From: Justine Stansen
To: [redacted]
Cc:
Subject: Hazelwood Mine Fire Inquiry
Date: Friday, 9 October 2015 11:59:00 AM
Attachments: RE Hazelwood Inquiry.msg
image001.jpg
RE Hazelwood Mine Fire Inquiry.msg

Dear Andrew

I refer to the hearing in relation to Term of Reference 6, and in particular to the evidence of Associate Professor Barnett and my letter to you dated 30 September 2015.

I **attach** emails dated 7 and 8 October 2015 respectively to and from Professor Bruce Armstrong in relation to the fourth report of Associate Professor Adrian Barnett. I have also forward the email to Associate Professor Barnett. I will send you the response from Associate Professor Barnett when received.

Kind regards

Justine Stansen
Principal Legal Advisor
Hazelwood Mine Fire Inquiry
[redacted]

From: Justine Stansen
To: "Bruce Armstrong"
Subject: RE: Hazelwood Inquiry
Date: Wednesday, 7 October 2015 11:38:00 AM
Attachments: image003.jpg
image004.jpg

Dear Bruce

Further to my email below, could you provide to the Board a short report in relation to the fourth report of Associate Professor Barnett dated 25 September 2015. The Board is interested in your opinion as to whether the fourth report has taken into account your earlier observations and whether you agree or disagree with the methodology used and conclusions reached.

The Board would be grateful if you could provide your report by 4pm on Friday, 9 October 2015. Please let me know if you have any questions.

Kind regards

Justine Stansen
Principal Legal Advisor
Hazelwood Mine Fire Inquiry
[redacted]

From: Justine Stansen
Sent: Wednesday, 30 September 2015 8:40 PM
To: 'Bruce Armstrong'
Subject: Hazelwood Inquiry

Dear Bruce

I refer to Term of Reference 6 and the recent public hearings held on 1-3 and 9 September 2015. During the course of those hearings two reports prepared by Associate Professor Barnett were tendered.

On 11 September 2015, Associate Professor Adrian Barnett contacted the Secretariat and indicated that he was undertaking further analysis of the daily death data provided to him prior

to the hearing and that he intended to produce a further report that he wished to publish.

On 15 September 2015, Associate Professor Barnett provided that third report to the Board. On 17 September 2015, the Board sought your views concerning the third report of Associate Professor Barnett. Your comments in relation to the third report were provided to the Board on 18 September 2015 and were forwarded to Associate Professor Barnett by the Board in an email dated 24 September 2015. On 25 September 2015, Associate Professor provided a fourth report to the Inquiry.

Copies of the correspondence described above and the third and fourth reports of Associate Professor Barnett are **attached**. Copies of the reports and the correspondence will also be provided to all experts who gave evidence at the hearing in relation to Term of Reference 6.

The Board will holding a short further hearing to consider this additional evidence held on **15 October 2015 from 9.00 am** in Melbourne. The hearing will take place on level 11, 222 Exhibition St Melbourne. The Board requests that all experts who gave evidence in the early September hearing appear again as witnesses as a panel and will be questioned about this new material by Counsel Assisting and any other party.

I would be grateful if you could confirm that you are available to appear by skype on 15 October 2015.

If you have any questions about the above, please contact me.

Kind regards

Justine Stansen
Principal Legal Advisor
Hazelwood Mine Fire Inquiry
[redacted]

From: Bruce Armstrong
To: Justine Stansen
Cc: Monica Kelly
Subject: RE: Hazelwood Mine Fire Inquiry
Date: Thursday, 8 October 2015 10:54:24 PM
Attachments: image002.jpg

Justine

Thank you for asking me to comment on Associate Professor Adrian Barnett's fourth report, which was attached as file Death.Analysis.3.pdf to an email he sent you on 25th September 2015. Barnett states that this fourth report was an expansion on his original (I assume immediately previous) analysis to answer [my] questions.

His further analysis responds effectively to these of my observations about the previous report:

"The greater increase in mortality in the period of the mine fire could be due, perhaps, to the more precise definition of the period of the fire or to effects of one or more of the variables newly added to Barnett's statistical model for this analysis (time trend in mortality, weekly variation in mortality and maximum daily temperature). Whether it was any of the latter could be tested by removing each in turn from Barnett's statistical model and observing the change in the mine fire result consequent on the removal."

His further results in Table 5 on page 11 show that the relative risk of death during the mine fire was sensitive to the (appropriate) inclusion of temperature in the model, and that this inclusion partly explains the higher relative risk of death during the mine fire that he observed in this model. I agree with him that adjustment for the effects of temperature is appropriate and thus that temperature should be in the model.

It does not appear to me that his further analysis has fully responded to these of my observations about the previous report:

"It is worth noting that Barnett's latest analysis shows an excess of deaths during the period of the mine fire in all four postcodes, Morwell included. In his second previous analysis there was an apparent deficit of deaths in Morwell (relative risk 0.8, 95% CI 0.55-1.28; Table 3 of the relevant report). Barnett does not describe how he arrived at the estimated number of extra deaths during the mine fire in the four postcodes."

Barnett now describes how the numbers of additional deaths due to the fire in each postcode were calculated. This explanation, however, is not clear to me. There are two variables in the expression that Barnett offers on page2, 4th line up from the bottom of the page:

1. The mean number of deaths per day for each postcode.
   The period over which this average has been calculated is not stated; It should be. As I see it, the period should (a) be relatively recent so that it can provide a reasonably unbiased estimate of the expected number of deaths in the four postcode areas over the period of the fire, (b) not include the observed deaths during the period of the mine fire and (c) be based on a period long enough to remove most of the effect of day to day variation in daily numbers on the calculated mean numbers. All these may be true, but it is not clear that they are.

2. Exp (a_{20}), the relative risk of death during the fire. As far as I can tell this is the relative risk across all four postcodes. If this is true, postcode specific relative risks have not been used when estimating the excess deaths and, therefore, previously apparent variation between postcodes in relative risk of death during the period of the mine fire is not taken into account when calculating the numbers of excess deaths. If this is correct, a deficit of deaths in Morwell during the period of the mine fire would be obscured in this analysis.

Bruce

BRUCE ARMSTRONG
Emeritus Professor, School of Public Health
THE UNIVERSITY OF SYDNEY
Senior Adviser
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CONTACT INFORMATION
[redacted]

From: Bruce Armstrong
Sent: Friday, 18 September 2015 10:18 PM
To: Justine Stansen ([redacted]
Cc: Monica Kelly
Subject: RE: Hazelwood Mine Fire Inquiry

Justine

I have now read Adrian Barnett's Analysis of daily death data during the Morwell mine fire (version of September 2015).

His analysis of deaths is, from a technical point of view, an improvement on his previous analyses because it uses daily death data (referenced to the postcode of residence) and Australian Bureau of Statistics population data. It also restricts the analysis to the four postcode areas of greatest interest – Churchill, Moe, Morwell and Traralgon. From this analysis he reports a relative risk of death from the days of the fire (9th February 2015 to 26th March 2014) of 1.32 (95% credible interval of 1.03 to 1.66; p value 0.01). He also estimates the number of additional deaths in the four postcode areas from the period of the fire to be 23, 1 in Churchill, 8 in Moe, 6 in Morwell and 8 in Traralgon.

These estimates take account of the time trend in mortality in these four postcodes from 2009 to 2014, the underlying differences in mortality in the four postcodes, the seasonal variation in mortality, the weekly variation in mortality and the maximum daily temperature. Therefore, on the face of it, the observed relative increase in mortality risk during the period of the mine fire was independent of these other variables.

These results are reasonably coherent with, but suggest a greater increase in mortality in the

period of the mine fire than, the other mortality analyses. For example, the table below compares Adrian Barnett's latest result with my result for the period February to March 2014 (Table 2 of my report) based on the Flander et al 2015 analysis.

Years	February-June			February-March			Notes
	Rate ratio	95% CI	p-value	Rate ratio	95% CI	p-value	
Deaths from all causes							
2014	1			1			
2009-2013[b]	0.90	0.80-1.00	0.04	0.83	0.68-1.02	0.08	As in Table 2 of my report
2009-2013				1.20	0.98-1.47	0.08	Inverted to be in the same form as Barnett's latest result
2009-2013				1.32	1.03-1.66	0.01	Barnett's latest result

The greater increase in mortality in the period of the mine fire could be due, perhaps, to the more precise definition of the period of the fire or to effects of one or more of the variables newly added to Barnett's statistical model for this analysis (time trend in mortality, weekly variation in mortality and maximum daily temperature). Whether it was any of the latter could be tested by removing each in turn from Barnett's statistical model and observing the change in the mine fire result consequent on the removal.

It is worth noting that Barnett's latest analysis shows an excess of deaths during the period of the mine fire in all four postcodes, Morwell included. In his second previous analysis there was an apparent deficit of deaths in Morwell (relative risk 0.8, 95% CI 0.55-1.28; Table 3 of the relevant report). Barnett does not describe how he arrived at the estimated number of extra deaths during the mine fire in the four postcodes.

Bruce

BRUCE ARMSTRONG
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From: Bruce Armstrong
Sent: Thursday, 17 September 2015 2:42 PM
To: 'Justine Stansen'
Subject: RE: Hazelwood Mine Fire Inquiry

Thanks Justine. I will be happy to give the Board my opinion. You should have it by Monday.

Bruce

BRUCE ARMSTRONG
Emeritus Professor, School of Public Health
THE UNIVERSITY OF SYDNEY
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CONTACT INFORMATION
[redacted]

From: Justine Stansen [redacted]
Sent: Thursday, 17 September 2015 11:29 AM
To: Bruce Armstrong
Subject: Hazelwood Mine Fire Inquiry

Dear Bruce

I trust you are well. We have received some further analysis undertaken by Associate Professor Adrian Barnett since the Hazelwood Inquiry hearings held earlier this month which is based on daily death data rather than monthly data. I was wondering whether you could consider the **attached** analysis and contact me to discuss your thoughts about it. The Board would be grateful for your additional input in relation to this issue.

I look forward to hearing from you.

Justine Stansen
Principal Legal Advisor
Hazelwood Mine Fire Inquiry
[redacted]