO make for 512 Panel between 27 April and 5 August last year on corrected axes to show the actual trend, is that what you would call a sustained rise in CO make?-- That is a sustained rise in CO make without question.

I think you were present here on Thursday when there was some evidence given relating to the rate of production in the same panel, 512, over the period covered by the CO make graph, and in that respect could the witness see Exhibit 245, please, Your Worship? Mr Mitchell, I take it you hadn't seen such a graph before Thursday?-- No, I have not seen Exhibit 245 prior to now.

I take it though you would concede, looking at the two graphs, with some exceptions admittedly, the rate of production as graphed seems to be tracked by the CO make graph. The trends are similar with some exceptions?-- I would say the exceptions overruled the commonalities.

The exceptions, can I take you to a couple of those just to see what your view is? If you look at Exhibit 245 which is the production graph, can you see a period between 29 May and 5 June which shows a rising, although slightly, rate of production in tonnage?-- Yes, sir.

And then you look at the CO make graph, roughly the same period, that is 29 May or so through to early June. There seems to be a drop in CO make?-- Exhibit 219 shows from 28 May to 11 June a rather sharp rise.

If you look from 28 May to 4 June it's the mid point?-- 4 June, in between, yes.

So doing it for the same periods roughly on the production graph, 29 May to 5 June, there is an increase in production?-- Yes, but one should never look at points. I always try to train my people to follow trends, pay no attention to numbers, and when you have - if you look at Exhibit 219 you look at the total curve, not the points within the curve.

Certainly?-- At least I do, and if you want to fight fires you better.

Perhaps rather than taking you to individual points - as you say, that's not of great benefit - can you tell us then why you see the CO make trend for 512 going upward being relative to a spontaneous combustion occurring as opposed to increased production as shown by 245?-- I don't have my rulers and my scales handy de, but visually I would guess, subject to correction, that the rate of rise of the CO make is

considerably greater than the rate of rise of the increase in production. I don't see any commonality between the two other than they both rose. One rose a lot more than the other and then when I look at other portions of the curve I see a relatively stable CO make with a continued rise in production. I would say you are looking at apples and oranges, and that's good for fruit salad, but not for interpretation of a condition.

So you are saying - it is true, is it not, that the more coal surfaces you expose the more oxidation you expect to occur; is that so?-- Definitely.

That would give off CO and hence you would have a rise in CO make?-- Correct.

Are you saying that the curves as they are depicted in 219 and 245 indicate that the rise in CO make is not explicable only to the rise in production?-- I would say so, subject to correction, if I had my scales and my calculator handy.

In any event, if you believed - perhaps erroneously - if you believed that the rise in CO make was due to increased production and mining method, things like that, what steps could you take to ascertain which was -----?-- If you don't mind I would like to answer your question by talking about what steps were taken. They sent people into the No 1 return - No 1 entry, the main return and I heard nothing on the record of these gentlemen taking gas samples like bag samples or vaccutainer samples or other types of samples for interpretation by gas chromatography, and I heard of no mention of them taking velocity meters or even making the attempt to, say, determine CO make at various points along the length of the -----

Return?-- No 1 entry. Mr Kerr later on, I understand, he went inbye as far as the fourth or fifth cross-cut and he found no problem there, but the evidence has been that if there was a problem this problem occurred in the earlier stages of mining and would be more likely to be seen up inbye cross-cut 8 rather than cross-cut - outbye cross-cut 4 and 5. So we did have an investigation, and Mr McCamley walked through areas of the goaf, he told us, and interestingly he did not walk into or around or close to the areas where the ventilation analyses implied potential for fugitive air flows. These would be the areas where spon com would be likely to be found.

Can I just take you back slightly to your proposal to walk down the No 1 roadway top return taking samples? I think you told us last week that you would take samples at each of the stoppings at the cross-cuts down the top return, No 1 heading?-- That would be the preferred method. The minimum effort would be every second cross-cut. Every cross-cut is the proper method and this is the technique that we demand when we are searching for the potential for spon com in a number of our mines.

Can you just explain a little more perhaps why that is the

technique, why you go down the return taking samples at each cross-cut?-- Where spon com - where the carbon monoxide is being - coming off of the coal, say, because of a larger amount of exposed coal due to productivity, production or method of mining, we would anticipate a reasonably uniform distribution of CO or CO make or CO/CO2 ratio or Graham's Ratio, whatever you want to use, cross-cut to cross-cut. This should be reasonably uniform. For example, let us say at cross-cut 12 we have a CO make of one and cross-cut 11 we have a CO make - we read the CO make and that's a CO make of two and we keep going down until we get to number - down to the ventilation station and, let's see, that would be - I would expect a CO make of maybe about 12 lpm. That would be showing a relatively uniform distribution of CO, 12 or less. Let us say instead I'm there at number 12 cross-cut and I get a CO make - we use CO make of 1 lpm and I get down to cross-cut 10 and I have 10 lpm and I get down to cross-cut 8 and I have 11 lpm I would say, "Hey now, what's going on? Why do I have that abnormality?". What one looks for in life, whether it be a coal mine or heating or anything in life, the things that give us trouble are abnormalities.

Assuming you were fortunate enough to be able to detect such an event in a zone such as that, what steps would you then take to ascertain whether it was in fact a heating or some other cause?-- Well, a number of decisions would have to be made. 1: can I introduce more air to remove the heat as fast as it's being generated. Now, this, if I have a heating, could exacerbate things but at least I'm prepared for it and I do all the things necessary to take immediate reaction. A heating such as this is best controlled - we have a problem at Moura No 2 which is unlike the conditions in most mines in the United States and in Australia, and many other parts of the world where spontaneous heating is a problem. At Moura No 2 we had both methane and the heating problem. If you try to solve the heating problem by normal techniques such as getting - creating a zero pressure differential across the affected zone, what you then do is exacerbate the methane problem. So in Moura No 2 the best immediate solution is to get air through that goaf and see if we can cool things down. Of course, during this period everybody is withdrawn from the mine except the mine rescue team that are doing this work. If we find instead that we are getting a steady increase in whatever - Graham's, CO make, CO/CO2, whatever gizmo we are using to foretell these events - then we have really no alternative but to seal off the affected area with explosion proof seals. For example, let us say that we found a heating that we thought we could not control somewhere between cross-cuts 9 and 11, therefore we would start building explosion proof seals, say - around wherever it was feasible. It depends on the mining and the time, but let's just say for the devil of it - here's a nice big block of coal between 6 and 7 cross-cut and we put in seals capable of withstanding 345 kPa as the regulations call for, and then after things become stable inside the sealed area we then start mining the rest of 512 Panel or we make a decision instead of sealing back there between 6 and 7, we say goodbye 512 and seal between 0 and 1 or something like that.

In terms of identifying the presence of a heating you could also use the gas chromatograph on site; is that so?-- That would be, I would say, an important component because the best way to detect a heating and the stage of the heating, where it is, how old this heating is, what's going to happen, is with the gases from the gas chromatograph looking at the interrelationship between the trends in nitrogen, oxygen, methane. Those are the three critical ones, and then your CO, CO2. Those - and then if you have hydrogen you are already in big trouble. So hopefully we have not reached that stage where we see hydrogen or any of what we call the fire gases, the ethylene, propylene, acetylene. In that condition you have no alternative but - not even bar the sealing - but to get everybody out of the mine and then through surface boreholes attempt to insert the area affected and calm it down.

And having the ability to inert the area, that is, having equipment on site, would be an advantage in that circumstance?-- It would be an advantage, except the cost effectiveness of that is a function of the availability of inert gases commercially. We, in the United States, are very fortunate in that nitrogen or carbon dioxide, which are my two preferred gases, are readily available within hour's notice of almost any mine in the United States.

In terms of analysing the gases for the presence of a heating, you could also - rather than use the on site gas chromatograph, if there was some doubt, you could send a sample away for expert analysis?-- You could send the sample away, but time is not your friend. The best thing to do, in my judgment, considering what you had available and the reaction I have read about in response to Moura No 2, is to use the on site chromatograph until SIMTARS or other comparable organisation gets there to provide the technical - to provide the better - a positive quality of chromatographers. When things get rough, I would like to make sure I have people of the calibre we have heard testify - we heard testify last week.

One other technique, I think you have mentioned already, is the use of the Probeye if the heating area is within sight?-- Yes, that's quite useful, except it depends how hidden is the heating. For example, let us make a wild assumption that the heating was underneath the fall in No 3 entry between 9 and 10 cross-cut. This is a very plausible place. The possibility of finding that with the Probeye - I have not been in Moura, so I'm not sure, but what I have heard about the roof and knowing a little about how sandstone breaks, I would say it's highly unlikely that in the early stages that the Probeye would find such a fire - such a heating. However, let us assume instead that we had crushed fenders or heavy rib sloughing and we were able to walk along that, then in those instances the Probeye should be highly effective.

Now, I think in your report - could I take you to page 14?-- Yes, sir.

You deal there with the issue of the identifying the site of the first explosion?-- Yes, sir.

And in respect of 5 South and 520 - that's towards the bottom of that page - you discount those areas because of the low gas concentrations not providing fuel; is that so?-- That's correct.

Were you present when there was evidence given here about a methane layer in 520 being discovered on the morning of Friday, 5 August?-- Yes, I was.

You heard, I think, also that there was no written report of any such event having taken place?-- That is correct, there was nothing in any of the deputy or managers' reports.

It seems also we don't know the quantity or size of that layer in 520; is that so?-- That's correct.

We do know that the area was flushed by opening a regulator in the 5 South bottom return, I think it was?-- That I understand.

We don't know for how long that regulator was open or whether the action was totally successful; is that so?-- That's - we know nothing about it other than the purported finding of a layer in 520 and that some remedial actions were taken and hopefully the problem was resolved.

Well, does that have some relevance in terms of your assessment of the 5 South area as being the site of the first explosion?-- Yes, sir.

Can you explain that for us?-- We typically do not get damaging pressures developed by ignition of a layer unless there is a major confinement in the flame path. When you ignite a methane layer, the flame will travel through that layer just like a wick and as long as there is no reduction in the - major reduction in the cross-sectional area, there will be no important production of pressure. This is based on the universal gas laws. As I have experienced, the universal gas laws, as you know, is the pressure times the volume is equal to a series of constants times the temperature. So, as the temperature increases - if you hold your volume constant, the pressure will increase, but we have a large volume - we have tremendous cross-sectional areas and we have multiple entries in Moura No 2, particularly in the 5 South and 520 area, so there - and we have no record of a major restriction such as a regulator in the immediate return for 520. The regulator is quite a bit down 5 South. So, we have - and there is no reasonable expectation of large machinery in that return. So, on that basis, unless we are given other information, which we haven't, there is no reason to believe a major confinement or restriction in area leading to the development of pressure, and regardless we have things that will militate against that: the rock dusting and the water barriers. It would have to be a humungous, tremendous body of methane in a layer in the 520 area to - under the worst conditions, or under the optimum conditions, to develop damaging pressures that would be sensed in the main dips and 1 North-west.

Well, we know that a layer was occurring on Friday morning, 5 August, and action was taken to deal with it?-- Yes, sir.

We do not know what the source of that layer was; is that so?-- Well, layers develop - we do know the source. Layers develop because of methane being liberated and layers are formed by having inadequate air velocity and turbulence in the zone in which the layer is forming.

All right?-- And those are the means for correction.

We don't know with certainty, do we, whether such a layer reappeared after Friday, 5 August, and before the explosion on the 7th?-- No, we don't know, but as I hope I explained before, it's highly improbable that that layer would have led to the first explosion in Moura No 2.

But it's a fact you would want to consider?-- We did consider, yes, sir. When I say we did consider, we did not consider that specific layer, we did consider layering in all areas.

And, of course, that specific layer we are talking about may have been present where men were working on the night of the 7th?-- Layers are quite common in mines particularly where you have these relatively high entries with large cross-sectional areas. Layering is common throughout the world and is very difficult to combat.

Can I take you then to page 16 of the report? You have a heading there called "The Future"; is that so?-- Yes, sir.

And you say in the second paragraph of that, "Except for economics, there is no reason why this mine or portions of it cannot be recovered." You go on to say, "Plans, however, must be predicated on positive knowledge of what effects re-ventilation might have; on maintaining careful, correct mine sampling analysis prior to and throughout the operation; and, having no fewer than eight mine rescue teams." Now, do I take it your view is that Moura No 2 could be recovered?-- Yes. Except for economics I have never encountered a mine that wasn't - couldn't be recovered. It's strictly a case of economics, and with properly trained people in teams and properly trained people making decisions relative to the operations of those teams, there is no reason the operation cannot be safely conducted. I say here eight. I made a subsequent analysis and I would like to correct that. No fewer than six mine rescue teams. I was looking at a two shift a day operation with eight and I don't want to do that. If I was involved I would limit it to a one shift per day operation.

And in fact such recovery operations are regularly - almost routinely done in the United States; is that so?-- And in other countries also, yes.

Most other countries around the world?-- Yes. It's not an uncommon practice.

And one of the reasons for the practice is to enable a full and detailed underground investigation of the circumstances surrounding such incidents?-- That is among the reasons. It's not a paramount reason. I would say this would be - there are so many reasons and I would give them equal billing.

One of the reasons being the gathering of evidence to substantiate various theories about how the explosion, if it was an explosion, occurred?-- Yes.

In this case, Moura No 2, you would expect, wouldn't you, there would be some evidence that would enable verification of a particular theory, or its denial, to take place?-- I could only answer that question after I have been or after someone has been in Moura No 2 and conducted a proper investigation.

That is to say, you would expect there to be evidence underground?-- Oh, there would be definite evidence. The interpretation of that evidence and the - that constitutes another matter and, as they say, seeing is believing.

Can I ask you generally: if you have an explosion that damages, for instance, a methane drainage line, that would result in the release of quantities of methane underground, wouldn't it?-- It would.

And if that occurred, that would be a potential source of a subsequent ignition?-- That has occurred on a number of occasions, yes.

And if that occurs, of course, it makes recovery of the mine and rescue of those underground much more difficult?-- Not after this period of time, no.

Not now I'm not talking about, but if you have an incident where an explosion damages a methane range, the period immediately after that is a dangerous time?-- Oh, that was - that would be an unacceptable re-entry at that time.

Is there a practice in the United States to guard against the release of methane from a drainage line upon its damage?-- Oh, yes, there are. There's - back in 1977 we had a task force that - there is an MSHA publication on underground pipeline - methane drainage pipelines in underground mines. This was a result of the fact that at that time there was a major push to have methane drainage and pipelines throughout - in a number of mines, particularly in Northern West Virginia, and we had a very good task force that came up with procedures that are in use today and have been proven safe and effective.

And is one such procedure that where the methane drainage line joins the drainage area, there is a safety shut-off valve?-- There are safety shut-off valves not only at that point but at various locations throughout the length of the pipeline.

So that at the site - wherever a pipe is damaged, the shut-off valve is activated and preserves the remaining range?-- That is the intent, yes, if they are maintained.

Limiting the release of methane into the workings?-- That's correct.

Is that quite a simple device to have those valves attached to methane drainage lines?-- I've never known a mine operator in the States who has had problems with it. A lot of them have been very wise and they have gotten people working with them from the oil and gas pipeline companies and they have provided some good, strong help and very good quality equipment.

Could I take you back finally to the question of interpreting the signs of a spontaneous combustion? If you thought, for instance, that the CO make trend was due to production and not a spontaneous heating, that is, the rise in trend was due to a rise in production levels rather than a heating - if that was

your belief, if you assume that, what would signs such as smell tell you about whether it was due to production or something else such as a heating?-- Well, what it would say to me is to ask the question what if? And then if I asked that question, I would hope to get an answer.

Well, if you had reports of smell and haze on the Friday and Saturday, 5 and 6 August, what would that tell you about a rising CO make trend being due to production increases?-- I don't believe anyone can correlate rise in CO make or in smell or haze on 5 and 6 August with production in the 512 Panel. There was no production in the 512 Panel, and if we are going to say it's production related, then it should have been dropping.

So, what does a rising CO make trend on that weekend, along with smell and haze, indicate to you?-- I have a problem.

And the problem is most likely what?-- Well, if I don't know what the problem is, then I have a bigger problem, so cause for saying, "What if I have a heating or maybe an active fire in the 512 goaf, and, gee whiz, I've got methane going up in there, I better get my people out of the mine until I know what's going on.", and the - actually, to continue the construction of seals - to continue the construction of seals, if you wish to dignify what was built as seals at that time, that would be not prudent at all.

You mean because of the risk of an explosion whilst the sealing is taking place?-- Very much so, because one of the things you do, when we seal a fire we expect explosions within the sealed area. As we seal the fire you will start hearing pops inside the sealed area. You will start feeling strong pulsations of the air as the fire breathes in and out and breathes more heavily. These are very common things, and if you don't know what you are doing, you better not.

Thank you. Thank you, Your Worship.

CROSS-EXAMINATION:

MR MORRISON: Mr Mitchell, you have sat through a lot of the Inquiry, haven't you, since Day 1, but for a short time?-- The month of October and the month of March to date.

And throughout that time you have taken an active interest in the evidence that's been given by various people?-- Yes, sir.

Including purely factual evidence about what was done and what was seen and so forth?-- I heard the evidence as it was given.

But including giving instructions upon factual matters; isn't that right?-- I don't know.

Well, haven't you been making recommendations about factual matters, what questions to ask, and so forth - that's so, isn't it?-- I have a problem with the word "factual", sir.

Haven't you been making recommendations about the factual evidence that's been given by witnesses - it is true, isn't it?-- If you will leave the word "factual" out, I believe I could answer the question. I'm not quite sure how you mean that. I'm sorry, that's a word that may mean different things to you and me.

All right, I will leave the word "factual" out. You have been making various recommendations to people about the evidence given by people at the Inquiry?-- I have spoken to Mr Martin and Mr Brittain of my interpretation of what I have heard, yes.

I think I understand. Now, can I ask you this: if we can start with page 1 of your report - can we do that?-- Yes, sir.

Down the bottom of the page in the footnotes, you have under footnote 1 a number of comments, as it were, or opinions based upon sampling entries?-- Yes, sir.

The first one is - these are all to indicate times. The first one is "belt entry sealed 11.42 p.m.". Where did you get that time from?-- This was based on the - my interpretation of the Unor data, watching how the data at sample points 5 and 16 fluctuated during the period that we describe in this footnote.

So, it is purely from what we can see on which point, 5 or 16?-- If I may refer to the data, I might be better able to answer - oh, excuse me, no, this says "sample point 5".

"5"?-- I'm sorry, I didn't look down there.

So, what do we see at 23:42:05 that tells us that's when the belt road was sealed? Is there some change in the readings?-- There was a change in the trend of the readings at sample

point 5 that would indicate it was seeing a lower quantity of air and it remained reasonably constant after that, indicating that this would be about what one would expect if what was being built was reasonably completed.

How does that sit? How do you reconcile that with the evidence of those who actually built the seal and says it was finished by 8.30 p.m.? How does one reconcile those two things?-- I reconcile it strictly on the basis that I am looking at the gases and it may take some time after those gentlemen completed their activities before the sample point at 5 saw a - an important decrease in oxygen. I am aware of what you are talking about and, as I pointed out, we are basing this as indicated by the Maihak data, not by testimony.

Well, on that basis, that entry is misleading, isn't it, because even on what you say now, 23:42:05 is some time removed from when the sealing would have been completed?-- It is not misleading, sir. I believe the footnote speaks for itself and it is correct as it is written. There may be additional things, as you are pointing out, that might be added, and you might want another column saying, instead of based on Maihak data, based on somebody's report.

Well, I thought you just told me-----?-- Excuse me, I didn't mean - I wasn't quite finished. When we are talking about entry - "belt entry sealed", we are talking about when it - the sample point - becomes an effective point, no longer seeing a large inflow of air. Until that happens, you may have finished construction, but you have not - if you don't mind putting quotes around the word "sealed", you have not "sealed" the entry.

I see. And you can't derive an indication from point 5, then, for when, in a similar fashion, the entire panel was sealed; is that so?-- There was no evidence indicated by sample point 5. Subject to correction of my memory, the data at point 5 on the 7th of August at 2.24 in the morning - the data were not too unlike what they were at 11.42 that evening - prior evening.

All right?-- That's all that says.

Now, the next entry you have got is "Explosion, 23:49:57" at point 5. This is according - this is with no time corrections to the - this is straight from the computer clock, is it?-- That's what the footnote states.

That's when a particular sample arrived at the surface?-- Yes, sir.

Now, when the sample that shows explosive products, if I can use that term, arrives at the surface, it is not, in fact, the time at which those products enter the tube, is it?-- No, sir.

So, if we were, in fact, detecting a time for explosion, wouldn't we have to count back the lag time on the tube?-- Assuming one can state with reasonable engineering certainty

what the lag time was at the instant of the explosion, we don't know what changes that event or disaster or whatever - what occurred - had on the lag time in the tubes, and this is why I did not consider lag time in putting down these times for footnote 1.

Do I understand correctly that you are not convinced that the sample at 23:49:57 was one of complete integrity? Do you understand what I'm saying?-- No, I'm sorry, I don't.

Are you satisfied - I'll start again. Do I take it from what you say that you are not convinced that the sample which appeared at the surface at 23.49 was, in fact, a pure sample - in other words, unaffected by the explosion?-- I would say the sample shown at sample point number 5 at 23:49:57 indicated products that one associates not with a sealed goaf, but with an explosion or a fire.

Right. Explosion or a fire. Can it be both?-- There is no difference, in truth, between a fire and an explosion. An explosion is nothing more than a fire that has been confined and allowed pressure to develop. An explosion is a pressurised fire.

The reason I ask is that that sample showed extremely low CO2. Would you not expect extremely low CO2 to be more consistent with fire than explosion?-- No, as I said, the gases you will get from a fire and an explosion are one and the same. The only difference between a fire and explosion - I hate repeating myself - but the only real difference is pressure, and also the speed at which the flame travels.

So, to stay with this point for the moment - do you consider then the gases shown in the sample that arrived at the surface at 23.49 are gases exhibiting the result of an explosion?-- They were gases that were importantly different from the gases in prior samples and they did contain what one with reasonable engineering certainty would believe would be gases from a thermal event.

I'm sorry, perhaps you could answer my question in a little more layman's terms. Do you consider that sample shows the products of an explosion?-- Again, sir, an explosion, the products of an explosion and the products of a fire and the products of a thermal event are one and the same.

So the answer-----?-- Except the only important difference is the quantities of the various ingredients.

All right. By "quantities of the various ingredients", what are you referring to?-- Well, in a thermal event, which could be starting off with a minor heating, you won't get the high concentrations - higher concentration of the various gases as you might get with a fire. Fire is - differentiates from a normal thermal event by the finding of things - when we have coal fires - of things such as ethylene, propane, acetylene. None of these things showed up at the Maihak.

Quite?-- And, so, we have to go on the basis of the abnormal

change in the other key gases which would be in the - as far as the Maihak was concerned, oxygen, methane, carbon monoxide and carbon dioxide.

And so you would expect to see a difference in the carbon dioxide, would you not?-- Not in it by itself. I look at all four gases. You don't look at things individually. You have to look at a total picture.

I understand that, but would you not expect to see a difference in the CO2?-- The Maihak, if I recall correctly, I wasn't too excited about the way it was analysing CO2.

Sorry, would you expect to see a difference in the CO2; that was the question?-- Would I expect to see a difference? If there was a difference, yes, then I would expect it. If there was no difference, I wouldn't.

We seem to be at cross purposes. You were telling me that any one of a thermal event, fire or explosion would produce similar effects in terms of gases and then we got on to a discussion, or at least you were telling us that you would expect to see differences in the proportions of those gases. I'm asking you is CO2 one of those gases that you would expect to see different in proportion if the products you were seeing were a product of a thermal event, fire or explosion, or whatever you want to call it?-- If you want to talk about CO2, I would expect to see an important difference in the CO/CO2 ratio; not in the individual gases, sir. I've said that numerous times. You don't look at a point, you have to look at the picture.

Perhaps if you could just answer my questions? The reason I ask you these, you see, is because you have used the word "explosion" in note 1, which expressly deals with times at which events occurred, so you have pinpointed the time of the explosion as being indicated by the sample arriving at the surface at 23.49. Do you see that that follows from note 1?-- Yes, I do, sir.

So, is it not right, then, that by that process of analysis, if we work back the lag time, you would place the explosion at something like 11.06 p.m., because that's the lag time - 45-odd minutes is the lag time on point 5?-- Wasn't it 43?

Well, 43, 45. In fact, if you take 43, it is 11.06, the figure I just gave you; so doesn't it follow on that process of analysis that you would place the explosion event at 11.06?-- As I said earlier - I'm sorry to repeat myself, gentlemen - I don't mean to bore you - I have enough familiarity with the tube bundle system that, given the traumatic events that occurred some time after 11 o'clock, I cannot state with any degree of certainty what the lag time actually was. The pulses of the explosion could have reduced the lag time, they could have increased the lag time, they could have done a lot of things. I don't know. That is why I cannot go beyond what I have said, and I will not.

Okay. Please just answer my questions. Do I accept, then, if

we can go back to the point I raised earlier, that you are not satisfied, or are not convinced, at least, that that was a sample with its integrity intact?-- Excuse me, I didn't ever realise that was your question. You are saying - the question, as I understand it, is the integrity of the sample; is that correct?

I thought I - I meant to say that earlier. I'm sorry if I didn't make it clear. When I said this was a sample, the products of which were not affected by an explosion, that's what I meant. I'm sorry if I misled you?-- You are asking the question might something have happened to the samples as they were analysed and are not correct?

Yes?-- Everything is possible.

Is this a sample-----?-- They may not be actually absolutely correct, but they are different from the sample and the samples that were recorded on the Maihak system immediately - for quite a period of time prior to that specific sample. That specific sample was different. That's all I know, and that's all I can say.

I just want to investigate this a little further, you see, because on the face of your report, you pinpoint the time of explosion by reference to that sample. If that sample came through the tube unaffected - in other words, the tube was not broken or damaged by the explosion - then by your process of analysis, the explosion occurred at 11.06 p.m. - that's the point I wish to investigate?-- I made no such interpretation - and, sir, if you will look at the point 16 sample, which indicates it was received by the Maihak system approximately seven and a half minutes prior to the one from sample number 5 - and yet we have lag time data, I believe, that were determined - determined that same day, and unless I'm - if my memory has failed me totally, the lag time for sample number 16 was 73 minutes, almost twice that of sample number - at point number 5, but even - let's say I'm wrong on the times, we know the lag times were quite different for the two points and, gee whiz, we are not that different here, and that tells me maybe we better not trust the lag time data that we had.

Well, can you answer my question then? If we get back to that original question, is this a sample, the 23.49 one, which, in your view, was unaffected by broken tubes, damaged tubes from an explosion? Is this a sample with its integrity intact?-- Gas got into the sampling tube at some place, at some point in the mine. There are reasonable chances that maybe that gas entered that sampling tube at the point at which sampling point 5 was installed. You may be right. Something might have happened to that tube. It might have been damaged, it might have been destroyed, and what we are seeing now instead is a sample of an atmosphere at a point other than immediately where sample point 5 was located - highly probable, not impossible; questionable, when you look at the other sampling points in the mine, which we also did, and that's why I was concerned and I paid no attention to lag time because of the time - the short time differential between 16 and 5, but then when you start looking at some of the other sampling points,

we don't see this abnormal atmosphere at about that time. So, whatever we are looking at is close to - reasonably close - it is closer to the 512 area than are the sampling points in 5 South, for example. Did I answer your question?

Well, as I understood it, you said there is a high probability, in effect, that this sample has come up the tube in tact; is that the summary of it? It is not impossible that it was affected elsewhere, but the high probability is it was in tact?-- It could have been, let's put it that way.

The reason I ask you, see, is because it is the central sample underpinning the analysis of SIMTARS as to what took place, but by your analysis, the explosive event occurred some 25-odd minutes earlier than theirs, and I wish to know how we are to reconcile those two approaches, if we can at all. Maybe we can't?-- I suggest you don't even try because it doesn't add up to a hill of beans. What difference does it make whether the explosion occurred at 11.05, 11.06, 11.02, 11.20, 12 o'clock, we do know there was an explosion and that's what we are here about. We also know that the explosion occurred prior to midnight, so some time in the later part of the hours - the waning hours of 7 August of 1994 there was an explosion in the Moura No 2 Mine. That's all we can conclude from all of this discussion you and I have had.

Well, do you consider, then, that that section of the SIMTARS effort which was directed at establishing a time for the explosion is - should not be viewed with any veracity?-- I would not take that opinion at all. It is interesting information, and the Warden and the panel will make their own judgment as to the calibre, veracity, quality - whatever word you wish to dignify it with.

I'm sorry, I'm asking for your view about that report. Do you view that as having any veracity, that part of the report which does try to establish a fairly precise time for the explosion, that being perceived at least by them to be a matter of importance?-- I'm sorry, sir, I did not - when I read the SIMTARS report I did not apply to it questions of veracity or anything else. I just read it as I would any other report of a similar quality organisation. They did an analysis and they gave their best judgment as to what occurred. It is not for me to question their judgment as long as I saw nothing horribly long with the basis for their judgment, and I found nothing horribly wrong with the basis for their judgment.

Now, we are here talking about the basis of their judgment for calculation of time or do you mean generally? Have you widened the scope of the answer?-- The whole report I thought was rather nicely done with - a good piece of work, very scientific.

Can we return then to this footnote, because if this report gets promulgated, as it undoubtedly will like all reports in this case, people will be reading this and saying that Mr Mitchell determined that the time of the explosion, because the word you used, was determined by that sample. That's exactly what the footnote says, "Times at which events occurred...Explosion 23:49:57." Now, you don't want it read that way, do you?-- That's how I wrote it and I stick with what I wrote. That's how I wanted it, in other words.

You don't mean to indicate that in your view the explosion actually happened at 23:49:57, do you?-- I have the caveat in there that, (no tube-travel time compensation). That's a caveat and removes any exactness from the numbers. This does permit you to go into the data, look at that time and look at the gas analyses at that specific time compared to the gas analyses prior to and subsequent, and this says, "Gee, at this time something different was sampled." That's all it says.

You've used the word "explosion" to indicate what has produced it. Is that an inapt term?-- Well, there is something that happened as indicated by that major change in gases. We say with certainty it was at least a fire and, gee whiz, based on what other people said about the time at which the explosion occurred, it probably was an explosion. I would be possibly in error. I maybe should have said, "Times at which events occurred...", and instead of saying "explosion" I should have say "explosion - fire" with a question mark, but that would be rather ridiculous.

Well, it is a matter of some moment to this Inquiry to determine the time of the explosion and people might be forgiven for thinking that that's what you were indicating, if one put in the lag time, that you were in fact indicating a concluded view by yourself that the explosion was at 11.06. Now, as I understand your evidence that view should not be attributed to you?-- That's exactly right. I never said 11.06.

No, what time do you put it at?-- I don't. All I can say is that - as I said just some minutes ago, on 7 August of the year 1994, some time before midnight - and I'll add some time probably after 11 p.m..

You can be no more definitive than that?-- I can't be.

Do you think anyone else reasonably can be?-- I don't believe that I have the competence to do it. I don't know about other peoples competence in that area.

Can I take you to page 2 of the report, please? I just want to ask you a couple of things that appear in the section headed "Ventilation". You mention that as retreat progressed stoppings between 4 and 5 entries were removed. That was an integral part of the mining system, wasn't it? As they mined those intersections and took out the bottoms and stripped the ribs in those areas, those stoppings came down?-- Yes, they took those stoppings out. I would not consider it an integral part of the operation. It's something they did.

Well, they could hardly maintain it in place, if they were going to mine through that area, take bottoms and strip ribs, could they?-- I don't believe we need to get into an argument of the mining practice of the mine - mining method. It's

Could you just answer my question? They could hardly maintain
-----?-- I could have maintained a ventilation control between the No 4 and 5 cross-cut - between the No 4 and 5 entries, and that way maintained a better quality flow of air through the goaf instead of getting a short circuiting of the air that was entering into the goaf.

I understand what you are saying, and this would be done during the mining process itself no doubt. You would have to do that?-- It would be part of the mining cycle. I don't know what you mean by "process". I use the word mining "cycle". There are times that you do certain things.

Inevitably your regulation would have to be done after the bottoms were taken and the ribs stripped because you are then dealing with a new cross-sectional area?-- That's correct.

Further on in that paragraph, the next sentence, you mention that doors in the stoppings separating the No 1 entry from the goaf were closed and opened again. Can you just tell me what it is you are referring to there?-- There was testimony about - actually I'm never could quite understand whether we had doors or did they just punch holes through the stoppings?

That's why I ask you, see, because you say doors in stoppings were opened and closed, and I'm interested to know where you got that information from?-- Well, we do know that there is at least a door in the stopping in the number 3 cross-cut. I have never heard of people going in and punching holes in - at least before - until now I have never heard of people going in and punching holes through stoppings, because gee, you kind of lose the purpose of the stopping except when, of course, you

are going to seal an area you do exactly that because that's what you need to do, breach those stoppings at that time, but during the mining process to breach stoppings, say at 8, 9, 12 cross-cut, that is - let's say in my experience, which only goes back 50 odd years - that's unheard of.

I really would appreciate it, Mr Mitchell, if you could listen to the question and answer it. We will move on much more quickly if you do that rather than give us a speech.

MR MARTIN: I object to that. Mr Mitchell is fairly answering the question. He was not giving a speech. He is answering the question which we will hear from him, hear all of it, not just selected parts that suit Mr Morrison. May he be allowed to finish?

MR MORRISON: The question was, in case you have forgotten it or I misstated it or misled you into the area, from where did you that get information? That's what I wanted to know. Can you tell me where you got the information that doors in stoppings separating the No 1 entry from the goaf were opened and closed?-- You misunderstood what you called a speech. Being that good mining practice would not be to breach those stoppings arbitrarily -----

Mr Mitchell -----?-- ----- then I assume, sir -----

Will you cease, please?-- If you will let me -----

Will you cease now, please? Please answer my question, Mr Mitchell. From where did you get that information?-- I am trying to answer your question as best I can, Mr Morrison, and just bear with me. I'm sorry if I am confusing you. I assume that good mining people do not breach stoppings arbitrarily, so I assumed, and obviously listening to you I assumed incorrectly, that what they did was opened doors in those stoppings because that would have been the correct thing to do even though at least to breach a stopping you don't punch holes in them.

Well, are you telling me then that those words in that second sentence under the heading "Ventilation", are merely an assumption on your part and not reflected in actual evidence; is that right?-- That's correct, sir.

Now, you say in the next sentence that openings were made in the stoppings between the 12th and 13th cross-cuts. Now, that's something that was not done during retreat; is that right?-- A hole was cut in the number 12 cross-cut stopping some time during the retreat operations because the retreat operations, if you will bear with me I'll tell you when they started according to your maps, and that occurred after that date.

I think we are at cross purposes. I'm directing you to the second part of that sentence, not the first where you say that openings were made in stoppings between the 12th and 13th cross-cuts?-- Yes, I believe Mr - maybe I'm wrong, either Mr McCamley or Mr Morieson or Mr Atkinson, one of those, maybe

another gentleman, but somebody like that talked about going through the stopping into the No 2 entry between the 12th and 13th cross-cut.

Those openings were made at the commencement of retreat, were they not, and as part of the approved mining plan?-- The way I heard the evidence it was rather confusing. I got the impression from what was testified during the month of October that those - that that stopping did not have a breach in it until this gentleman made the breach to go through.

You are talking there about a stopping actually between the 12th and 13th cross-cuts. We are at one on that, aren't we?-- In No 2 entry. I could be wrong. My memory sometimes fails me, but -----

The reference that you make here was to that occasion, if that occurred -----?-- That's correct, sir.

You refer there also to analyses that you've done, and you point out in the footnotes they are available to interested persons, those analyses indicated the likelihood of more openings or leakage paths through other stoppings; is that right?-- That's correct, sir.

Those analyses, am I correct in saying, are based on a number of assumptions that you had to make about the ventilation system?-- Yes, sir.

You did not have available to you actual data in relation to the mine?-- No-one to my knowledge does other than the information we have for the ventilation station number - in the No 1 entry and No 5 entry.

The answer to the question is that you did not have actual data except in that limited way; is that right?-- And the mining plan.

So the substance of the analysis that you've been able to do had to be necessarily based on a number of assumptions you have made?-- The base model was based on a number of assumptions and all of the other models that followed thereafter carried those same assumptions. So the intent of the analysis was how does analysis A differ from analysis B because all the assumptions are equal.

And built into the analysis then is necessarily, as a product of those assumptions, figures for drop in pressure and the like along the top return, for instance?-- Yes, you would be looking - that would be one of the results of the analysis.

It's axiomatic, I think you would agree, to the extent that the assumptions prove incorrect then the analysis may be flawed?-- Not the - as I explained just before, what we are doing here, the base analysis may have faulty assumptions and that is perfectly all right as long as when you compare and make a change, the only thing that - you change one thing at a time, and you are asking what happens when I make this one change, and you find out that - you find an answer and then

you make another change, but you keep going back to your base all the time. So the analysis is not faulty if the assumptions on which it is based are not perfectly correct.

What was the pressure drop you got along the top return in your analysis?-- Will you bear with me while I find it?

Certainly?-- In so far as I gave copies of this data plus the computer print-out to one of your people, I will just refer to junction numbers and he can correct you. The pressure drop between junctions 200 and 100 are the answer to your question, and if you will look at the cumulative head loss - bear with me a little longer - here we are.

Right return No 1 entry?-- Yes, the total pressure drop in that No 1 return is ----

About four?-- Roughly three-hundredths of an inch water gauge.

Which translates to - can you give us a different pressure measurement?-- I don't have my calculator with me. It is not the 100 pascals that we see reported in the IMC. However, to get a greater pressure drop all I had to do is put more resistance into that circuit which would have made the air flows into the goaf smaller. What I was doing was giving your - giving this analysis the greatest chance to get the most air into the goaf. If I used the numbers that IMC use I would have had much lower flows, and interestingly when I compare my analysis with IMC analysis we come up with the same zones of low pressure and low quantity flows. So the analyses are not incorrect.

We will come to that in due course. Can I just ask you would you agree that the cumulative head loss on the right return No 1 entry in your analyses is about four pascals?-- It is, as I said before, three-hundredths - let's see, .096 and subtract .059, so call it six, it's about three-hundredths to four-hundredths inch water gauge.

Would you accept that's about roughly four pascals, just assume that for the moment?-- If you will swear to it, yes.

I'm not here to swear anything, Mr Mitchell?-- I can't assume then.

Well, you are not prepared to assume that.

MR MARTIN: Well, can Mr Mitchell do the calculation and then we will be on common ground? How long would it take you? What do you need to do it, Mr Mitchell?-- I need my calculator which is in the room.

MR MORRISON: I think we can proceed without it and he can do it - no doubt Mr Mitchell will do it over lunch. If you accept for me for the moment, and I know you are reluctant to, but do it to please me, accept that it's four pascals down that top return, if you are out by a factor of 10, namely that it's about 40 pascals, doesn't that have a serious impact on

the validity of your analysis?-- No, sir, because one thing - we don't know that it was 40 pascals. The only basis for 45 pascals is the IMC report which was based on a large number of assumptions also. We can all keep making assumptions, and it really doesn't make any difference, what it would end up doing is with my analysis there was more air flowing into the goaf than the IMC analysis, and the IMC analysis did not have a 40 pascal drop, it had a 100 pascal drop.

Can I just ask you this: do you agree with the proposition that if you are in fact out in your analysis of that point by a factor of 10, that is, it's a 40 pascal drop rather than 4, it has a serious impact upon the validity of your analysis?-- Yes, it has a serious effect. If I used the 40 instead of the 4, I would have had less air flow and I would have had more air leakage through the - I would have had to get more air leakage through cross-cuts 1, 2, 3 through 6 to get the quantity of air recorded at the number - at the ventilation station.

Well, can you please try to answer the questions I asked? It does have a serious impact upon the validity of the analysis, does it, if what I suggest to you is so?-- I would not use the word "validity". It has an impact on the results.

Now, can I come back to page 2 of your report? In the next paragraph down you are referring here to the matters that you listed in the first paragraph under ventilation, and as we have heard one of those at least is an assumption and not fact, but in relation to those you say these things were purportedly done to increase air velocities around the large pillars. Can you tell me where did you get that information from?-- That came out of testimony given here before the Inquiry as well as statements given by various people to the Inspectorate.

So, it comes from evidence given at the Inquiry or in the statements; is that so?-- That's what I just said.

But nowhere else. You don't source it from anything else?-- I just gave you my answer, sir.

Now, can I take you to the last sentence in that paragraph where you say because the goaf was at a lower elevation than the active faces and the main return, that would tend to cause rising flows of methane and warmed air to suck in fugitive air. Do you mean suck it in to the inbye end of the panel?-- Yes, sir.

Now, it would be correct to say, wouldn't it, that that impact of such an event would be minimal given the size of this panel?-- The impact of such an event has nothing to do with the size of the panel, sir. The impact - do you want me to explain what the impact would be?

I am just asking you whether the impact -----?-- I just answered it.

----- would be minimal given the size of the panel?-- It has no influence - the size of the panel has no influence on the degree of impact.

All right. Would the impact be minimal?-- It has - the impact - based on the size of the panel?

No, no, I've just withdrawn that part of it?-- Okay, you are withdrawing that part. No, sir, the - it would not be minimal. It depends now on how hot or how warm the air is

that's rising and how - the rate of methane flow in the layer. These are the things that determine the quantity of air, because nature abhors a vacuum. Let us just say if I have so much air at such a temperature moving upwards, I have to replace that with something, and that's going to be cold air or cooler air that would be, say, in the No 5 entry or No 4 entry.

Now, it's a fact of life, isn't it, that if methane is emitted and migrates out, then obviously something has to replace it. It's a fact of coal mining life?-- That's correct. That's what we just agreed.

Well, this is what you have just said. So, the effect you point out here is nothing abnormal, is it?-- It is - it's a function here of the 7 per cent - 7 degree dip. This is a rather - in other words, this would have a - one effect. If you had, say, a 20 degree dip, that would have another effect, and if it was perfectly flat, that would be something totally different. So, that has to be put into the equation.

The effect that you are describing here for all down dip workings is nothing abnormal, is it?-- No.

And its effect here, given very low methane make, would be minimal, would you agree?-- I have not agreed that we had a low methane make. I'm not quite sure about that.

All right. Well, can I ask you something else about this area? Down in the footnotes - in footnote 6 you say there that whether the backing-out of air was an actual reversal or layering is not clear, and you then go ahead to calculate a layering index of something in the vicinity of 1; do you see that?-- Yes, sir.

Would you agree that that calculation proceeds on the basis that the 1.8 per cent methane to which you refer was across the general body?-- Yes, when you read Bakke and Leach, they tell you that the general body methane concentration is the only methane concentration that you are allowed to use in calculating the index in accordance with their formula.

And if indeed on this occasion what you had was not a general body concentration but layering about 100 mils thick, then it would give you a misleading index, wouldn't it, to take the general body as containing 1.8 per cent methane as opposed to the layer?-- That's correct.

So, the layer would result in a higher layering index if the methane was in fact layered and it was the layer that was 1.8 per cent?-- I'm confused.

I'm sorry. Are you? Well, I'll start again. Your figures proceed upon the basis that the entire cross-sectional area contained 1.8 per cent methane, isn't that so?-- My calculation was based on the information I had indicating that the 1.8 per cent was the general body methane concentration reported.

So, it proceeds upon the basis that the entire cross-sectional area contained 1.8 per cent methane, isn't that right? It must necessarily follow if you use a general body figure rather than a layering figure, does it not?-- Not necessarily, sir.

Does it do so here?-- The general body does not necessarily - the general body methane concentration could be quite different from the concentration taken near the roof and then it's a function of how close to the roof, near the ribs and near the floor. You might get 20 different percents if you took those samples.

Well, on the occasion that we are discussing, there might be a difference between the effect which is general body contamination of 1.8 per cent and layering which contains 1.8 per cent; is that right?-- A layer doesn't have 1.8 per cent. A layer has something going from 0 to 100 per cent, or close to 100 per cent.

Well -----?-- That's what a layer has.

On the occasion that we are discussing, if in fact the effect that was seen was layering, there was a methane layer and not general body contamination, isn't it true to say that your layering index would be incorrect?-- If the 1.8 per cent was not a general body methane reading, then this calculation would be incorrect.

And if one calculated the figures based upon a layer of, say, 100 mils thick, then you could get a much higher layering index, couldn't you?-- There is no basis for doing a calculation using a methane reading in a layer. As I said some time ago, Bakke and Leach, who are the gentlemen who developed the layering index which is worldwide used, specified without equivocation that the methane reading must be the general body reading. Any other reading would be - there would be no basis for using either their nomograph or their formula.

In which case, if there was not a general body contamination, then your reference to layering index really means nothing?-- If you can prove to me that this was not a general body methane reading, I would have to stand corrected, yes, sir.

Now, can I ask you to look at figure 1 which you say represents the 512 workings as they were on 12 July 1994? Now, can I just ask you about only one aspect of this for the moment? In the top return, which you have headed No 1 entry, you have got a capital R. What does that signify? Next to the words "No 1 entry" what's the capital R signify?-- The "R" signified what was a regulator or ventilation station.

Well, it signifies here a regulator, doesn't it?-- A regulator as indicated on BHPAC Australia Coal drawing number 45/27.

27 or 26?-- 27, sir.

I see. Well, your note 3 says it's based on 45/26. Where do you get the 45/27 from?-- Those are two complementary drawings. The layout is based on 26 using the dates of extraction and the monitoring point in No 5 and in No 1 entries are based on 45/27.

I'm sorry, if I'm confused it's no doubt my fault, but are you saying the capital R refers to a monitoring station?-- A regulator and, of course, that should be the monitoring station.

In fact, you have heard most of the evidence at this Inquiry and no-one says there is a regulator in that position, do they?-- I have heard of a - various things like a prep seal being there and other things being there, and the drawing 45/27 shows in No 1 entry the same thing they have in No 5 entry, and the testimony and evidence is clear that there was a regulator in No 5 entry.

Well -----?-- So, if I made an assumption based on the testimony and this drawing that was incorrect, you will have to excuse me.

Well, 45/27 simply shows a capital M in each of the top return and the bottom return. Do you have 45/27 available to you?-- Yes, it's right in my hand, sir.

So, you don't mean by that to indicate a regulator, do you, on figure 1?-- I am assuming that those two slash marks that you have broken in the middle constitutes something that acts as a ventilation control. It's a very common notation for some form of ventilation control.

Is it? What's the capital R immediately outbye in the 510 top return? What does that stand for in your -----?-- That would stand for a regulator.

The same thing that you designate by capital R -----?-- I should have put - instead of an R, I should have put what you call those two marks.

Does the fact that you indicate a regulator in that position in the top return have any impact upon your analyses about ventilation in 512?-- Absolutely not, sir, other than the fact that that is where we have a set quantity of air based on that specific date.

I understand. Can I ask you to go over to page 4 of your report for a moment? You here mention a number of features to do with spon com. One of them is under the heading "Incubation" and you point out a number of the factors that determine incubation time. Do you see the place?-- Yes, sir.

Now, we have heard a few of these before. You mention that they are unpredictable. I take it that's because you can't actually control the factors; you take what you get with coal?-- If you wish.

270395 D.50 Turn 6 mkg (Warden's Crt)

Now, down below that you point out that dependence upon parts per million of CO or CO make can lead to confusing, if not meaningless numbers. Can you tell me what you mean by "meaningless numbers"? I understand what the English means. I am just wondering what an example of meaningless numbers would be?-- Well, I give the example to liberate approximately 15 lpm might indicate many kilograms of coal being oxidised with minimal rise in temperature.

Or the converse?-- Or the converse. One half - approximately a half a kilogram of coal producing about 14,000 Btu per minute, and that's a very hot fire.

Well, the figures aren't meaningless. It's surely just a case that you can't tell what's causing them?-- That's what I mean by "meaningless".

By "meaningless", I see?-- If I can't interpret - if I can come up with two different answers, that's meaningless, in my judgment.

All right, I see. I think I understand?-- Two opposite answers.

Or you can't ascribe one single answer to the figure?-- That's correct.

And in those circumstances if you can't ascribe one single answer to the figure, then on a parity of reasoning the figures are either meaningless or not susceptible perhaps of proper analysis?-- That's a more elegant way of stating it.

And this comment is equally attributable to CO parts as to CO make?-- Yes, sir.

You would agree, would you not, that given standard ventilation - sorry, I will start again. Given constant ventilation, parts will track CO make. Given constant ventilation, parts will track CO make?-- Parts should track CO make.

May they not even in circumstances of constant ventilation?-- There is a little more to it than that. That would be a very broad point. That's why I would rather use the word "should", not "would".

Are there circumstances where that may not apply, that's what I'm asking?-- I can consider a number of circumstances where that might not apply.

Such as?-- If I had a large body of coking - of cokes between the point of CO make - point of CO generation and the point of sampling - cokes absorb carbon monoxide. There is some absorption of carbon monoxide by certain wetness on coal. That will absorb carbon monoxide. So, I may have a lower concentration of carbon monoxide at my sampling point than in one circumstance. In other words, what I am really saying is we could have a tremendous - an infinite number of CO makes.

I see?-- Based on what conditions existed between the point of CO liberation and - or generation and the point of measuring.

I rather assumed that when you were referring to ppm of CO or CO make in this paragraph, it was a reflection of what one might see at the sampling point. Do we understand that not to be so?-- That is - you may understand that that may not be so.

I see. How then does one ever tell what the true CO parts per million are or the true CO make is unless one has an infinite number of sampling points or indeed a sampling point directly at the source of CO production?-- It's a problem. It's a real technique, and for this reason I am not too - I do not consider the use of either to be the sole means for interpretation of conditions. I prefer under some circumstances, not all circumstances - everything - in everything good there is evil, but where it's useful the CO/CO2 ratio is a useful indices, and where that is not useful then you must go to full sample analysis and, as we discussed before, look at the comparative rates of change of nitrogen, methane, oxygen as your principal gases and then how these relate to carbon monoxide and carbon dioxide.

The same difficulties that attend the use of CO parts and CO make for the reasons you have expressed attend the use of the CO/CO2 ratio, don't they?-- Yes.

So, to the extent that the one is meaningless, so is the other?-- Not to the same effect. The CO/CO2 ratio, except where you have a large body of water producing either a larger - acidic body of water or a highly alkaline body of water between the make and the point of sampling, it is under that one circumstance that the CO/CO2 ratio is inappropriate. Excuse me, I am wrong. Also in goafs that are large - that produce large quantities of CO2 as a normal part of its atmosphere. In those areas you are forced to go to full gas sampling.

Or, indeed, if there is CO2 in air, the air of the particular area?-- If you could only tell me where the area is.

Well, if one had, in the normal air around Moura, a percentage of CO2?-- At Moura the CO/CO2 ratio would have worked.

Sorry, if one had CO2 in the normal air around Moura, would that not impact upon the ratio?-- As long as that CO2 in the normal air around Moura did not change radically, as long as it was reasonably constant, and typically we find the CO2 is a reasonable constant unless there is something producing CO2 such as large quantities of decaying wood or a large body of acidic water, as we mentioned before, where we have this in contact with calcium carbonate containing materials.

Calcium carbonate containing materials belonging in the mines?-- Like stone dust.

Stone dust contains it. I am about to move to a slightly

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different point.

WARDEN: It might be an appropriate time, gentlemen. We will resume at 2.15.

THE COURT ADJOURNED AT 1.01 P.M. TILL 2.15 P.M.

XXN: MR MORRISON

WIT: MITCHELL D W

THE COURT RESUMED AT 2.25 P.M.

DONALD WILLIAM MITCHELL, CONTINUING:

WARDEN: Before you start, Mr Morrison, I am informed that on 31 March there is to be a one day mining seminar at Redbank conducted at the SIMTARS establishment. There is a list circulating of guest speakers and an agenda. I am informed that there has been some last minute changes to it, but it is possible that one or two members of the panel may be considering attending that seminar. If there are any objections or concerns, please, we would like to know, but I would indicate there are some last minute changes going on that I'm not quite aware of. Thank you.

MR MORRISON: Mr Mitchell, we were looking at page 4 of your report when last we spoke. Now, as I understood your evidence in relation to that part of the report which provides the alternatives for what 15 litres might signify, you added another one which wasn't originally here, but I think in agreement with Mr Martin, 15 litres might indicate nothing, in fact?-- I believe I say that somewhere in the body of this-----

Oh, you do? Sorry, I may have missed it. At least let's understand it in this context: it may indicate nothing, or a variety of alternatives, as you postulate there, ending with "many kilograms of coal being oxidised with minimal rise in temperatures"?-- That's correct.

Let me understand this rightly: the mere fact you get, say, 15 litres of itself doesn't tell you anything, does it?-- You are right.

Which is why you and other experts say, "Don't look at absolute values or point figures, look for trends."?-- That's correct.

Because if we looked at the figure of 15 litres - and Figure 2, for instance - Figure 2 in many ways would be consistent with and must, I think, necessarily be so, in your report, consistent with "many kilograms of coal being oxidised with minimal rise in temperatures"?-- It might be.

Absent other things, it might be consistent with that?-- It might be.

So, if one took the view that particular features of the method of mining and rate of production were likely to generate a higher than normal CO production and then higher than normal CO make, then if that was the view taken, such a graph could be viewed as consistent with what you say here - "many kilograms of coal being oxidised with minimal rise in temperatures"?-- If one was so imprudent as to take that view-----

Sorry, I didn't ask you for your view about prudence. Did you understand that I was asking you that?-- I'm sorry if I thought you asked that question.

I would like you to listen to what I ask and not proffer views about things which might matter to you, but not things which matter here; do you understand?-- I hope so.

If one had the view I postulated to you, that graph could be consistent with the last proposition on page 4 of your report; that is to say, "many kilograms of coal being oxidised with minimal rise in temperatures". Sorry, I thought you had it open. I think page 4 is coming to you now?-- I have it here now, sir. Excuse the delay.

I am directing you to the last in the sequence on page 4 and Figure 2?-- Up to the - some time on 6 August one might have that view.

And on the point that you are identifying is where it moves above that and consistently above that limit?-- Yes, sir.

And that you know to be about the time of sealing, don't you?-- Yes, sir.

Could I ask you one other thing while we are dealing with page 4, please? In relation to the indicators of spon com, you mention a number of them at the top of the page, one of which is smell, and we have heard a deal about that, I think I read your paragraph correctly to be expressing this view: that due to the range of sensibilities and the imprecision in identification, as such, that you would not advise dependence upon that signature?-- I would not depend on the absence of those things. If someone is saying that they smelt a certain smell, this being specific, should someone else say, "Gee, I don't smell that."? It could be he doesn't smell it because he chews tobacco, takes snuff, smokes heavily, has asthma or some other respiratory problem, so the failure to smell could be for causes other than the absence of the odour.

Just turn your attention to the last sentence in the first paragraph, please. "Testimony given before the Inquiry evidenced such a wide range of sensibilities that dependence on these 'signatures' is questionable and possibly impractical." Now, aren't you there stating that the evidence indicates such a wide range of sensibilities and identification that dependence upon that is impractical - not dependence on the absence, dependent on the signature?-- It is a poorly written sentence and I apologise for that.

Doesn't it, in fact, express the converse view to the one you have just proffered to us? It expressly says, "dependence upon the signatures is questionable and possibly impractical"?-- This is the problem with American English. You are right, and I apologise. It is - the failure to smell is what I believe the paragraph is implying.

Are we supposed to read this as really meaning the opposite of

what it says?-- I hope you would, sir. It is not the opposite of what it says, it is the intent of the paragraph saying that if you don't smell these things, maybe the reason you don't smell it is for reasons other than the absence of those things.

Your own physiology?-- Yes.

All right. I understand that point that you make there. Chewing tobacco and taking a pinch of snuff is no doubt more routine in the States than it is in Australia?-- As I understand, but it is not alien.

No. All right. Now, with the production of smells, smells are really just the aromatic gases produced by a heating; that is to say, a rise in temperature in coal?-- That's correct.

All right. And as the heating or as the temperature continues to rise or develops, then the production of such an aromatic gas would become consistent; in other words, it wouldn't come and go, it would start to become consistent, and that I think is reflected in that paragraph that Mr MacSporran read out to you?-- I was thrown by the word "consistent". You will have to excuse me. There is no consistency to it. The smells are there sometimes and the smells are not there sometimes, and you get these sweet smells more in the early stages of a heating rather than in the latter when you start getting the tarry smells and the volatiles.

I see. You are drawing a distinction between the sweet smells and tarry smells. I understand now. If the circumstances were such that the gases produced delivers a smell, particular smell, and it is evident upon the goaf air coming out and up, say, No 2 heading - if one encounters it then, if that condition continues or increases - that is to say, what produces the gas in the first place - on similar reversals at the same place or very close to it, would you agree that the probabilities are that you would encounter the same smell?-- One should smell something.

And that's where the probabilities would lie?-- Yes, you would smell - the chances are - would be that you would smell something alien to the normal mine atmosphere.

I understand. Can I ask you to turn to a different point, if I may, and that is on page 6 of the report. In the first sentence on page 6, "Any sustained rise in CO make, no matter how rapid or slow, is cause for concern."?-- Yes, sir.

Now, when one has an extraction panel, we have heard some evidence from Mr Mackenzie-Wood and others - Mr Humphreys, I think, and Dr Cliff - that what you get with coal as it is exposed to oxygen is that it oxidises at a certain rate, which, over time, drops off?-- Yes, sir.

And the next piece of coal that you expose to oxygen, it oxidises at maybe the same rate, maybe a slightly different rate, depending upon its features, and then that drops off?-- That's correct.

Over the course of extraction, would you not expect then for there to be an incremental increase in CO production and CO make simply by the very nature that none of the coal in a few months stops oxidising, all of it continues and some is oxidising at a greater rate than the other stuff?-- Basically, yes.

So, if we looked at that particular scenario, then, would you not then see a sustained rise in CO make, albeit slow, from the very nature of continually exposing more new coal to the air?-- Yes, and as you've pointed out so often, you have to read the whole sentence.

Well, I did read the whole sentence. "Any sustained rise in CO make, no matter how rapid or slow, is cause for concern." full stop?-- Right. Now, the next sentence defines what the word "concern" means, which applies to your question.

I haven't yet got to the next sentence?-- Sorry.

I was at the first one. Take it step by step. Such an experience - that is to say, the normal experience of exposing coal to the air - would not be a matter for concern, would it?-- Any sustained rise is a matter of concern is what I say here, and I'll stick to that.

I suppose, then, the answer to the concern that might be generated by the normal experience of exposing coal is answered by exactly that - the experience one has in normal panels?-- Experience and knowledge, both, yes.

So that one could turn to, for instance, the history of a mine, or, indeed, continuous panels, or similar panels within the mine in order to draw upon experiences to - how to analyse what one was seeing?-- And other panels.

And other panels as well. All right. Now, the balance of this paragraph here on top of page 6 deals with Figure 2, I think, doesn't it?-- It does, sir.

And this is a document generated by you which draws upon two features, firstly velocities as taken from time to time, but in no case, I think I'm right in saying, are those matched simultaneously with a CO figure. You have taken daily averages; is that right?-- With some exception - with one exception.

And the one is Mr Tuffs, and-----?-- That is correct, and we see Mr Tuffs' reading is indicative of a problem.

Yeah. If the reading is true, that's right, isn't it? If the reading is true? Obviously-----?-- All readings are true until you can prove them false, but first you must accept them as true and if you have questions, then the question is: under what circumstances is it not true? Not the converse - that this is false instead of true.

I see. All right. Now, you have taken daily averages for all

of these figures with the exception of Mr Tuffs; is that so?-- I believe Mr Tuffs and also the points above Mr Tuffs, to the far right of the graph - the points to the right of Mr Tuffs' point.

I am wondering about the Tuffs point because he got, as indicated on this graph, something like 25 litres, yet his calculation that night was 16. How do you account for that?-- That's a good question. I just noticed that, and let me go to the raw data if you would, sir?

Certainly. The raw data shows 16.66 as calculated by him?-- Mmm.

You must be taking a different figure?-- I took the Unor reading at that same time.

Which time was that?-- Hold on, please. I have a reading of 10.2 during the hours of 8 p.m. to 9 p.m.

On monitor point 16?-- Yes, sir.

You have used a different figure again from - I see - all right?-- 10.2 with a 1.1 velocity gives me a litres per minute of 24.15.

I see. Now, you have ascribed that on Figure 2 as 8 p.m. on 6th of the 8th?-- Yes, sir.

And that's because that's what Mr Tuffs said, isn't it?-- I believe so.

Now, in relation to the graph generally, Figure 2, that is to say, as I understand your report, this is not - whatever its features - is not the sort of indicator you would primarily use. You would use the CO/CO2 ratio as your primary indicator?-- I prefer that.

Well, can we turn to that for the moment? In relation to the CO/CO2 ratio, can I just investigate a couple of things about that? It has obvious difficulties if CO2 is affected by some of the features you have mentioned - absorption in water or background CO2 in the air and the like?-- That's correct, and when those are important, one must not use that ratio.

And if the inherent CO2 content in the coal varied one would have to take that into account as well?-- That's correct, sir.

Now, we have heard a number of people, and I think you agree with them, that there are potentially quite significant variations within a seam and within small parts of a seam in coal?-- In coals - some coals, yes. The Unor data, the Unor Maihak data for 512 do not show major deviations from a norm for the CO2 ratio - for the CO2 concentration.

But what it does show you is that the CO2 stayed pretty much static, doesn't it?-- Yes, it does.

In relation to the CO/CO2 ratio can we understand a couple of other things about it? It's true, isn't it, that it's not generally applied in Australia?-- We used it at Ulan mine. I'm not familiar - let's say the only mines I'm familiar with in Australia what they do is Ulan, the Cyprus mines, Gordonstone and Moura 2.

Can you tell me where Cyprus is?-- They are down in New South Wales.

Gordonstone and Moura 2. Moura 2 you are only familiar with out of this Inquiry, and Gordonstone I think equally recent?-- October.

So you can't comment upon the wider application of the CO/CO2 ratio beyond saying that it was used at Ulan?-- Yes, and it will not be used at Gordonstone.

In what circumstances was it used at Ulan? Was that after sealing of a panel?-- Well, I was involved in the recovery of Ulan mine.

Was it during the recovery operation that it was used?-- Yes.

And used basically because you either advised or decided that it should be used?-- Yes.

No evidence that it had been used prior to your involvement?-- I don't know what they did prior to my involvement at all.

Do you understand also - or can we understand correctly also that that ratio is also not commonly used in the UK?-- It is not commonly used in the UK.

And there they depend very heavily on Graham's, don't they?-- That is correct.

And you, as I understand your evidence correctly, you find the Graham's a particularly unreliable indicator?-- Not in the UK. In the UK it's a very reliable indicator in the single entry, particularly the advancing longwalls. They are having some problem with it in some of the retreating.

Now, in relation to page 6 on your report when you come to the CO/CO2 ratio, in the second paragraph of that section you say

that - dealing with the first sentence, CO₂ is liberated during oxidation of coal and should be seen before CO. "Its subsequent rate of rise, however, is not as rapid as is the CO rate." Do you see that?-- Yes, sir.

Is that true for Bowen Basin coals or might it be that Bowen Basin coals, the CO₂ rises more rapidly than the CO?-- I heard some testimony about this the other day. I'm trying to recollect it. I don't know whether it's true with respect to the Bowen Basin coals. It is true for 16 of the 17 coals examined by Chamberlain and his colleagues in Great Britain, and it's true for almost all of the coals in the western Unites States and it's true for the coals in Alabama and West Virginia and Pennsylvania.

If it happened not to be true for Bowen Basin coals, that has an impact upon the utility of the ratio, doesn't it?-- If it's not true for that then it would not be an appropriate item to use, yes.

Another feature of the use of the ratio, if I can just call it the ratio from now on, is the one you mention in the next paragraph, that is to say the impact of water upon it, and you mentioned this earlier, I think?-- Yes, sir.

Now, if it was the case that this panel had quite a degree of water in it that would also impact upon the utility of that ratio, wouldn't it?-- Very much so, yes, but the evidence does not support a large body of water during the months of June and July in the 512 Panel because it would collect, and if it did it would have an adverse impact on the ventilation analyses made by myself and IMC because that would have tended to block off the No 5 entry at its junction with 12 and 13 cross-cuts.

Well, we can certainly go to the evidence in due course. I don't mean with you, but we generally can go to the evidence in due course to see what has been said about water in the panel, but let's stick with the general principle. If it's evidence of a significant amount of water in the panel that will have an adverse impact on the utility of the ratio, wouldn't it?-- I answered yes to that before.

Sorry. In relation to the carbon monoxide, as you point out that's given off at a lower temperature initially than CO, isn't it?-- Carbon dioxide is given off at a lower temperature.

Generally at the early stages of emission that's in such small quantities, would you agree, that it gets lost in the overall CO₂ of the atmosphere, in the early stages?-- Yes.

And that's another factor which one has to bear in mind in assessing the utility of the use of that particular ratio?-- And it is the reason why developing a history for a panel from its inception is a critical adjunct of monitoring where this potential for spon com exists.

And just as with the other ratios where you would advise

against the adoption of absolute values as being particular indicators, so too with this ratio, would you agree, there is no particular figure or absolute value where the ratio represents a heating?-- There is no absolute value in any ratio indicating anything. One must follow the trend and trend alone.

In relation to the graph that you have produced in Figure 3 which is of the CO/CO2 ratio, it exhibits a number of peaks and troughs. Do you have it now?-- Yes, sir.

Could it be that the accuracy of the analysers would account for the peaks and troughs?-- If you are talking about the peaks and troughs that are occurring approximately - let's say the 20 something of June onward that might be the case. That could be one of many reasons, but I don't believe my discussion relates to that period at all.

No, but mine does. Now, the analyser for CO2 reads between 0 and .5 per cent. I ask you to accept that, and the normal drift for the analyser is two per cent. It's well within the variations that one therefore would get on the analyser that you would have peaks and troughs shown - let's accept the period you discuss, 25 June on?-- You might, that might.

And one would, in trying to determine an appropriate CO/CO2 ratio and then graph it, have to take into account a couple of the features that we discussed earlier, namely whether there was background CO2 in the air?-- Yes, but as long as that background CO2 in the air remains reasonably constant its involvement in the calculation becomes of no consequence.

If it is consistently the same, what you are saying is that the trend will be evident even though the absolute values might be wrong?-- That's correct, but I don't want to use the word "consistently". As long as it's reasonably - in other words not jumping by large amounts up and down.

Now, we agreed before that the CO2 remained pretty much flat. Do you recall that?-- Yes.

Therefore the rise, if we turn to the rise that you do find significant, 19 June, is really due to CO, isn't it, not CO2?-- Well, the rise as shown on Figure 3 is the ratio, and you are correct in that the ratio is increasing because the CO is increasing at a faster rate than is the CO2.

Well, as the CO2 remained pretty much flat, how is that consistent with a heating, and to try and not use the word "consistent", constant flat CO2, how is that consistent with a heating generating what we see at 19 June?-- We don't know that it is consistent with a heating. All we know is that there is a very sharp rise that one should reasonably pay attention to and respond to.

Well, if the CO2 did not rise isn't it correct to say that in all probability what we see at 19 June is not given by a heating because a heating would generate a rise in CO2?-- I would not say that's correct to say. In fact one can say that

the consistency in the CO2 should have been a matter of concern to persons monitoring the Unor data to find out why it was so consistent because its an abnormal thing to see.

Well, what we do know is that it was flat and constantly so, don't we?-- It was reasonably flat and seemed to maintain a reasonably level trend.

If there was a heating would you not expect there to be a higher production of CO2 than that trend indicates?-- I don't really know.

Would you agree with this proposition: the CO2 outflows would be up to 100 times greater than the CO during the beginning of a heating?-- It's actually infinitely greater than the CO at the beginning of a heating.

Well, if that's so then the greater will include the lesser and you will probably be able to agree with my proposition, that the CO2 outflows are up to 100 times greater than the CO during the beginnings of a heating?-- I wouldn't put a number, just agree that it's greater.

I only put the proposition to you because it comes from your book?-- I know, but right now I'm not interested in using the term "a hundred" because at the period before CO is generated it's infinitely CO2 than there is CO.

In which case we should see for any part per million rise in CO that much higher proportionate rise in CO2, shouldn't we, if there is a heating going on?-- That should be expected unless something is absorbing the CO2.

What might absorb the CO2? Water?-- Water, very wet coals - if I had a very large pile of very wet coals, that would absorb the CO2. It would absorb CO also, but it could absorb more CO2 than it would absorb CO.

For the purposes of this discussion let's assume that your assumption about the evidence is right and that there is not a lot of water in this panel. We don't see that proportionately very high increase in CO2 to the rises in CO, what might account for that if it's not the absence of a heating?-- That would be something I would like to investigate.

In relation to Figure 3 while that's there, that graph has been obviously produced by yourself?-- Yes, sir.

And in doing so have you allowed in that graph for calibration error on the analysers?-- No, sir, we take the data as it is and hope that the errors in analysis in the equipment and all don't jump around like - too much.

Have you taken into account, I assume not, the background CO2?-- No, you don't - that is not an appropriate technique.

Have you allowed for the recalibration of the analysers?-- You allow that the analyser is calibrated routinely and based on what we see in the data the change in calibration doesn't

seem to be too great.

Well, we now know that it was recalibrated on 19 or 20 June. Did you take that into account in generating the graph?-- I took the data, as I said earlier, as they came and I did notice the calibration and I did notice that the change was not critical in my judgment.

Well, just let me ask this: can I ask you to have a look at this graph? This is a graph which reflects the correction of CO2 for point 16 with reference to, amongst other things, point 14 which measured just natural air and we can see the recalibration shown on this graph as well, 20 June. Do you see that?-- Yes, sir.

And the blue line is recorded daily averages and the red line is corrected values. Do you see that?-- Yes, sir.

Do we see that as a result of the recalibration, contrary to the period before that time subsequent to that time, as corrected, the CO2 read the same, the disparity no longer exists; is that right?-- I'm sorry, I didn't -----

Disparity between the recorded daily averages and the corrected values. Do you see the disparity?-- Yes, I do.

If one carries back the calibration - the recalibration back in time you will see that there was a significant disparity that wasn't -----?-- There was a disparity.

And as corrected the CO is flat as you've pointed out?-- The difference between the two is not as great as it was prior.

I'm sorry, I think I said CO, I meant to say CO2, I beg your pardon. I tender that graph.

WARDEN: Exhibit 251.

ADMITTED AND MARKED "EXHIBIT 251"

MR MORRISON: Can I ask you something else in relation to Figure 3? On what paper is this graph drawn?-- I'm sorry, I don't understand the question.

Well, I'll try and be clearer. Is this on cartesian paper?-- Yes, it's not - the graph is a cartesian graph it is not semilog.

It's not semilog, is it?-- No.

You've expressed the view before that in relation to discerning trends on the CO/CO2 ratio it is impermissible to do it on cartesian paper, that one must do it on semilog; isn't that right?-- No, sir, that's not right. The word "impermissible" is the wrong word.

XXN: MR MORRISON

WIT: MITCHELL D W

What would you say?-- I would suggest that semilog - that when one looks at trends one is best to look at semilog graphing of the trend, but if you will recall, that is not with respect to CO/CO₂, that is with respect to the analysis of all gases from gas chromatography.

If I read this to you: "Detection procedures should include...", amongst other things, "...plot the ratio CO/CO₂ on 2-cycle semilog paper; ratio on ordinate, day on abscissa. Trends cannot be determined from plots on cartesian co-ordinates."?-- That's correct.

That's page 30 of your own book?-- That's correct, and that's a correct statement. You can't calculate the trend, you are right.

So when we look at Figure 3, it being done on cartesian co-ordinates, is it not true that we should not use this to discern trends?-- You should not calculate the trend. You can observe an increase, and it was done on cartesian in so far as all of the graphs presented were cartesian, and I did not want to give you something to confuse the question.

So you are saying we can determine trends from figure 3?-- No, I did not say that. I said you cannot calculate trends from Figure 3.

But we can, what -----?-- You can observe an abnormal rise.

In the book when you say, "Trends cannot be determined from plots on cartesian co-ordinates.", that is meant to be read as trends cannot be calculated rather than trends cannot be discerned or determined?-- Well, they are semantics now and "determined" to me means one plus one divided by something and you come up with an answer.

It would have a different appearance, wouldn't it, on the semilog - or at least I suppose we have to speculate about that because it has not been done, isn't that right?-- It was done and I'm trying to remember, and I won't speak to it, no, I can't remember specifically.

Certainly bearing in mind your own book this is not the sort of graph that should be put forward for critical examination of trends?-- If I were fighting a fire this would not be acceptable. For the purposes of this Inquiry, in my judgment it is more than satisfactory.

Notwithstanding that it doesn't take into account the recalibration impact, the background CO₂; is that right?-- That's correct, sir.

It also contains within it this feature that what is done is that the ratio is not shown, is it, a percentage is shown here; is that right? You've applied a multiplier which happens to make it a percentage?-- I see what you mean. Our practice is just to divide parts per million by per cent CO2 because this gives a number that people like yourself can understand.

Well, in doing this you have applied a multiplier, haven't you, to make the differences more apparent? I think you have multiplied all the figures by 100; is that right?-- I didn't multiply by 100, no, sir.

Well, how did you - what multiplier did you apply in order to make the differences more apparent?-- No multiplier. Let me give you a for instance. On 18 June you had 4.2 ppm of carbon monoxide and .12 per cent carbon dioxide. So, that is basically 420 divided by 12 and that comes out to be 35, and - now, let me get myself straightened out here. That comes out to be 35, and I'm looking for that.

Take your time?-- Actually we divided these numbers by 100.

Divided them by 100?-- They were divided by 100 to get it - this turns out to be - I'm sorry, I misspoke. This is per cent divided by per cent.

Yes, it is a percentage, not the ratio itself at all, is it?-- No, it isn't.

If we did the graphical representation of the ratio from the SIMTARS documents, if we took the range measured by SIMTARS of .005 to .36, that is on the scale from 0 to .4, would you agree with me that that would produce a line showing close to 0 up to midnight on 7 August?-- No, sir.

Fine. Now, you do agree that there has been a vertical exaggeration applied to your figures, don't you?-- No, I don't.

All right. Now, let's move to another point. The data that you show in figure 3, regardless of its pedigree or otherwise, clearly enough is not something that existed at this mine, is it?-- Would you say that again?

Sorry, I will make it a little clearer. Perhaps a trite point that you will agree with, I am sure. No-one had the CO/CO2 ratio plotted or calculated at this mine, did they?-- That's correct.

So, in so far as your comments are given about what this data might show, you are talking about a hypothetical situation?-- You're right.

Now, can I turn to another point, if I may? On page 8 of the report, you deal there with spon com mitigation, and in that first sentence you express what is truly, I suppose, the theme of your experience and that is to say that the best bet is to monitor the CO/CO2 ratio. You place that ahead of all the others?-- Yes, sir.

Now, further down that page you express the view that from the beginning of retreat operations at least one stopping between 12 and 13 cross-cuts should have been kept open. Now, do you mean fully open? I assume not because you refer to stoppings. Do you mean one door in one stopping should have been kept open?-- There must be a way for air to go from the face to

13 cross-cut.

Yes, I agree?-- And for that we have to have one or more stoppings between 12 and 13 cross-cut open. I would not have this arbitrarily, I would - with the way they shoot up 13 cross-cut it's hard to say, it depends on the effects on flow of air. Personally I would prefer to see the stopping in No 4 cross-cut be the means of main outflow from the goaf.

Well, you know from the evidence that there were stoppings across - along the back of the panel between 12 and 13 cross-cut and that there were doors in them that were open, don't you?-- There were doors in them. It was not clear from the testimony given, I believe, by Mr Morieson that they were open at the time that he arrived at that point sometime in June.

You are referring to one occasion then when there may have been stoppings closed and not even all of them; that's the effect, isn't it?-- Well, we don't know about the others. I believe Mr Morieson only spoke with respect to the stopping in No 2 entry and maybe in No 3, I don't recall.

Well, this comment that you have put in this sentence is meant to cover the entire period, is it not, from the beginning of retreat operations to the end?-- Assuming that they had stoppings or ventilation controls in the - between the No 4 and 5 entries from No 5 cross-cut inbye.

I'm sorry, we are at cross-purposes. I am asking you about that sentence that we are directing our attention to. Isn't that sentence meant to comprehend the entire period from the start of retreat to the finish because you say from the beginning of retreat something should have happened?-- Yes, they should have kept one stopping open, yes.

Or more?-- Or more.

And the reason you put this in here - I'm sorry, I will start again. We know that that was in fact the case, don't we, except for perhaps that one occasion Mr Morieson talked about?-- We - I have heard no evidence that gives us reason to believe stoppings were either opened or closed between the No 12 and 13 cross-cut with the onset of retreat mining or at least when they were mining and taking bottoms in 9 and 10 cross-cut areas.

Well, is this sentence put in then to indicate in some way your opinion or your view that for that period there wasn't a door open in those stoppings? Otherwise why say it?-- I have no view. I'm just saying that a door should have - at least one door should have been kept open. If it was, good, but if it was, with the absence of ventilation controls in the stoppings between No 4 and 5 entries and also the opening breaches made in the stoppings between the No 1 and 2 entries, those openings in the back were meaningless. That's what the rest of the paragraph says. In the total context that is a hanging sentence.

Well, it's not really, is it, because it is qualified by the very first one. The whole purpose of this paragraph is to advance some criticisms by you of adjustments made to stoppings and ventilation controls in the context that they had exacerbated spon com and in that context you offered a second sentence?-- And the third.

Just pause?-- And the fourth.

Just pause, please. We are only dealing with the second at the moment. The fact of the matter is that whilst it's proffered as an indicator of what is in the first sentence, there is - in fact, you have no reason to say it, do you?-- Yes, I do have a reason to say it.

What's that reason, the one occasion when Mr Morieson said that a stopping was closed?-- No, my reason to say it is that good ventilation practices would have had at least one stopping between 12 and 13 cross-cut open. If this was the case, good. If it wasn't the case, then we had bad ventilation practice.

But, Mr Mitchell, you are proffering it as an example of what is contained in the first sentence?-- As you read it.

But that's the way it reads, Mr Mitchell. You wrote the report?-- Yes, sir.

As an example of the first sentence you give the second, but it's just not so, is it? As you describe it, it's a hanging sentence, hanging there in mid air, and it may or may not be right, who knows?-- It is part of the total ventilation picture, and this is for the panel to decide. The panel will have all the information it needs, and the Warden will, and if they find that they - there was at least one stopping open back there, they will take that into proper consideration. If they find this is questionable, that's their decision. I don't - I can't speak for them.

Well, we are certainly not to read the second sentence as being an actual example of exacerbating spon com, are we, because it's not an actual example; it may or may not be right depending on the evidence. That's the way - the position, isn't it?-- As you read it.

Is that so or not? Do you agree with me or not?-- No, sir.

You don't agree with me?-- I've made that clear, I believe, in my prior answers.

Now, over the page on page 9, the first complete sentence up there is, "As mentioned previously, air flowing out of the goaf into the No 2 entry could have been caused by excessive leakage through stoppings between the Nos 2 and 1 entries outbye 9 cross-cut." Now, that sentence is a conclusion or a view that is dependent upon your ventilation analyses?-- That is a conclusion, sir.

Dependent upon your analyses?-- No, sir. Supported by the

analysis but not dependent.

Well, the only basis for it that is offered is the "as mentioned previously". The only thing "as mentioned previously" is the analysis, isn't it, in this context?-- Let us go back to the "as mentioned previously", sir.

Well, the only thing that you have mentioned about leakage through there is what you referred to in the footnote on page 2, footnote 5, and that refers up to the last sentence of the middle paragraph. Now, do you agree or not?-- It applies to the entire paragraph beginning under the subheading "Ventilation" and ending with the word "stoppings", not to the one footnote or one sentence.

So far as it deals with leakages, what is there but your analyses of the ventilation system to indicate that?-- We talk about - actually the second sentence - the second paragraph is a part of that too. The fact that they were getting layering right at the working face is typical of inadequate pressure between the working face and the back of the panel.

Well, we are talking about leakages between No 2 and No 1, that's into the top return, not to the back of the panel?-- Now, wait, these are all interrelated, sir. The only way that - with that quantity of air that they had, almost - and I believe it was in excess of 50 metres - cubic metres per second, and as you - and as IMC has calculated, approximately 100 pascals - with that there was more than enough air quantity and pressure to push air through this goaf effectively. We find instead that air is not pushing through the goaf effectively, we are getting reversals and we are not getting air flows into the back of the goaf.

Do you ascribe that to leakage into the top return?-- Yes, sir.

Fine. So, the analyses and the fact of the reversals are what you rely upon for that; is that right?-- And my experience in this area.

Well, no, I'm sorry, I'm talking about what's listed in your report and what we can derive from it?-- Okay, I would say you're right.

So, when we come to the top of page 9, what we rely upon there, to read that first complete sentence, is the analyses and the fact of reversals; is that so?-- Yes, to a large measure.

Now, can we move onto the next section, please, the pressure differentials? You here offer the view that they weren't done and they would have shown something had they been done, basically. Now, would you agree with me that if you measured the pressure differentials across the regulators, what that's going to show to you is whether there is an increase or decrease in the resistance of the panel?-- Yes, sir.

Now, what it's not going to tell you is why that increase or decrease has occurred?-- That is exactly what happens next. We now get the answer why. That's the whole purpose of mining.

And there could be a lot of reasons for it which would include roof falls, temporary changes in the ventilation because of mining position, even regulator changes in 5 South or 510. All of those could impact upon whether you have an increased or decreased resistance in the 512 Panel?-- Exactly.

So that all you can say here, surely, is that had pressure differentials been done they might have indicated something, not that they would have indicated anything different or led to a different course of action; isn't that right? It's entirely speculative?-- And, as we say, these changes must be brought to the attention of management and understood, if not remedied, at the time of their finding.

I understand what you say there. That's not quite answering my question. My question was directed to this: that whilst there might be a comment that pressure differentials were not taken, it is a matter of speculation thereafter as to what they would have shown, what the cause would have been and whether it would have led to any different conduct?-- Not speculation, sir.

Well, we don't know what the pressure differential showed at any particular time, do we?-- No.

And we don't know why - if such a change was shown, why it occurred?-- That's correct.

Nor do we know, because it never happened, what might have occurred as a result of finding out that information?-- That's a shame.

So, it's all speculation, isn't it?-- I would not categorise that as speculation. We just failed to do the job.

I see. Now, can I take you to page 10 of your report, please? Under the heading "Monitoring Behind-Seal Atmospheres", you there offer some views about the number of monitor points and their positioning and so forth and all to the effect - this is on page 10 - that it would militate against dilution from the exchange of gases between the open and sealed atmospheres?-- Yes, sir.

Now, we know that this panel pressurised very quickly with an outward pressure?-- Yes, sir.

Would that not by itself militate against dilution between the outside/inside atmosphere?-- No, sir.

Why would it not?-- The very fact that we have such a rapid rise of internal pressure, then as these gases are flowing out there will be air leaking in.

I see. The gases flowing out are those that are accumulating

in the panel from increased methane make and increased CO make; is that true?-- Well, let us say some gas - something caused a rapid rise in pressure because the evening of 7 August they monitored 3 per cent methane at - along one rib outbye - immediately outbye the seal, the stopping, or whatever you want to call it, in the belt entry, and that indicates an outflow from that point.

I'm sorry, could you say that again? Which stopping outside the belt entry?-- It was - I'm fairly - I hope I'm correct. The reference in the discussion, I believe, by Mr Blyton with reference to somebody else taking a measurement, they are finding 3 per cent methane, I believe, along - I may be incorrect - but along the left rib.

Of the belt road seal?-- Immediately outbye the thing in No 3 entry, which would be the belt entry.

I understand you are reluctant to call it a seal; I won't press you to do so. The thing. Okay, let's talk about these things. Now, these things that were put across all these entries pressurised early and as a result at least methane and possibly more gases than that were coming out under pressure from inside?-- Yes, sir.

Can I suggest to you that, in those circumstances, that is a factor that militates severely against dilution from the outside atmosphere? We disagree about that?-- I disagree. That same person who measured 3 per cent methane, let us assume, along the left rib, if he took a smoke tube and went to the right rib or up along the floor he might find, lo and behold, the flow into the belt entry.

And this is another piece of speculation, isn't it?-- No, this is common. It's speculation - I just said if somebody - he might find -----

This is speculation?-- It's very typical.

It's speculation?-- If you wish, but this is what we find commonly.

I understand what you are saying. Now, over the top of the next page, page 11, you make this point: "Before sealing, all stoppings must be breached in the first two cross-cuts or to the sample points, whichever is farther." Do you see that?-- Yes, sir.

Now, were you here when Mr Stafford gave evidence?-- When who gave evidence?

Deputy Stafford?-- No, sir.

Deputy Stafford gave evidence that at least on his understanding it was one of the absolutely critical features that arose out of the Kianga report that one not do this at all, ventilation controls not be interfered with. Now, if that is so, then there is a dichotomy of views between that view and your own?-- There is a great difference, and I hope

the Australian miners do not continue with that view.

Well, let's just understand that there is a big dichotomy, is there not? If that view is truly understood and correctly understood as arising out of one of the reports in this case, it expresses a contrary view to your own?-- It is contrary to -----

No, sorry -----?-- ----- experience.

Excuse me, Mr Mitchell, you really must try and pay attention to the words used. It's a contrary view to your own, that was the question. You have now tried to go and answer some other question. What's the answer? It is a contrary view to your own, is it not?-- That view is not my own. That's the reason for -----

Excuse me?-- ----- my statement.

Are you having some difficulty understanding the words? I am not using American English. It's a contrary view to your own, is it not?-- Sir, what I have expressed is not my view, it is what I have learned and been taught. It is the view - it's the view, it's the picture, and -----

Is it not -----?-----

MR MARTIN: Let him finish. I insist that the witness be allowed to finish his answer, please.

MR MORRISON: Well, I'm happy to allow him to finish any answers, but we are not getting too many of those. Is it not your own view; is that what you are saying? Some people hold this view but you don't?-- My experience and training has been to breach those stoppings inbye, and this is a standard practice, it seems, throughout the world except here in Australia.

Mr Mitchell, it is your view, isn't it, this should happen? Is it your view?-- Well, I accept this, so if I am accepting it, it must be my view then.

Fine, fine. And to the extent that we understand differently out of the Kianga report, I hesitate to ask: does that not mean it is different to your view?-- What is being recommended in Kianga is different from what I am suggesting or recommending here.

All right, okay. Now, can we look at something else just a little further down, please? Under the heading "512 Monitoring", the second paragraph, you express the view there that the top return is the entry in which highest concentrations of fire gases and methane were likely to be found. Is that so?-- That's so.

That's purely a product of its elevation?-- Yes, sir.

And that's not only its elevation with regard to the most inbye end of the top return, but across the panel laterally?-- That is correct, sir.

And the accumulation of those gases, no doubt, would be impeded to some extent or other by the fact all the stoppings were up and sealing off the goaf from the top return?-- That is correct, sir.

And the minute we sealed, we would no longer have the condition of lower pressure in the top return as compared with the balance of the panel?-- That is not correct, sir.

Well, what would generate the lower pressure in the top return once the panel is sealed?-- The pressure inside of a sealed area - the pressure drop across a sealed area internally will equal the pressure drop on the external faces; so if, for example - if I have a drop between No 3 and No 1 - because that's the way they ventilated it - it is 3 to 1 and 3 to 5 - if I have a drop - and we will just pick a number out of the air of 10 pascals between No 3 and No 1 externally - then if I took an internal measurement, lo and behold I would find a similar equal drop internally, and the law is that air or atmosphere will always flow from a point of high to low pressure, which means that when you have a flow, as they did have from No 3 towards No 1 entry along the face of the seal - they had a flow internally from No 3 somewhere - internally - it got from 3 over to No 1.

Fine. Now, from what we understand, then - from what you postulated it is necessary then that inside this panel we had, in addition to convection, a pressure differential driving gases to the top corner?-- That is what happens, yes - driving atmosphere to the top corner.

Okay. And along No 2 roadway - it would try to get to the point of low pressure, which is next to the-----?-- 2 would be at a lower pressure than 3 the way they had this ventilated after they constructed their various brattice and the rest in 510. You must look at this with respect to the ventilation controls that were installed in 510.

I understand, but the point I was asking about was the fact that the atmosphere would try, according to your theory, to get closest to the thing that covered the top return - I'm not going to call it a seal - that thing - that's the point of lowest pressure - and to do so would go up No 2 roadway, by and large, because it couldn't get through the stoppings that separated the top return in No 2 road?-- That is correct.

So, the most immediate point of accumulation, then, quite apart from what made its way up the top return from the most inbye end of the panel, the most immediate point of accumulation will be No 2 roadway, 1 cross-cut and across the gradient?-- You're correct.

And if we see, in fact, that there is almost no or very little

difference in real level elevation between the belt road seal - sorry, thing - and No 2, then we could expect a fairly quick accumulation of gases from No 2 back through to No 3?-- I don't like the use of the word "quick". Eventually you might.

I accept that. Now----?-- It is highly unlikely that you would get - if I sampled No 2, it is highly unlikely that I would ever see an atmosphere exactly the same as in No 3.

Right. I accept what you say. Now, then, if you sampled anywhere in the panel, from what I understand you to say, and others, you are not going to get any two points showing you the same sample, are you?-- No.

Because of convection currents, pressure differential, different rates of emission and so forth?-- Sample point 5 will always show the lowest concentration of fire gases.

Oh, no, that's not right?-- Yes, it is.

If you put a sample point in the bottom return right up near its seal, it would show less, because it is a lower gradient, isn't it?-- Number 5?

Yes?-- Because of the pressure differential going from 3 to 5, the way they had it ventilated you would have a flow of atmosphere internally from 3 to 5 and it could very well overcome the gradient, which was not that great between those entries.

All right. I understand what you are saying, I think. Can I just ask you about Figure 4 very briefly? Figure 4 is, again, a CO/CO2 - is says "CO/CO2 Ratios" for various points in the mine. Does this suffer from the same features as figure 3?-- Yes, sir.

So, they are percentages again and not plotted on cartesian coordinates?-- That's correct.

Just susceptible to all the difficulties of figure 3?-- The data aren't worth trend analysis.

Can we turn then to a different point, if I may? That is in relation to the site of the first explosion, page 14. In relation to that, towards the bottom of the page you deal with 5 South and 520, and you have made your points earlier about the absence of a significant methane volume there. Now, what you don't seem to deal with, but I'm interested to hear very briefly, if I may, is whether interseam emission is a factor that might play a part. Do you understand what I mean by "interseam emission" - emissions from C seam down to D, or E up to D - that is seam----?-- I understand that.

It is not mentioned in your report and I'm wondering whether it has been taken into account and discounted or----?-- The only thing we know about 510 - 5 South and 520 is what the Unor Maihak system tells us about the samples that were taken at 2 and 5 South and the one good one in 510.

You are talking about-----?-- 520, excuse me. 5 South and 520, excuse me. The only thing we know about those are the two samples, points 6 and 7.

Okay. So, they don't show any big build-up that would be consistent with interseam emission?-- I don't know what they - that they show anything related to interseam emissions. All I know is that they don't show much methane at either sampling point.

Now, the original point that I wanted to come to was does that mean that you have taken that into account and been able to dismiss it, or is it not something that you have taken into account?-- I'm not looking at sources of methane. I'm looking at the methane concentrations that we know, as a fact, existed, or within reason existed at points 6 and 7.

All right. Can I just ask you this: the opinions you proffer on page 16, you say the most probable site of the first explosion was within 512?-- Yes, sir.

And the next sentence is an expression of your view which is basically based upon what that analysis of the CO/CO2 ratio shows - the jump?-- And also the CO make, had it been plotted properly.

Fine. I understand. Can I just ask you about the last paragraph of your report? You there offer the view that smoko, as it is practised, is inconsistent with mining practice?-- Not mining practice. They are consistent with mining practices in Australia.

Fine. All right. It is an Australian feature, isn't it?-- It is an Australian feature.

And no doubt those who enjoy it will be jealously guarding it, but do you recommend basically that it be done away with?-- I recommend that deputies or some other certified person be with their assigned crews as long as their assigned crews are underground.

All right. Can I just ask a couple of things about that? You do understand, don't you, that production deputies don't leave their crews underground - you do understand that?-- Yes, sir.

So, for those deputies at least, they don't leave their crews underground and come up for smoko; they stay down?-- That's as I understand it.

The other outbye deputies don't have a crew; they are in charge of simply doing inspections themselves; is that so?-- I'm not quite sure - who is not - give me an example of an outbye deputy.

A non-production crew deputy; one in charge of inspections of spare panels, outbye areas of the mine, the belts - in other words, the non-production areas?-- Well, they must have people doing work on the belts or doing work on maintenance or doing something, otherwise they are not supervising.

So, is it confined really to those deputies, your comment?-- Who are supervising persons, yes.

In the event that there might be some deputies who are supervising men underground and leave them to come up to the top of the pit to have smoko, that's the confine of that comment?-- That is my concern.

All right. And that's what's reflected if you go back to page 1. Am I right in saying that's the point you make in paragraph 6 in your-----?-- That is correct.

Thank you, Your Worship. I have nothing further.

RE-EXAMINATION:

MR CLAIR: Mr Mitchell, can I ask you to go to page 2 of your report there?-- Yes, sir.

You were asked some questions by Mr MacSporran, in fact, in relation to some of the details contained in your note 8; do you see that?-- Yes, sir.

Which reads this way: "Analyses indicated the most likely sites for the fugitive air flows that can lead to spon comb were in areas adjoining the inbye ribs of the large pillars between Nos 4 and 5 entries, and between the 9th and 10th cross-cuts in the Nos 1 and 2 entries." Now, why do you isolate those areas, first of all?-- Well, I isolate those areas, first of all, because IMC International Mining Consultants in their report dated 24 January 1995, and I independently, found that those were the areas in which there was the lowest pressure differentials and lowest flows of air in the goaf, and it is in those areas that one would look first and ask the question, "Would this be a good site for spon com?", and one would normally find spon com more likely where there is the low quantity of air flows rather than where there is a high quantity, for reasons I discussed many times before.

Now, in relation to the large pillars that you mention between numbers 4 and 5 entries, are you there referring to the large pillars that are further inbye in the panel? Are you specifying there pillars between any particular cross-cuts, or at least intending to specify there pillars between any particular cross-cuts?-- Actually, according to the analyses, 9 and 10 cross-cuts both were particular - were the areas of particular concern, and if I may go to this area here?

Yes, you can pick up that laser pointer, if you like, and point at it so we can see it, or stand to one side so we can see what you are pointing at?-- These 9 and 10 cross-cuts, as you see after the slabbing - and we also have extremely large spans of roof here - which large spans would tend to cause

RXN: MR CLAIR

WIT: MITCHELL D W

crushing as well as increase the sloughing of these ribs on the remnant pillars - and the analyses indicate very - the least flows of air in the goaf - and I said this was both mine and IMC's - were in from heading 5 to heading - into heading 2. They were worse than - we additionally had a fall - a relatively large fall in No 3 entry between number 9 and 10 cross-cuts. This created a zone between No 2 and 3 entry and 9 and 10 cross-cuts that, for all practical purposes, were blocked from air flow, and this is also an area that Mr McCamley did not walk through. We know Mr McCamley walked - Mr McCamley testified about walking in 9 and 10 cross-cuts between No 3 and 4 heading, and since he walked there, that reduces the probability of the heating there and increases the probability - not increases, but tends to indicate that this area between No 2 and 3 entries in 9 and 10 cross-cuts, because of the air flows, might be a good site for spon com. In fact, they were the best sites for spon com, though as I say later on in the paper - my report - we have evidence of large quantities of loose coal in 11 and 12 cross-cuts in that same area, but-----

How do you mean in the same area?-- Between No 1 and 2 headings, right through here - around this remnant slab, between 11 and 12 cross-cut and 2 and 3 heading.

Okay. Let me understand this: you distinguish between - looking again at your note there, you distinguish between the large pillars between 4 and 5 entries and the pillars on the other side between numbers 1 and 2 entries in 9 and 10 cross-cuts on the basis of what you understand to be evidence about a fall in that area between 2 and 3 entries; is that right?-- And also-----

Is that right? Before you go on, let's clear up how far we have come, because in your note you talk about an area between 9 and 10 cross-cuts in the numbers 1 and 2 entries?-- Right.

But when you are indicating things on the model there-----?-- I am entirely incorrect.

Okay. You see, I want to get the picture correctly, because you have been indicating things on the board which, to some extent, haven't been recorded on the record yet, so if you can be patient with me, we will get up to date. When you were indicating on the model there, you indicated the most likely area between 2 and 3 headings and between 9 and 10 cross-cuts, and you referred in that connection to the pillars which had been robbed there, which I understand you refer to as slabbed pillars?-- Slabbed, yes.

Slab pillars, and you said that you considered that to be a likely area because as you understood the evidence there was evidence of a fall in that area, between 2 and 3 headings and 9 and 10 cross-cuts. I understood you to say that when you were up at the model there?-- If I said that - the fall was between 9 and 10 cross-cut in No 3 heading.

In No 3 heading?-- Yes, sir.

And for that reason you say that there are two features relevant, just let me get up-to-date on this, one is, as you understood it McCamley couldn't get access to inspect there, that's one of the features you rely on. The other is that the existence of the fall in some ways slowed down ventilation into that area. Is that the other feature that you were relying on?-- Among other things, yes.

What other things?-- The other thing being in the absence of the fall that was also the area of lowest ventilation pressure and flow.

As far as the area of lowest ventilation, if you isolate that area, what about these other pillars that you refer to in your note there, the inbye ribs of the large pillars between 4 and 5 entries? Are we there still talking about 9 and 10 cross-cut?-- Yes, sir.

For what reason do you isolate those areas then?-- Again for the same reason as before, the lowest ventilating pressure and quantity of air flow.

Well, were they as low as over the other side, between 2 and 3 headings or were they lower or around the same?-- I would - they were low. Let us say compared to other places within the goaf these had the lowest ventilating pressures and quantities.

You go on in your note to say "Looking at Figure 1 any slabbed pillar would be a good candidate site." Now, can you explain first of all what limitations you put on that when you say "any slabbed pillar", that is in terms of how far inbye or outbye in the panel and then just explain why you say that?-- Well, "any slab pillar" means any slab pillar in 512. We do know, however, that the first signs of heating were in June and therefore - at least say before the middle of July there should have been evidence of a heating and people were starting to look for something, and any slab pillar, as I said before, with the large spans that they had of this very strong sandstone roof, there should be heavy sloughing of the ribs and crushing of the fenders. These little points, if I may just point out, a little point like this triangular sticking up in number 12 cross-cut between the No 4 and 5 heading, this would be a zone that one would anticipate should crush out as it takes roof weight. It doesn't constitute a viable pillar. We see in between number 9 and 10 cross-cut between - just in between No 4 and 5 headings we see a rather irregularly shaped slab pillar that one would look at and say, "Aha, that is likely to suffer crushing."

That's perhaps between 5 and 6 headings that point; is that right?-- I call this 4 and - 4A and B because we only have five initial headings and the break-up in between, I don't know what you do in Australia, but we would categorise that with -----

You were in fact indicating between 4B and 5 in that case?-- Yes, sir.

On this point of why the slabbed pillars then might constitute good candidate sites for a heating, you refer to the crushing out and the sloughing of the pillars. Could you explain what you mean by that but go on to explain why that then would create a good site for a heating?-- Spon com is normally associated with a large quantity of fine material. The larger the quantity and the higher the pile, the higher this quantity is stacked, the greater the potential for spon com. This is, for example - more commonly, take a hay stack, and good farmers always keep their hay stacks low. The reason is that if you build your hay stacks high, the higher the hay stack the more liable that they are going to start on fire, and so the spon com - and also coal piles outside we find the same thing. Height is a critical parameter and therefore along - the sloughing which would be along the rib would give us a higher pile than we would get from loose coal on the floor.

When you speak of sloughing do you mean simply a cracking, or is that a process by which the coal actually becomes detached from the rib and falls but keeps leaning up against the rib?-- That second definition is what I mean by sloughing, yes.

Go on. Why does that present a good environment for spon come?-- Well, in addition to that we have the fracturing of these relatively thin pillars, and so we can get fugitive air flows, and we use the term "fugitive" meaning that this is an air flow that is not the direct ventilation flow. It's not the air being pulled through the zone by the mine fan and the ventilation control. This is air that is finding its way into and through these cracks and through this sloughed material, and this is the air that's oxidising the coal in this case, and it is so slow and it is not capable of removing the heat as fast as the heat is being generated. If you put more air through it, and that's what the ventilation studies - the sole purpose of the ventilation studies was to see where did I have a lot of air, and where did I have a lot of pressure, and it turns out that where we have these pillars between 9 and 10 cross-cuts we had very low pressure - we had relatively high pressure differentials with very low flows of air and this would be conducive to spon com along that sloughed rib.

Because what you describe as the high pressure differentials lead to insufficient movement of air?-- The high pressure pushes the air in, but there is insufficient air to go through this high pressure to remove the heat. I use the word "relatively"; the pressure wasn't high, but compared to other places in the goaf it was higher.

Now, we seem to have in fact moved into some confusion - or at least perhaps I have. You speak about one possible

environment for spontaneous combustion being within the areas of sloughing or loose coal, but then in the course of your last answer you went on to speak about the cracks in the pillars, particularly in these remnant pillars -----?-- Yes.

That tend to crush out, if I can just finish. Now, are you saying that that is in effect a separate area which might well be a good environment for spontaneous combustion, deep in the cracks?-- This could be a second area conducive to spontaneous combustion deep in the cracks, as I described for the Orchard Valley fire, for example. However, for this I would tend to postulate the ease of fugitive air flows from, say, 9 into 10 cross-cut through the slough along the rib in 9 through the pillar into the slough along that same rib in number - in that parallel rib in number 10, and this could lead to a high probability - a greater probability of a heating developing in the slough along number 10 cross-cut. I hope I haven't confused you.

No, I think I've been at least deconfused, if I was confused, but in any event you were speaking of those two possibilities as separate possibilities, not in conjunction, that was the sloughing and the cracks?-- They could either be separate or in conjunction.

Can I ask you about some other areas that appear there? If you were to look at the model, in the pillars between 1 and 2 headings, first of all between 11 and 12 cross-cuts and then between 9 and 10 cross-cuts there are those larger pillars which have been punched from No 1 - sorry, from No 2 heading towards No 1 heading, fairly deeply punched. Do you see those?-- Yes, sir.

Now, what if anything do the ventilation studies that you carried out indicate in respect of ventilation in areas like that?-- There was a relatively low flow of air passing those openings or whatever you want to - those punched out areas. However, Mr McCamley purportedly walked by them and solely for that reason one would give that a lower probability than some other specific area.

But solely for that reason?-- Solely for that reason.

There is no other basis on which you rule those areas out?-- No, it was solely what I understood Mr McCamley's path to have been.

Those areas there might well have loose coal on the floor?-- Yes, they did have loose coal on the floor according to other testimony.

Can I go to page 8 of your report, please?-- Yes, sir.

Perhaps the best starting point is your note 21 where you make the observation that, "Creating a zero-pressure differential across a heating is the fastest, safest and most effective way to stop its progression." Now, that's a note that you've made to that sentence which appears at the beginning of the last full paragraph on the page wherein you state, "The other key

to mitigation is preventing air from flowing through large piles of loose coal in partially sheltered places (sloughed ribs, crushed fenders, under falls, heaved bottoms)." Now, that's an answer, but does that have its dangers?-- Yes, -----

In a gassy mine?-- Yes, my very next sentence says, "This, of course, must not be done where methane might accumulate."

Well, in this panel is that a danger that simply can't be avoided?-- That is a danger that cannot be avoided in this panel.

So that in the context of a mine which can be described as a gassy mine, that's simply not an answer, to in effect create a zero-pressure differential across the area where the heating is suspected to occur; is that right?-- It would be the wrong answer.

Let me ask you this though: one of the suggestions that appears from some of the literature we have seen as a method by which to investigate the existence of spontaneous combustion where some suspicion of spon com has arisen from other features is that the ventilation through the panel be slowed down with a view to, as it were, enhancing the - enhancing the presence - the ability to detect the presence of smells or hazes or even perhaps to enhance the possibility of detecting differences in the CO make which might indicate the presence of spontaneous combustion. Now, is that a method that can be adopted in a mine which might be described as a gassy mine?-- It would be something you better never do. We have a basic rule, I believe, in mine rescue throughout the world; you never touch the ventilation without good compelling reasons, and those were not good compelling reasons. You don't exacerbate a problem to solve it.

In other words you find some other way to investigate; is that right?-- You better.

Page 9 of your report, you were asked some questions about the area described there as pressure differentials by Mr Morrison, but I want to touch on it again. That last paragraph in that sentence which is the fourth paragraph on that page commences, "The differential should continue to decrease during retreat operations; again, an increase evidences leakage which in turn adds to inadequate ventilation through the goaf." Can you explain what you mean by that?-- Let us make the assumption that in 512 we had, when we started operations, started going into 512 - let us say that we had 100 pascals differential between the No 2 and 1 entries. Now, as you extend the panel in you are increasing the resistance of the panel, and if you are holding the quantity constant then - and you are increasing the resistance, then the pressure differential must decrease. There is a rule - this is basically like one and one equals two. So -----

Just pause a moment. I understand you to be speaking about as you develop the panel?-- Yes.

Yes, go on?-- You are increasing the resistance. So this is the way we tell how far you can drive a panel. There is an extent to how much air you have to drive this panel. If you don't pay attention to this you may find yourself 12, 13, 20 cross-cut without any air. So this is the criticality of that. Now, as you start your retreat - excuse me, if instead when I get to 12 cross-cut - let us say that I had 100 pascals to start with and it dropped down as I went, we will say 10 pascals at a time, and all of a sudden I'm down to number 9 cross-cut and instead of being about - let's see, 10 pascals at a time, I have about 10 pascals left. I read my pressure differential is 30, the only way I could have that is through leakage through stoppings between 1 and 9 cross-cuts, excessive leakage.

Let me ask you first of all why do you say that the pressure differential decreases as you proceed through the extraction process?-- Well, this is with the development process first, first things first.

Yes, but I then understood you to move on to when you are extracting, or were you still talking about development?-- I was still talking about developing.

My misunderstanding?-- I'm sorry for that.

You've reached, say, 13 cross-cut, and assuming that the quantity of air being supplied to the panel is the same, what you are saying is that the pressure differential between - the example you were using, 1 and 2 headings, has decreased?-- Yes, sir.

Now, can you go on from there? What happens then?-- Actually it's the pressure differential you measure across your ventilating station. In this case it would be the regulator in 510 since there was no regulator in No 1 entry. Now, as you retreat the differential should continue to decrease because the material that's caving and the like is further increasing the resistance, and again if you find, no, that you are not getting a decrease that's linear with your operations - this should be reasonably linear - if you see abrupt abnormal changes this is strong evidence of abnormal leakage and you go back into the No 2 or the No 1 entry, and one of the things you do is look for open doors. This is quite common, or you look for a hole punched through the stopping, say for a rock dust hose or for some other reason, and where this isn't closed off and you repair those. You close the doors, you repair the breaches and hopefully reduce the leakage, and if you find you are still getting leakage you take your smoke tube and move this along the face and along the perimeter of the stopping, look for large major outflows of air and you correct those deficiencies if you want to mine safely and cleanly.

When you referred before to the possibility - or a situation where you find that instead of being down to 10 pascals at a time when you would expect to be down to that - this is after you have retreated - that there are instead 30 pascals, that might indicate that there is some leakage through the stoppings - I think you said between cross-cuts 1 and 9, but in the case of 512 it could be through the stoppings in any cross-cuts between 1 and 12; is that right?-- That's correct.

That is the stoppings between 1 and 2 headings. Now, are you suggesting that there is something by way of the research that you have done or become aware of in respect of the ventilation pressures in 512 Panel that indicated that in fact there was a greater pressure differential that there ought to have been towards the end of extraction or at any time during extraction?-- No, sir.

Can I ask you this: you do refer in your report to the effect of putting a hole in the stopping between 1 and 2 headings between 12 and 13, or at least in 12 cross-cut. Is that what I understood you to be referring to?-- That's correct, sir.

Now, in practical terms that, of course, allows some of the ventilation going into the panel to, in effect, take a short-cut through to No 1 heading, albeit in the good purpose of, as it were, flushing out that area of the goaf?-- That is correct.

Do I understand you to say that by allowing that air to, in effect, take a short-cut into No 1 heading and then outbye along No 1 heading, that that would, in effect, reduce the pressure of air in other parts of the goaf?-- That is correct, particularly in the area between 4 and 5 headings.

Now, you have had something to say in your report about monitoring of the panel after sealing. As I understand, the view that you are expressing is that the monitoring point that was chosen was, first of all, not far enough inbye. Did I understand you to say that?-- That is correct.

And, secondly, it was at the - in effect, the worst possible position in the goaf - I may be paraphrasing your words - because the pressure differentials between the seal in the No 3 road and the seals in Nos 1 and 5 roadways was such that, in effect, the atmosphere in the goaf was being pushed away from the monitor point. Does that accurately sum up what you said?-- That very elegantly summarises it.

Perhaps not elegantly but in terms at least that I can understand. Well, what is your suggestion then for monitoring in the goaf? How far inbye does a monitor point have to be?-- The practice in Europe and the United States is to - and I was under the opinion all Mines Rescue - was to have the monitoring point as deep inbye as you could get it so that you militate against the effects of the exchange of air and gases that are normal to all sealed areas. That exchange is greatest, say, between the 0 and No 1 cross-cut; it's greater between 0 and 1 than it would be between 1 and 2, and between

2 and 3 there would even be less effect of that interchange of atmospheres. That's one facet; the other facet being that the deeper it is inbye, the more quickly it would see the outflow or the out-movement of gases from the inbye areas. So, you want to get it in as deep as you can possibly do it. We typically talk at least two cross-cuts minimum, and if there is no reason not to, then you want to go three or four.

So, the ideal, if one could have the ideal, is to have it in a panel like 512 somewhere right down there in the middle, 9 cross-cut, something like that?-- Well, that would be ideal, but let us say 3 or 4 cross-cut would be satisfactory and 2 would have been a lot better than 1.

Is there ----?-- I'm not sure. Let me correct that, sir. I'm not sure that 9 would be ideal. This assumes that there is no problem between 9 and the outbye portion of the area. I would say no. I would say 3 or 4 would be as far inbye as I would want to go, and if I couldn't go there, go at least to 2.

Okay. Now, can I ask you to go to page 11 of your report? Again, it's an area about which you have been asked some questions. There are a couple of matters that I need to pick up correctly, and it relates to the breaching of these stoppings. What you suggest in your report, as I understand, is that prior to sealing and for the purpose of sufficiently monitoring the panel it was necessary to breach each of the stoppings between No 1 heading and No 2 heading right down the panel. Is that what you are suggesting?-- No, sir, I'm suggesting that you breach these stoppings between 1 and 2 headings at least as far inbye as the sampling point.

At least as far inbye as the sampling point?-- If you could go in farther, that is good, but it might not be practical to do.

Well, again, looking for the ideal, the more the better, is that what it is?-- The more breaching you have, the more rapidly you will get the movement, as we discussed before, of fire gases to the place they want to go, and the place they want to go is No 1 heading, and if they want to go there, they will get there somehow.

Two questions in that connection: is there any good purpose served by having a second monitoring point behind the seals?-- Very much so, sir.

And in that case you would suggest that there should be a monitoring point in No 1 heading, I gather?-- Yes, sir.

That would be your next best point after, for instance, No 3 heading?-- Assuming the stoppings between 1 and 2 were breached.

Okay. Secondly, is there - well, coming back to your report perhaps, you make some point about stoppings not being breached between No 3 heading and No 5 heading. Do I understand you to say that?-- Yes, sir.

And is that in fact your understanding, that there were stoppings there that were not breached?-- It was my understanding that stoppings in between No 4 - actually, call it No 3 and 5 - that there were stoppings in cross-cuts 1, 2, 3 and 4.

Yes, I understand - there is a little note that has been paused up that Your Worship would like to take the afternoon break now.

WARDEN: Yes, thank you, Mr Clair.

THE COURT ADJOURNED AT 4.20 P.M.

THE COURT RESUMED AT 4.35 P.M.

DONALD WILLIAM MITCHELL, CONTINUING:

WARDEN: Before we start, that one day seminar on 31 March, the final agenda has now been prepared and we would like to know before the end of proceedings today if there is any comments on it.

MR CLAIR: Mr Mitchell, just one final matter: I understood you to say in answer to questions from your counsel, Mr Martin, that under the relevant Federal legislation in the States - which I think was the Mine Health and Safety Act; is that right?-- Yes, the present one is 1977.

Under that Act there was provision - or is provision for regulations whereby the alert and the alarm levels of gases are determined by the local inspector who administers the Act; am I correct in that?-- Not quite. If I say that, may I correct it quickly?

I am relying on my note rather than the transcript?-- I will try and do it quickly. The Act does not specify alert and alarm, however for fire protection, the operator must petition his district - his local district - not his local inspector, but his local district - for permission to have this alert and alarm level - 3 and 6, 5 and 10, whatever it might be, parts per million of carbon monoxide or certain per cent methane. The local - the district will then send a special investigative team to the mine and they will make a recommendation that might be to - they say, "Yes, we will go along with this.", or they may say, "We will go along with this but with these provisos.", or, "Absolutely not." Whatever their decision, it is now sent to MSHA headquarters in Arlington where this is subject to a policy as well as technical review. If MSHA agrees that we should, say, allow this mine operator to have an alarm - an alert and alarm - say, 5 and 10 parts per million in his mine - they will approve the petition. However, other interested parties may say that they will not permit this. For example, the union may disagree and demand that this go before an administrative law judge. The administrative law judge puts down a decision, the Secretary of Labour approves or disapproves the ALJ's decision. If they still don't like it, it goes up to the Appeals Court and Supreme Court.

Now, you say that the purpose of this is for the mine to establish what you called, I think, fire protection?-- Yes, that's one level. We also have this requirement for methane levels, particularly in very long panels where the belt entry adjoins a solid rib and you - or the tailgate adjoins a solid rib, and you may get very high methane readings at the regulator for the panel - higher than allowed by law - and that requires these same alert and alarm systems to be petitioned.

RXN: MR CLAIR

WIT: MITCHELL D W

Now, let me just understand this: must every mine have what you have referred to as this fire protection system?-- Every mine that does not use a point - fixed point type fire sensor - and that now constitutes every long wall operation in the United States - and this is just a guess - I would say at least 30 per cent of the bord and pillar operations are all using CO and methane telemetering systems as well as velocity.

Is that what you call a "fixed point system"?-- No, that's what I call a system that requires certain alert and alarms. The fixed point is specified in the regulations.

So, fixed point is what we might call the system that has been used in the past. Is that being replaced progressively by these new systems?-- That's correct.

Which involve an alert and alarm level to be fixed?-- Yes, sir.

Now, those alert and alarm levels on these Unor type systems, whether they are a telemetering system or tube bundle system, these fixed points are fixed, what, for a whole mine, or for particular areas of the mine? Sorry, not the fixed points, do the alert and alarm levels, I should say - do they vary from one part of a mine to another?-- In some mines they do vary from one - they may not be the same in various places within the mine. This is why the - why the need for this investigation is so critical - to make sure that the mine operator does not have areas of the mine where the alert and alarm might be inappropriate.

But in each case, wherever alert and alarm levels are fixed, they are fixed after this administrative process you have spoken of?-- That is correct.

There is the petition to the district and then through from there, subject to whatever appeals might be lodged, and finally there is a program, as it were, of alert and alarm levels determined applicable to a mine or part of a mine?-- Yes, except the district manager has the authority to require lower alerts and alarms than the petition specified - not higher, but lower.

I see. Now, can I ask you this: how is that system policed, as it were, by the local mine authorities?-- It is policed.

Is there an inspection system?-- Yes. Typically our mines - the great majority of the mines - well, all mines in the United States get a - what we call a AAA inspection, which is a complete mine inspection every quarter. The great number of long wall mines have inspectors - at least one inspector a day at their mine. These things - the alert and alarm - the computer data must be maintained and there are print-outs which the inspector exams. They may also have a system of a red hot telephone where if someone in the mine believes that things are not being done in accordance with what are required, they will call and notify MSHA. This is a quite frequent occurrence.

Can I just for a moment postulate that Moura No 2 was a mine that was located in the United States and that it had a Unor system, or the local equivalent over there of a Unor system. Would the alarm levels for 512 panel - that's the monitoring of 512 panel, in so far as CO levels, for instance - would those alert and alarm levels - or would there need to be alert and alarm levels fixed for the monitoring of CO in 512 panel?-- Yes, sir. We could postulate during development - let us say that they found a normal liberation, we will say, of 2 ppm of carbon monoxide. If there was no history of spon com, it is not unreasonable to expect that the petition would state that the alert level be 5 ppm above the ambient; in other words, it would read 7 ppm would give an alert, and 12 ppm would give an alarm.

Is there invariably about that distance between the alert level and the alarm level with parts per million of CO?-- I would say that's a common one.

That's a common one. Let me ask you this: in order for those alert and alarm levels to be fixed, then quite obviously some background would need to be established?-- That is exactly right, and that's part of the investigation made by MSHA, and mine operators must make that investigation before they submit the petition.

Now, you have already postulated that, for instance, there may well be a background established on development of, say, 2 ppm, but on extraction it is expected that 5 ppm may well be fixed as an alert level. Now, are you aware of any work that has been done in the context of fixing these alert and alarm levels - any work that has been done that has involved investigation of some higher background CO resulting from different methods of mining?-- We have many different methods of mining. There has been no - let us say formal research, but take a company, for example, such as Cyprus Mining. Cyprus Mining does have an internal research program, and they have people at each one of their mines, and they have well in excess of a dozen mines - very large mines - in the United States, and two people from each of those mines meets at least quarterly and they describe - discuss just what we are talking about here, and from this they have come up with formalised programs and the basic thing is we find no important difference between methods of mining.

Sorry, you say you find no important difference - you mean in terms of background carbon monoxide, or in some other respect?-- In terms of carbon monoxide and also in terms of carbon dioxide. There are no important differences among mining methods. We do have important differences between alert and alarm among these mines, depending on such things as length of a panel. We have one mine that has a 22,000 foot long long wall panel, and if alert and alarm is down at 3 and 6, because of the concern - the criticality of it is getting as early a warning as possible.

Now, just one final matter in respect of these fixed levels, then: is there any system whereby alert and alarm levels have

been fixed for an end result calculation of CO make as opposed to simply measurement of parts per million?-- It is basically based - basically based - that's a nice word - on CO make in so far as the nomograph, as well as the formulas, look at the inter-relationship between the area - the cross-sectional area of the passageway in which the sensor will be placed, the velocity of the air in that passageway, and by use of this nomograph you determine the alert levels - the minimum alert level that you must maintain.

That is alert level in parts per million, but taking into account the cross-section and perhaps the envisaged air quantity?-- It is taking it into account for all practical purposes, and I just realised your question; it is based on CO make.

Thank you, Your Worship.

RE-EXAMINATION:

MR MARTIN: Just talking about oxidation rate of coal for the moment, Mr Mitchell, is there some physical change in the property of coal or the appearance of coal?-- When it oxidises?

Yes?-- Oh, yes.

Well, what?-- As the coal oxidises, where the air interacts with the carbon, you form a film - it is just like rust on steel or iron. Rusting is oxidation. You form this coating, and the coating impedes the further oxidation. This is why when coal is wetted, you exacerbate the rate of oxidation and the heating process because this wetting washes off the oxidised coating, exposing fresh surfaces to air.

What happens if it is not washed off and a rise in temperature continues to generate? What happens to the coal?-- Well, as Mr Morrison was describing earlier, where the oxidation rate increases and then reaches a peak and starts declining, this is a case where coal is not spon com prone, or if it is spon com prone, you are putting sufficient air through the coal to remove the heat as fast as it is being generated. So, in that event, nothing happens. However, if it is spon com prone, or the quantity of air flow is insufficient, you will get a heating and possibly a fire.

You very briefly touched on water barriers. Does a water barrier have any effect on a methane ignition?-- No, sir - well, if the water barrier is in the immediate igniting zone, it does have an effect. It does not have any effect on quenching the flame associated with a methane - a burning methane. It will affect coal dust.

And of methane and coal dust?-- Well, it won't have any effect on the methane portion. When I mentioned about within the igniting zone, what you are doing is cooling the developing flame as its developing which retards its development, and the French use what they call a Mitchell Quencher and they discharge a high volume of water into a face when they are blasting to prevent these ignitions.

I just might turn to something else. You were talking about inerting a panel; is flooding an option used in the United States?-- Flooding with inert?

Well, flooding with water?-- Flooding is an option. We have a number of options. Flooding, if practical, is an option. The problem is often times it is not practical. For example, in 512 we would have a problem with the shore line because you have to look at your gradients and your shore line would be associated with the No 5 entry, and so we would have no water - we'd have less water, say, in No 4 entry and less water in No 3 and less in 2 and less in 1. So it would be difficult to flood 512.

To the 510 panel right to that extent is that what you are referring to?-- That's correct.

Just one final thing, and I might need leave for this question, Your Worship, typically in your experience measurements on a shift basis of carbon monoxide, carbon dioxide, velocity measurements, wet bulb, dry bulb, what's the purpose?-- To have done that there has to be a reason. I mean you don't have deputies who never as a usual act do this unless there is a reason, and I always wondered why did they take CO2.

But what's your experience in the United States for usage of that set of circumstances?-- In the United States if we found a mine operator - well, first of all our section foreman, which are your deputies, they are required every shift to take air readings at the last open cross-cut. That is a requirement, and the fire bosses and mine examiners will take air readings there and also at the regulators. So this is done on a normal basis every day. This section foreman will take methane readings and only under real cause conditions would they be required to take CO and CO2 readings. At Utah Fuel's Soldier Creek mine we do require the section foremans every three hours to take CO and CO2 readings in addition to air readings because of a spon com problem and we want to catch it in its very earliest stages.

Well, having taken those readings how is it caught?-- How is it caught?

Yes, tell us how you catch it?-- Well, you keep - they call out these data that - when they take their readings they get on the telephone, they call it out. This is put into the computer and a graph is maintained and if the trend line even slightly starts rising then they start taking readings more frequently. Actually they will send down the ventilation crew and they will take readings more frequently and they will go

back into the bleeders and start their readings back there on an hourly basis minimum.

One final thing, you mentioned a graph would be done; a graph of what?-- A graph - well, at Soldier Creek we happen to use CO/CO2 ratio as a function of time and that is indeed a semilog plot on the computer.

Thank you, Your Worship. Thank you, Mr Mitchell.

EXAMINATION:

MR PARKIN: Mr Mitchell, what conclusions do you draw from the build-up of CO after the panel was sealed? Could the witness be shown Exhibit 248, please? Have you got the graph?-- Yes, sir.

This just shows, just to put it into context, a build-up of approximately 12 to 150 ppm of CO in approximately 22 hours, approximately, after sealing. What does that indicate to you?-- Contrary to some of the - I apologise to the people who have testified to this, they were wrong. This graph in the absence of other critical data tells me that I have in all probability a very - a serious development of a heating if not an actual fire.

If you take that into account with the Graham's Ratio, and we have had some discussion here about the Graham's Ratio, particularly after sealing, but the ratio did increase from .2 to .7 along the same time period?-- That's just adding fuel to the fire that's reducing the speculation and making it less uncertain, and it's saying there is a good chance there is a bad condition.

Are those two criterior the main bases for your comments on item 5 in your summary? Could you read that out, please, the item 5 in your summary?-- Yes, sir, that is one of the bases for that statement in item 5 in the summary.

Mr Mitchell, we have had some comment about the CO/CO2 ratio and in your report you state that the heating in 512 could have been recognised as early as June 1994. In light of the cross-examination by Mr Morrison, I think Mr Morrison suggested that the vertical axis had been exaggerated, and I think also there was some comment about the CO2 monitor being recalibrated. In your Figure 3 would we still be able to detect that heating in sample point 16 from early June?-- Yes, but I didn't realise that anyone claimed that the vertical axis is exaggerated. If it is not semilog it is not a logarithmic scale but it is - the distance from 0 to .5, .5 to 1, 1 to 1.5, the distances are exactly equal, it's cartesian. What I said was you could not calculate an exact trend. We do have an abrupt rise, and regardless of how you plot it, and regardless of the diversion between the actual and calibrated, as long as you are keeping the same error in

there, as long as that error is not changing radically, the results don't change either, and this is telling us that there is an abnormal rise. It may not have been as great as shown, it might have been greater, but it is abnormal.

But I guess what you are saying is that regardless of the axis one would have been able to determine, had one been using this ratio, would be able to determine that something was abnormal, as you put it, in your words, from early June?-- That is correct, not only with this curve but with their own data for the CO make showed a comparable abnormality.

So am I right in suggesting that if we have a seam that didn't contain CO₂ as a seam gas then the CO/CO₂ ratio is certainly an indicator that we should use in the future?-- I would recommend it. We find it quite useful from a practical point of view because it's so easy to use.

Just on one point regarding spontaneous combustion, when the bottom return was closed, what impact would that have on a potential heating in 512 in your view?-- With the closing of the 512 regulator this would be another change in the flowpaths of air through the goaf. This change could exacerbate a heating, it could reduce the heating or it could do nothing. Take your choices. You can't take your choices when you have a pending problem. You better know what your problem is and define it.

I was thinking more in terms of, you know, if the heating was deep in the panel and it was close to the bottom return itself, when that bottom return was closed off the ventilation path across that potential heating would be very much minimised?-- Yes, if you had a heating, say, in 9 and 10 cross-cut or 11 or 12 cross-cut between 4A, 4B and 5, anywhere in that area, you are correct, we would have had a major reduction in air flow, and as I said earlier, where we find these major reductions in air flow, look for spon com if you've got a spon com prone coal.

Just one final point, what measures would you put into place to prevent a similar occurrence as to what we are investigating here?-- One occurrence would be to use the concept of an alert and alarm that is not - I believe they use the word "acknowledged" and "changed", that when you get that alert, regardless of your belief that it might be production oriented or method of mining oriented or whatever you want to call it oriented, make sure that you know what is causing this condition and you've got a problem now. If you require an unchanged alert and you don't remedy the condition you never get rid of the alert, and as long as you never get rid of the alert you can't have people working in the panel. So this problem is find out the problem, solve the problem and go on back to mining, in that order.

Thank you.

EXAMINATION:

MR NEILSON: Mr Mitchell, in response to a question put to you by Mr Clair you mentioned that in every mine - as I understood you said it - in every mine in the United States they receive a triple A inspection every quarter?-- Yes, sir.

Could you just explain what a triple A inspection is?-- A triple A inspection is where you send, depending on the size of the mine, enough inspectors of the various types, the electrical, the technical, the ventilation, the roof control and then your basic inspector and they go in as a team and they examine every place accessible place within the mine and they will then cite the mine operator for any violations of either the regulations, the Act or of their approved partitions. They will give the operator a time in which to correct these. If they find what they consider imminent danger they will demand withdrawal of all persons from the mine immediately except those persons required to correct the problem and then there are various fines and other means to assure the positive co-operation of the mine operator in achieving safety.

So basically it would be an inspection with a fine tooth comb looking at every aspect?-- I like that expression, yes.

Including their gas monitoring equipment and what the readings may have been over that period?-- Everything, yes, and every record, all the books, these are gone - they send a special group of inspectors who do nothing than to go through the deputies' books, the fire bosses' books, the electrical books and the mechanical books and the fan books.

You've heard quite a number of questions asked of particularly the people who worked at Moura mine, deputies, undermanagers and managers relating to what type of education they may have had in terms of spontaneous combustion?-- Yes.

What programs may have been introduced, were there any programs introduced at the mine itself or had people been sent away to seminars et cetera. Could you tell us what happens in the United States in respect to education and who might receive such education?-- Well, there are a series is education. The mine operator is responsible for providing a new employee with 40 hours of training specific to his job. When a person changes jobs he is required to have another 40 hour training period specific to that job, and then every year there must be a minimum of eight hours refresher. In addition the safety department gives the same as you do, the tool box education and training. Additionally mine operators will send various people to the academy in Beckley, West Virginia. They will attend special courses in ventilation, and with respect to that, I sent Mr Brian Lyne a copy of the ventilation course that is given to various deputies and other people at the mines as well as inspectors. You might find this of interest. They have various courses for the various types of activities in the mine and these will take anywhere from three to eight

weeks of training, and we are seeing a great number, particularly of the larger companies, it is not an uncommon practice to have all of their section foreman - what you call deputies and managers attend these courses.

I take it these courses are - they deal with all aspects of mining, it wouldn't be just looking at singling out one like spontaneous combustion?-- No, there is individual courses just like in a college, it's a curricula. I just gave that one as a specific because it's available for anyone here to review.

I guess I will be a little bit more direct then. If, for example, you had a mine in the States that was liable to spontaneous combustion, would there be an education program at that mine on spontaneous combustion?-- Yes, sir.

Who would conduct that?-- I hate to say it, I do an awful lot of that, in addition to the inspectors and in addition to the companies sending people to Beckley, but there has been a very major growth of training and education by myself and a fellow by the name of Bill Moser in this area in the west and also in Illinois.

During the testimony given by Mr Mackenzie-Wood there was some degree of confusion thrown around the issue now of CO make and its relativity, if you like, to increases in production?-- Yes, sir, I remember that.

You are aware of that?-- Yes, sir.

I know you've been asked questions by Mr Morrison today, but I'm still somewhat confused and I think it's an area that if you can't fix up then probably we need to talk to somebody else, but what would you advise us in terms of what reliance we should place on this question of increases in production in cases such as we have seen on the graphs that related to 512?-- If one insists on closing their eyes and their mind and not asking the question what if, then there is a good chance that the 11 who are lying there in No 2 Mine died in vain, I'm sorry to say. We have got to not have pre-conceived notions. We have got to ask: what if this is not related to production? What if this is not related to method of mining?

That's not quite the question I asked you. In your experience, would an increase in production in a panel such as 512 have any real relevance in the determining of what the CO make might mean?-- One would expect the greater the production, the more CO make. When I was shown those curves, a quick look, without calculation, showed me that the trends were not alike, there was a great difference. In fact, we had a period where the CO make increased and the trend in production remained relatively stable. So, there was no real total relationship on those two exhibits, 219, I believe, 245 - I may be incorrect - there was no positive basis for saying that there was a relationship between CO make and productivity or production. If that was not productivity, that was production.

So, I mean, do I assume then what you are saying is that yes, there is or can be a relationship between the CO make and increases in production, but if you see that, then you should go and investigate and make sure it either is that or it is something else? Is that really what you are saying?-- That's what I'm saying. Ask the question: what if?

Thank you, Mr Mitchell.

EXAMINATION:

WARDEN: Just a couple, witness. Do you have any type of recovery vehicle down there for re-entry in the United States?-- We have done quite a bit of work and spent quite a bit of money on developing something like your NUMBAT. These have been highly effective in, say, a warehouse or a building fire. Our problem - we have one that they have been doing studies with at Twin Cities - the US Bureau of Mines Twin Cities Research Group developed a unit like your NUMBAT and this has been used experimentally, but not on a real fire, by the people at mines in the Eagle area at the North-western portion of Colorado. The big problem is that they're great as long as the problem is close to the portal. If we tried to send something like this into - down the main dips and then up 5 South and then into 510 and looking around 512 or going on up to 520, we probably won't have a vehicle very long. Then the other question is the - almost the impossibility of making these things intrinsically safe, and because they are subjected - perhaps they could be subjected to so much trouble or potential damage in its travels, that the intrinsically safe circuits become suspect. This has been one of the big questions. They would be fine, say, if the problem in Moura No 2 was in, say, 1 to even 3 South. Beyond that I would say it's questionable, and regardless of what NUMBAT or anything found, if we are going to re-enter the mine this must be done with Mine Rescue trained people. So, the purpose of NUMBAT is suspect.

Getting onto that point, the rescue and recovery, you would not advocate sending anybody in on a rescue unless you knew

the conditions that existed at the time?-- That is a unquestionable must, and not only at the time but you must know conditions as they developed prior to that time and as they continue. We must maintain stability during a mine rescue recovery - recovery operation such as this. Any - you have got a condition where we know we had fire. Somewhere there was a fire in this mine. We know that a fire such as this will always rekindle months - years later on the re-introduction of sufficient air. If it's coal that was ignited and is now smouldering and you put as little as 5 per cent oxygen in its area, the coal will burst into flame. So, stability must be maintained, and you better know what you have before you expose anyone to the dragons that are underground.

What I wanted to get at was this window of opportunity some people talk about post explosion, you have to be very sure of what's down there before you even considered it?-- Right, and you have to know - you have to make a pretty good bet on how long that window stays open.

Thank you.

EXAMINATION:

PROF ROXBOROUGH: Mr Mitchell, a few questions, if I may. Normally ventilation in mine roadways is turbulent?-- Yes, sir.

So that we can take it that the air entering 512 Panel down the five entries would be turbulent?-- Hopefully, yes.

And when it moves into the goaf area, we now have a very much larger area, the velocity drops proportionately to the increase in area, the perimeter reduces and we now have the potential for laminar flow; is that correct?-- That is correct, and we - I believe we have the probability of laminar flow in that No 2 entry at the time we saw the reversal or the movement of what might have been a layer because the turbulence is what you must have to militate against layering.

You are anticipating my line of questioning by that answer?-- Sorry about that.

That's all right. Of course, when we have laminar flow, different laws of ventilation apply, don't they?-- That's correct, sir.

In undertaking your analysis, your network analysis of 512, did you take that into account?-- I did, sir.

And did you determine if there was in fact, or likely to be laminar flow in the goaf area?-- Yes, sir, I believe I testified as to some of the locations where both myself and IMC should have anticipated laminar flow.

It is laminar flow that links up, does it, with the layering index?-- Very - that is what the layering index is based on.

Is a layering index of 1 a cut-off between laminar flow and turbulent flow?-- That's correct, according to Bakke and Leach's report using the Froude and Reynolds numbers.

The important thing is you did take that into account in your calculations?-- Yes, sir.

In answer to a question by Mr Martin concerning an investigation that you would have carried out in 512 when meeting the first signs of things not being right, I think you said you would have undertaken a ventilation survey along No 1 and No 5 headings and along 13 cross-cut?-- Yes, sir.

You appreciate the difficulty of doing that in 512 Panel, I guess 5 return really becomes part of the goaf and it's a question as to whether it's travellable. The same might be said also of 13 cross-cut. Is there any alternative method that they might have used, or that might be used - let's put it that way?-- Well, the less area you can cover, the greater you must assume to be the chance that there is a problem that you cannot define properly and, therefore, you better take greater precautions. If you can look at 5, 13 and 12 - and No 1 and say conclusively that there is no probability of an abnormality - an abnormal outflow of fire gases or thermal action gases, then it's only under that circumstance that you can say that there is no heating or no - there is a low probability of a heating.

You seem to be firmly of the view that the first explosion occurred in 512 and was caused by spontaneous combustion. I know you have given evidence with regard to other potential causes, but could you postulate the circumstances leading to the second explosion?-- No, sir.

Does that mean that you would be advocating re-entry to the mine in order to determine that?-- If the Warden and Panel determine that to be essential to come to a decision, then a re-entry would be among the things that would have to be considered.

I'm sorry that a number of these questions appear to be disjointed or disconnected. I hope you will bear with me in that regard?-- No more disjointed than my answers.

We will take them one at a time. I was a little puzzled to an answer that you gave to Mr Morrison with regard to the differential pressure between 512 and the outside atmosphere. I think the proposition was put that the pressure within 512 would be higher than the pressure outside 512; is that correct?-- I believe that was the postulate, that the outflow of methane, which they only knew about in one side of No 3, indicated an increasing pressure within 512. Whether that's true or not is - that was the postulate, so we discussed it on that basis.

And you were - I think, if I understood you right, you expressed the view that albeit there was a higher pressure in 512 than outside - and this is generally true for such panels - that you could still get migration of gas into the panel?-- Yes, sir. This has been shown definitively at a number of instances and there is an excellent paper by Dr Winter of Versuchstrecke with respect to their studies following the Rossenheigh explosion.

I just have the difficulty because it appears to be in conflict with what you said previously of movement only being from a higher pressure to a lower pressure?-- Except when the outgassing - that is your point of low pressure and you have to fill that vacuum, so let us say, just as an example, that's why we typically would find - on a seal like that when I find gases coming out one side, I always look at the other side because it's not abnormal to find air sucking in, so it's just going round and round that one stopping. It's not really a pressure differential due to an increased pressure within the goaf.

Is it possible that the - that gas in solid coal surrounding the panel could lead to gas movement into the panel? What I am trying to get at is if, in your opinion, the - once it was sealed, if Panel 512 would tend to fill up with methane starting at the back of the panel?-- Well, it would start within the panel all over. We have a large quantity of coal in No 1 and 2 cross-cuts that are now - from which we have reduced the flow of air, so I wouldn't put it at the back of the panel, I would say the methane will come out all over, and the quantities will be a function of wherever it wants to come, it will come.

I guess what I was thinking of was the coal that was being drained from 520 panel, right, that was still active and that was still producing, as I recall, about 5,000 cubic metres a day. The panel itself, the area where the panel was operating, had been degassed, so I was postulating the possibility of a greater quantity of gas entering 512 after sealing from that area, i.e. adjacent to the back of the panel?-- With the sandstone roof and also the large amount of coal remaining on the floor, when we reduced the pressure from the - pressure from the ventilation, we will tend to see these gases migrating more rapidly and readily into the open area than heretofore - I shouldn't say more rapidly - that they become more obvious. So, your evolution - your liberation of methane after sealing typically seems to increase, but in thinking about it, it may just be that we had so much air going through before, relatively speaking, that we didn't notice it.

In American mines are the positions of the seals, final seals, predetermined before the panel is extracted? Do you have the concept of prep seals?-- We have the concept of prep seals. We do use them in some mines. On some long walls we actually seal as we go along, but the area where final seals are to be constructed is determined not after the panel is started but basically before the panel is started in a great number of mines. This is the way they try to get a - the least

cross-section possible for the sealing and, for example, you might open in a place which will, say, just take three entries for an example and then broaden it out to five entries. This way you only have to construct three seals, and the areas where these seals will be built, they are generally very careful in their mining to make sure it's a clean mine - cleanly mined area.

So, are you saying that prep seals are a good idea in some places but not all places?-- I would say so, yes.

And what about situations such as 512 - panels such as 512?-- I'm not in a position to know that. This is a very practical thing that I would have to - I would say mine management would have to make that decision, hopefully.

In response to a question by Mr Martin you said that in your opinion - I think you perhaps were even more dogmatic than that - that water barriers would not extinguish a methane explosion, and in that regard you agree obviously with Mr Stephan but you seem to disagree with Mr Mackenzie-Wood?-- The Germans and the British have found that water barriers will not quench a propagating methane flame. If the flame body is a coal methane flame, it will effectively reduce the influence of the burning coal on pressure development but it will not - it has not yet - at least in the literature I am familiar with it has not reduced - importantly reduced the pressures developed in a propagating methane explosion.

So, it wouldn't even retard it - slow it down?-- That would be a difficult thing to know because the length of flame - the volume of flame from methane, as Mr Urosek or Mr Stephan described - we talk typically 4 to 5 - it could be 7 times - theoretically 7 times the original volume, and depending on the homogeneity of the body and strength and location of the igniting source, it might only be one or two times.

See, Mr Stephan has given us his opinion that the magnitude of the explosion was not very big. I'm just wondering if it could conceivably have been somewhat bigger than what he originally estimated as a consequence of water barriers?-- Well, I disagreed with Mr Stephan. If we just - I believe I said if we assumed that Mr McCrohon - I believe his name was - I hope I'm not saying it incorrectly - was exposed to, say, 1 psi pressure wave, then if we assume the explosion initiated within 512, it had to be at least 8 psi in 512, but then we must take into consideration that that is with respect to a single entry, and the data on which Mr Stephan referred to was for single entry explosions. We have found in double entry and triple entry explosions, which are the largest actual research explosion areas - the maximum number of entries in which we have ever had research explosions where we can actually measure these things - that was three parallel entries - that this was an order of - in other words, the pressure would typically be at least to the square root of the - so, it is 8, and you have to - so, you could have a pressure 64 psi, which is difficult to achieve, because the maximum you are likely to get with methane - methane alone - is 75 psi.

Thank you.

EXAMINATION:

MR ELLICOTT: What, in your opinion, was the likely fate of those in and around 5 South on the evening of 7 August 1994?-- If the explosion was initiated in the 512 panel, persons inbye 512 and 5 South likely died from carbon monoxide or an oxygen deficiency. Now, the only exception to that would be if there was a flammable body of methane in 5 South from the terminal point of the flame coming out of 510, and there is no evidence to support that. We find that flame will only travel up into a dead end when there is sufficient either coal dust raised into suspension, or sufficient methane to support the propagation of flame in towards the dead end. You might get pressures going in about half-way. It is like pressurising a pipe that you have dead-ended. If you tried to pump compressed air into it, you will only find it typically goes half-way.

What further, in your opinion, was the potential or otherwise for any scope for self rescue by those persons using any equipment that may be available to the industry within your knowledge?-- If their problem was, as we postulated, carbon monoxide poisoning or an oxygen deficiency, the one hour

self-contained self-rescuer was developed just for that specific purpose, and where we have people who escape the effects of the - who are not seriously injured by the pressures and the light, they generally have enough time, if properly trained, to don their self-contained self-rescuers, and in a multiple entry zone, such as 5 South, one should anticipate a viable escape. I would like to see isolated escape ways, but these would increase their chance for escape.

So, you are saying it may have been possible, had those people had that particular kind of equipment, for some of them to have got out?-- We have not only found it possible, we have experienced this on quite a number - unfortunately too many occasions since self-rescuers - oxygen self-rescuers have become available. They have saved lives.

Is the availability or otherwise of transport a factor in this?-- Transport of the people, or transport of the-----

The means for people to transport themselves, other than by walking?-- Well, if you are not seriously injured, you can walk out. He had a very major fire leading to the deaths of 24 people in the Wilburg mine because they didn't bother putting on their self-rescuers. The one man who did walked by, actually, talked to some of the people, his foreman, told them, "I hope you have enough insurance.", and he escaped and is alive today.

But as I gather, the potential success of these things depends upon people initially surviving an explosion?-- That is correct.

And do you think in this case we have a feel for that - as to whether they may have or not?-- Given what they experienced in 1 North - 1 North-west, excuse me - there is a high probability that these people - most of these people might not have suffered serious injury, particularly those people in the upper reaches of 5 South. The man patrolling the belt, or whatever he was doing, I would raise questions - he mightn't have been in an as enviable position, but there was a gentleman on a telephone, and we know this was up close to the face - very low probability that these people suffered damaging pressure and there is a high probability that they could have reached the maindips with one hour oxygen self-rescuers. That is not that far a distance to travel.

Might these sorts of unknowns or possibilities be taken into account when considering re-entry?-- When considering what sir?

Re-entry into the mine - to get answers to these sorts of questions?-- Re-entry into the mine - none of this has any bearing on re-entry into the mine. Re-entry into the mine is dependent solely on stability and knowing without question what conditions were in the mine and having that - what the Warden described as that window of opportunity, a period of proven stability where as long as we don't get a major barometric change, we can anticipate that the conditions we are observing at this time - that is that we do not have CO in

excess of 750 ppm - that's a critical parameter in my judgment - that's one of the critical things - that with that I would send people into the mine.

We have heard in earlier evidence from people from the United States that it is very much the rule rather than the exception that mines are re-entered. What do you understand to be the primary driving force for that?-- One of the primary driving forces is the code, at least in the United States, Canada and Europe, to get our bodies and bring them out. That is a primary force. The second force, of course, is to determine what might have happened and how it occurred so that we can militate against this happening again. The final force is to get the mine back into production so that the survivors and the others have gainful employment.

Thank you. I have nothing further?-- Thank you.

WARDEN: Anything arising out of that?

MR MARTIN: Not from my point.

WARDEN: Mr Morrison?

MR MORRISON: Just a couple of points.

FURTHER CROSS-EXAMINATION:

MR MORRISON: Mr Mitchell, Mr Parkin was asking you about the CO/CO2 graph, and you, in answering that question about what it might show around the 19th, 20th of June said that the mine's own CO data showed the same thing; do you recall making that comment - you were telling-----?-- Would you repeat the so-called comment, please?

Well, I'll repeat what I've got noted. You were answering Mr Parkin about the CO/CO2 graph and he was asking you questions about - can you recall when he asked you about whether there had been - the vertical access had been exaggerated - I think it was that line of questioning; do you recall those?-- Yes.

In answering him during the course of that, you proffered the comment to him about that change - that the mine's own CO data showed the same thing - that's - the mine's own CO data shows the same thing or showed the same thing?-- What's "the same thing", I'm sorry? Shows an exaggeration?

I don't know whether you meant showed an exaggeration or showed a jump. I would like to know what you meant when you said that?-- The CO/CO2 ratio showed a-----

Jump?-- -----unquestionable increase.

Right?-- And it was an abnormal increase. Let me give you

FXXN: MR MORRISON

WIT: MITCHELL D W

some specific data from your Unor to - because this would indicate that - the diversity of which was about a half a part per million - is of minor consequence in the interpretation, but let us just take, if you will, sir-----

Can I ask you to stop for a moment because I don't really wish to ask - and I haven't asked - about the CO/CO2 graph. In answering that question you made the comment that the mine's CO data showed or shows the same thing. It might have been CO make data. I'm just wondering what that comment was about?-- Yes, the CO make data. I'm sorry if I did not emphasise the word "make". The CO make, and I - I believe I said this in response to one of your questions, and also perhaps to Mr Martin - I stated that during this period of June and July there is a consistent rise in both the CO make and CO/CO2 ratio, so either was indicative of something to be looked at.

Okay. Now, that's what I wanted to find out. It is a reference to the rise in the CO make?-- Yes, sir.

Fine. Thank you. That's all I need to know. Can I ask you one other thing: Professor Roxborough asked you about laminar flow in some areas of the goaf; do you recall those questions?-- Yes, sir.

Now, the goaf, as with a lot of goafs, but certainly this goaf, has a lot of irregularities. You can see some depicted on the relief map with punched areas in pillars, irregular pillars left slabbed and so forth, and you yourself make the point about rib sloughing and irregularities into the floor. All those mitigate against laminar flow, don't they?-- No, sir.

Don't they create - that is, irregularities on rib and floor - turbulence-----?-- Sorry, I don't mean to interrupt.

Go right ahead?-- The critical effect on air flow - laminar flow leading to layering - which was the basis of the questioning - were the irregularities along the roof line, because this is where the layer forms, and if you don't have reasonable turbulence along the upper regions of an entry, then you have induced laminar flow. You can actually have in high entries, like three or more metre high entries, you could have a turbulent flow in the - say, the lower two thirds and a laminar flow in the upper third.

I understand the point you are making. So unless there are irregularities on the roof, you say you can in fact get laminar flow in this goaf?-- Yes, and particularly because of the large areas. I estimate the typical average area in the goaf to have an area of 440 square feet compared to about 200 some odd square feet in the active portion of the 512 Panel.

I understand the point you are making. Now, you mention in answer to Mr Ellicott - you gave some answers to him about prospects for the men in 5 South. As I read your report you in fact postulate that following the explosion the borehole data, and I'm reading it now, supports reasons to suspect active fires in 510, 512 and 5 South?-- Yes, sir.

So that would have an impact on the prospects of survival and exit?-- It all depend when these active fires became active. There is good reason to believe based on some of the data presented by Mr Urosek and Mr Stephan, for example, in reference to their figures showing the involvement of coal, as you yourself pointed out, some time after the initial explosion. So this implies that immediately following the explosion we might have had fires, but they were not major, and typically this would be more towards the 520 area and the right side of 5 South, and I made it specific. I would sure like to have seen an isolated escape way in 5 South because this would have given them a greater means for egress - a more safer means for egress for any survivors of the explosion or fire.

Yes, but in relation to the fire, what we don't know is just when it started. That's the truth, isn't it?-- That is correct.

Because the borehole data only tells us, I think from memory when I was talking to Mr Stephan, about one day or .9 of a day after the first explosion?-- Except methane fires are typically more localised and we have people who have escaped from configurations such as we have at 5 South/520, we have had a number - on two occasions at least to my memory where people have escaped safely.

But these things are all matters of speculation in terms of this one?-- One has to postulate how large the fire was and nobody can answer that until we observe the victims.

Thank you.

WARDEN: Thank you, gentlemen. That concludes proceedings today. Can we resume at nine o'clock tomorrow morning bearing in mind our time frames? I would just finally advise you of that one day seminar at SIMTARS on Friday, 31st. Guest speakers are Mr John Urosek and Mr Clete Stephan. The agenda is available if anybody wants to peruse it, and please advise if you are participating at the appropriate telephone numbers by Wednesday, the 29th.

MR MARTIN: Just one small thing, can Mr Mitchell be excused? I'm not sure when he wants to leave Australia but it might be fairly imminent.

270395 D.50 Turn 17 dfc (Warden's Crt)

WARDEN: The witness will be formally stood down and he is free to leave.

WITNESS EXCUSED

THE COURT ADJOURNED AT 5.50 P.M. UNTIL 9 A.M. THE FOLLOWING DAY

FXXN: MR MORRISON

WIT: MITCHELL D W

