T R A N S C R I P T

STANDING COMMITTEE ON THE ENVIRONMENT AND PLANNING

Inquiry into unconventional gas in Victoria

Sale — 1 July 2015

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Ms Harriet Shing — Deputy Chair
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Witness

Dr Jo McCubbin (sworn), paediatrician.

Necessary corrections to be notified to executive officer of committee

The CHAIR — I welcome members of the public to the second day of hearings in Sale of the inquiry into onshore unconventional gas in Victoria. All evidence at the hearing is protected by parliamentary privilege; therefore you are protected against any action for what you say here today. But if you go outside and repeat the same things, those comments may not be protected by privilege.

We ask that the first witness, Dr Jo McCubbin, be sworn in. Jo, if you can give your name and contact address, you can then swear the oath.

Dr McCUBBIN — I am Dr Jo McCubbin of [redacted].

The CHAIR — Jo, you might like to begin with a short statement. Then we will ask you some questions.

Ms SHING — Of about 5 minutes.

Visual presentation.

Dr McCUBBIN — I will quickly show some slides of how I got involved. I then have some stuff on the health impacts. I will show you some pictures of my involvement. This is about having a gas neighbour. This is a letter my elderly mother received. She lives just near Boundary Creek. The key aspects of this letter were that it said that they were about to start stimulating an old well, drilled in 2005, down to a depth of 700 to 900 metres. The stimulation contractor will be mobilised. However, the timing of this is subject to the contractor completing similar operations near Seaspray. The stimulation treatment will involve up to eight periods of high-pressure pumping over a period of about 10 to 14 days and then some flaring off.

At no point did it mention fracking, hydraulic fracturing or anything that the community I think in due respect should know, but by checking the websites of Beach Energy and Lakes Oil, we found they had told their shareholders that they were going to be fracking. That is important. It does not help how much the community holds the industry in esteem I suspect.

This is my neighbour's place in the foreground. Over there is a picture of the well. There are two wells there: Boundary Creek 1 and 2. One is sort of in the middle of the well pad, and two is to the north of the track. That is another view of much the same. The little bit over to the left-hand side is the well pad. This is the front gate. I might say the owner of this land invited me to come and have a look because he thought that he was going to earn money from the gas under his property, but he has subsequently said he does not want it to go ahead — and has been respected. They are the locks on the gate, such as they are.

That is the holding pond. This is in July 2012, when we first got that letter, showing piles of pipes. This is a meeting, around the same time, of the local community. I think out of about 60 people I counted five or six doctors and the bishop. That was the Gippy Times. That is the signage for Boundary Creek 1, and that is the old well. This is Boundary Creek 2, which was the one to be reopened. That was what it looked like the following summer, and you can see kangaroos have been in there drinking the last of the water. The signage had crumbled a bit by the autumn. This was what you saw down under that grille. There is a strange hole in the side. Then in the winter, that is what you see down that hole. It is under water. Then when the owner got wary of the whole thing, the pipes got cleaned up. They filled in the lake, and there was a curious square hole. I could not figure out what that was until I went to have a look at the pipe sticking out of the ground, which had been buried under a pile of sand. That is what you could still see if you looked under the grille.

This is Seaspray in April 2013. You can see the pads all over there starting to look a little bit like the view around Chinchilla, except that it is green — beautiful, abundant agricultural land. That is a close-up look at one of the places I visited just recently. That is the wellhead. Correct me if I am wrong, but I think this is Wombat 3. They are the trees, which I think you heard about yesterday, that caught on fire. That is the current state of the pondage. Then they were rallies in Melbourne.

Health: that is my great-grandmother, if you want to know, and one of my great-aunts, I think. When you think about it, the reason that people are disturbed about potentially living in a gas field is concern for their health. They might say they are worried that the water will be contaminated. Why? Because they are worried that they or their stock will get poisoned by it. The kinds of things that people worry about are threats to the water, threats to air quality, threats to the food chain and our exports, the global warming contribution and the mental health effects.

Water is obviously a concern. I presented to Gippsland Water in 2012, and really there was no evidence at all either way. It was all anecdotal, but it is starting to accumulate. There have been documented incidents of leakages and chemicals turning up where they should not but no documented effects on humans in Australia yet.

The ways that water could cause contamination is obviously by surface spills, particularly important in Gippsland via faults, fracks, cracks or seismic activity. We have our fair share of earth movement. There is a paper there from Penn State University which shows that new techniques show contamination of drinking water. They were lucky to get this water, because they sampled the wells before the legal settlement with the company that stopped any information getting out.

Ms SHING — Sorry to interrupt you, Jo, but can you please provide the title of that document that you have held up so that we know what you are talking about — just the title so it is in the *Hansard* transcript.

Dr McCUBBIN — It says 'New technique shows shale-drilling additives in drinking-water taps near leak'.

Ms SHING — From Penn State? Is that what you said?

Dr McCUBBIN — Yes. I think that is actually the media release that went with it. In a similar vein, the March 2013 quarterly report from Lakes Oil says:

> … oil … previously encountered in Wombat 3 has migrated along natural fractures from oil bearing source rocks located significantly below the total depth of the well.

Further on it says:

> … plans to isolate the oil-bearing zone in Wombat 3 in order to flow test the oil that was previously identified … It is proposed to seal off the gas/water producing zone …

That suggests to me that sometimes things do leak upwards and downwards.

Air quality is one of my key concerns. This is where there is stronger existing data from the US. There are various ways that air quality can affect you. Of particular concern are $PM_{2.5}$, which are well recognised as damaging to health. The reason that we are concerned is that the really small particles get into your lungs, then into your bloodstream and then they can go anywhere. The lungs are used in medicine as a way to get drugs into you. If you are nearly dead, with no venous access, you cannot put stuff in a drip, but you can often put things down into someone's lungs and resuscitate them, so it really does get into your blood.

It is those tiny soot particles particularly, because carbon adsorbs, that can take with them heavy metals and organic compounds and essentially smuggle them into your body. There is a diagram which you guys cannot see demonstrating how small we are talking about. There is lots of evidence that air quality is harmful to health.

This slide shows another way of looking at it. The picture shows brown droplets on my flyscreen at the time of the Morwell mine fire, and all the bushfires in east Gippsland on the other side last year. If the dew was that colour, that is what we were breathing, and that is a scary thought.

So what about threats to food? Particles may fall on the grass, on crops or on water bodies. Toxics may also be irrigated, flooded or leaked onto the soil, contaminating crops and livestock. Really it is our export reputation as well as our own health that is at stake there, because would you rather feed a baby infant formula from cows in Australia or in China?

From the history of this in the US, you get the impression that they have been doing it forever, but in fact the real gas rush took off there mostly since about 2005, so it is relatively recent. From asbestos, smoking and things like that, we know that it may be 15, 20 or 30 years before the cancer hits you, so it is no surprise that there is not yet much peer-reviewed hard evidence, and it is going to be years before we know whether we are causing cancers or we are not, so we should wait and see.

The other significant thing about this is the health effects of climate change. Just last week the *Lancet* came out and reinforced what it originally said about climate change being the biggest risk to human health for this century. Since natural gas is methane, and that is 25 times more potent than carbon dioxide, we do not really need to release too much more into the atmosphere. Casings do leak, and increasingly so as they get older.

Because it is a new industry they may not be leaking as much now as they will in the future. Seismic instability and subsidence, which are Gippsland problems, may also further damage the casings and cause problems.

Finally, there is mental health. I think at this early stage the threat of gas has been a positive for this community because everybody has gotten together and said no, and the community activity that has arisen has been really inspiring. Just look at who is here. On the negative side, hearing about stuff from Queensland and from the US, you have got to think about what it does to your community and those who remain. Do you see your life's work on your farm and your real estate values diminishing?. That is not good for your mental health. We know that rurality increases suicide risk and it is much harder to access quality mental health services.

Substance abuse is an issue, and an emerging area is that it may be that some of the hydrocarbons and things — think of petrol sniffing, for example — have effects on your brain and your mental health. I would ask that if you do nothing else, please make it impossible to have a gas well within 100 metres of your home. If you have no rights to protect your land and your family, you may well feel like screaming. I did not realise until I looked closely that it looks as if he has a pile of pipes running along next to him.

How does being in a gas field damage you? There is immediate toxicity, and then there is the long term, which may affect your heart and lungs, fairly obviously, but also other systems. There is the cancer risk and also endocrine disruption. If time allows, I would like to finish off with babies and young children, where there is already good, hard evidence. That is my special area.

Obviously, if you have sore eyes, your asthma gets worse, you feel sick, you have rashes or loss of consciousness, which is an extreme case, but you could get that from carbon monoxide and hydrogen sulphide. They are the causes of that. If you then leave the area and get better and then come back and get sick again, you begin to see a cause-and-effect pattern. But in the longer term the inhaled particles and gases could do lots of things to the foetus. There is evidence that they may cause heart malformations, amongst other things. But also, if you are born at a low birth weight, your lifetime cardiovascular risk is increased. Those babies have a higher risk of hypertension, diabetes and lots of other things. It also affects your immune system. I have information on endocrine disruption if you need it. Its effects on the brain are an evolving area.

Basically, the immune system is a complex body with cancer-destroying cells on the one side — things that try to keep things in sync. But if you knock out one little part of the complex system, it can go rogue and you can attack your own body, or it can allow cancer cells to proliferate, so there are issues there. Hydrocarbons are known to affect the bone marrow.

Endocrine receptors — it is really about similar-shaped chemicals. The basic shape of progesterone, oestrogen and testosterone, opposite genders, are very similar with just different bits tacked on the sides. These are from the World Health Organisation. Issues about endocrine destruction depend on the age of exposure, how long since exposure and the mixtures of different compounds. That is an area on which we really need more information. Sometimes it is the really low doses that cause more harm than higher doses, which means that you can affect generations to come. Most people have heard of diethylstilbestrol, which ended up causing cancers in the daughters of women who were given that synthetic oestrogen to stop miscarriage.

Endocrine destructors may trigger maleness in girls or femaleness in boys. They may cause abnormal sexual development or reduced fertility. There are lots of examples from animal studies, such as alligators whose penises have shrunk because of pesticide contamination in the water and so on, which we do not need happening to humans.

Lots of hydrocarbons, diesel, the BTEX chemicals and also PM2.5s are linked to cancers. Cancers can also be caused through endocrine disruption. We have a Fiskville kind of example. But a lot of the papers suggest that you study people in the oil industry, and they are healthier than the general population, but that is put down by the epidemiologists as something called the healthy worker effect. It is a phenomenon observed initially in studies of occupational diseases. Workers usually exhibit lower overall death rates than the general population because severely ill and disabled people are excluded from employment — they have left, so they do not get counted — so we do not get the true figures.

Benzene exposure is known to cause things like lymphohaemotopoietic cancers. There is a study I mentioned where 25 000 offshore oil industry workers did have increased risk of acute myeloid leukaemia, multiple

myeloma and chronic lymphoid leukaemia. Kidneys can also be affected — that is an emerging link to air pollution — and the brain is now accepted as definitely linked.

Actual data from actual gas fields: it is quite hard to get good-quality data. There is a lot of anecdotal stuff for both sides of the argument and there is a lack of proven cases, mostly because everything is settled out of court, so it does not get to a state of proof, and then no-one can talk. There was a study from Colorado in 2012 — I have given the details there — which looked at data sampled every week for a year before, during and after drilling and hydraulic fracturing of a new gas well. They found amongst the non-methane hydrocarbons 30 that affect the endocrine system and that may be harmful at very low concentrations actually below the state safety standards. Similarly I would comment that selected polyaromatic hydrocarbons were at concentrations greater than those at which prenatally exposed children in urban studies had lower developmental and IQ scores.

The tabloids get excited about stuff like this and tell you that diesel can cause autism, schizophrenia and all sorts of things — perhaps rushing into it a bit. However, Harvard in 2014 did find that women exposed to higher levels of fine particulate matter, specifically during the third trimester of pregnancy, may face up to twice the risk of having a child with autism than mothers living in areas with low particulate matter. That is using data from the US Nurses' Health Study, which is a huge study. I think that is salient because we are certainly seeing more and more autism in society generally. That is another picture you might want to look at.

This just shows you where the key areas in foetal development happen. The red areas are when cells are rapidly multiplying. You can see for the brain that it is the longest of any of the organ systems. The heart is fairly early on, and the rapidly dividing point in their development is when the most harm can be done. If you can imagine that just one cell is about to turn into all your white matter, if you knocked off that one cell you would get no white matter. If you wait until you have got thousands of white matter cells and you knock off just one, it has less effect. It is very important for foetal development.

There is actually some evidence from lots of animal studies and other information about children's brains that it seems to depend on what the pollutant is, the doses, how long the exposure is, age, gender and general health status. Animal studies show that one or a combination of criteria pollutants cause permanent changes in neurotransmitters and altered brain development, most commonly resulting in long-term deficits. There is also — I have mentioned it somewhere — some evidence that early exposures to some of these kinds of chemicals may be linked to developing Parkinson's and dopaminergic neurones et cetera.

The Pennsylvania study came out in 2014. Births were analysed from 2003 to 2010. Then they looked at whether the mothers drank well water or town water, and they found no difference. However, the air quality results showed that if you were close to the wells, there was a significant reduction in birth weight, and Chinese data backs this up. They are certainly exposed to lots of poor-quality air. It seems to be linked to polyaromatic hydrocarbons, which can also make the term babies smaller. There is a difference between the low birth weight and intrauterine growth retardation. That means that you have a preserved head — a big head — on a tiny body and that is evidence that this baby has been malnourished throughout the pregnancy, whereas low birth weight does not so much. It shrinks the whole baby a little bit more. There are subtle differences. The Pennsylvania study also showed that there were slightly lower Apgars in the affected babies.

Colorado has also looked at this aspect. They looked at the major areas that could be affected: the heart, the developing brain and spine, and birthweight. They looked at 12 800 births between 1996 and 2009 within 10 miles of a gas well or more than 10 miles from one. There was a statistically increased risk of congenital heart defects. They did not see a huge reduction in birth weight, but it was there, though not to a significant degree. They did not see prematurity, and they did not see any association with cleft lip and palate. I think this is an issue that doctors take very seriously. This slide has a picture of the day of the Seaspray human sign, and there are about five doctors in that picture.

I would say to you that, if you do nothing else, when you look at the economic impact of a gas field, you have to factor in the cost of the health effects, which will far outlast the gas production, and that will really look at the cost-benefit analysis for onshore gas. Is it really going to be worth it in the end?

My take-home message would be that we should hasten slowly. The American evidence will emerge, the Queensland evidence will emerge, but it might take more than 10 years — 20 years or 30 years — and I think we have to wait until there is rigorous scientific proof that there is no harm to health, because I think it is a real risk. That is it.

The CHAIR — Thank you. That is a very detailed presentation, and a copy of that has been given to the secretary. We may want to follow up a couple of those papers, if that is possible.

Dr McCUBBIN — I will give you a copy of that. I do not have 17 copies at $23 per copy!

The CHAIR — No, that is fine. Keir will get that as we require it. I have a couple of questions. Has the National Health and Medical Research Council or any other similar body looked at the health questions or otherwise around gas in this way, do you know?

Dr McCUBBIN — I do not think so, but I do not know that they have not.

The CHAIR — Is there a similar body in the States or elsewhere around the world that we could look to?

Dr McCUBBIN — It tends to be more regional. For example, in New South Wales the chief medical officer had a look. In the UK there has been — there are papers out there but not quite on a national level perhaps.

The CHAIR — That is actually quite helpful. The other point is that with many of these studies the causality is the difficult thing to tie down. There may be associations, but there is often selection bias as well.

Dr McCUBBIN — Possibly, but like that Pennsylvania study of whether you were more or less than 10 miles away, that was very closely controlled to make sure that the socio-economic status, the smoking status and all those other variables are counted in.

The CHAIR — The other point in terms of your advocacy and so forth on climate change and other matters is that gas perhaps has an important role as opposed to some of the other alternative fuels. Victoria of course is very dependent on coal, so there is an argument that is put by some — —

Dr McCUBBIN — Thank you. I meant to say that. I think the myth that gas is our transition fuel has been well and truly exploded. We do not need it. We can slowly close down bits of the coal sector. I have solar hot water and solar panels on my roof. I have no electricity bills. I barely need gas, and I am thinking of getting my house completely off gas, because really the alternative technologies are almost there. The costs have come right down — they really work — and the cost of batteries is getting cheaper and cheaper so that we are not going to need gas. We should just bypass this whole business and move to the future.

The CHAIR — I should say for the record that I spent some time with a technician a few weeks ago who told me the opposite to that — he said the technologies are not there yet, so — —

Dr McCUBBIN — We have got 30 years of gas offshore, though. We have got plenty of time to refine these alternative energies. I would have thought industry would be looking in that direction if they have really thought about it, because gas is only a temporary measure — it is not really worth investing in.

Ms SHING — Thanks for your presentation, Jo. I note that you have focused on research from the US — the Colorado and Penn State studies — with a brief reference to China — —

Dr McCUBBIN — And Colorado.

Ms SHING — Yes, I mentioned Colorado. Is there any research that has come from New Zealand or Canada in particular that goes to the issue of knock-on effects for human health, whether that is physiological or psychological? The reason for this is if we are looking at the type of land being used, there are, to my mind, direct comparisons to be made in the type of agricultural land and population spread in those two jurisdictions. Are you aware of any research that is being conducted in relation to health effects in those areas?

Dr McCUBBIN — No, I am not, but I think the problem is that it is a relatively young industry. Yes, there has been a little bit of fracking going on for a long time, but this sort of mass — pads everywhere that you see in those aerial shots — is relatively new. Because it takes two to four years to get a peer-reviewed article peer reviewed and then published, that evidence is really only just emerging, and that is the problem. It is going to be another 5 or 10 years before hard data from Australia is there, and it would be the same in Canada, New Zealand, Europe and everywhere else, unfortunately.

Mr LEANE — You are the first witness to mention any interaction with Gippsland Water that we have had in the last two days. Are you able to expand on the activities? Obviously there were concerns around the well water that were brought to their attention. Do you know if they did a report or what activities they entailed?

Dr McCUBBIN — Sorry, Gippsland Water?

Mr LEANE — Yes.

Dr McCUBBIN — I was, for a while, a community representative on a community reference group mostly dealing with toxic waste over at Dutson Downs, but I asked them whether they were planning for the gas industry moving onshore, and they said, 'Oh, we haven't thought about that. Perhaps you had better do a presentation'. I had to go looking for information, and there was not a lot.

Mr LEANE — Maybe we should write to Gippsland Water and see if they have done.

Mr YOUNG — I just wanted to clarify the concerns and issues you have raised — whether you are relating them back to unconventional gas, or are you talking about all conventional gas mining?

Dr McCUBBIN — I am really talking about the likely effects on people living near gas fields.

Mr YOUNG — So specifically are you raising these concerns because of unconventional gas or gas in general?

Dr McCUBBIN — Unconventional gas — any onshore gas really.

Mr YOUNG — Any onshore gas? Okay, thank you.

Ms BATH — Just a question; I came in a tad late. With respect to Doctors for the Environment, could you tell me briefly about your role in that or what that represents?

Dr McCUBBIN — I need to emphasise that I am not speaking for them. They have a kind of peer-review process, and due to internet problems — and thank you, Telstra; it is wonderful in Sale; we do not have broadband — I was unable to send the information through to get peer-reviewed, so I am speaking for myself rather than for Doctors for the Environment, but I do have a close relationship with the Doctors for the Environment. I am a member, and there is a gas group of people in every state except Tasmania, and we pass on to each other interesting new papers. About three members are research docs in universities around the country and they often have access to papers before passing them, so they are shared around.

Mr BOURMAN — I am fairly new to the inquiry, so this might seem funny, but you said something about there a little bit of fracking going on for a long time in some places.

Dr McCUBBIN — Yes.

Mr BOURMAN — The issues or potential issues you are describing, would they not turn up in a small node around those areas?

Dr McCUBBIN — I think to date there has been exploration but no production. In 2005 I remember being at a hockey club event. There are a lot of oil workers who play hockey, and they were laughing about people trying to find onshore gas and mostly finding carbon dioxide. It was starting to happen then. One of my slides is of a drillhole from 2001. So there has been a little bit.

The other thing that is done elsewhere is that there are monitoring bores around the well pack. You did not see that anyway here — that kind of thing. If anything happens, we really need to be monitoring it much more extensively than we are.

Ms HARTLAND — Thanks very much for your presentation. I am interested in Seaspray Primary School — —

Dr McCUBBIN — Yes.

Ms HARTLAND — I am not sure whether that is one you know about. Considering that within 1 kilometre there are three wells, do you think there should be barriers between primary schools and this kind of industry — —

Dr McCUBBIN — Kind of offset?

Ms HARTLAND — Yes. Also, are you aware of any studies being done on those children at this stage?

Dr McCUBBIN — No, there are not any studies. Look, that is a really difficult one. You could rush into the school with your boots on and say, 'Right, we are going to assess all your children in case they have been poisoned by gas'. What is that going to do to their mental health? So you cannot do that. But it would be fantastic if there could be a really thorough study of the health of this population now before anything happens, because then you have base data that you can go back to if you think you are seeing clusters of something happening. It is the same with water quality, there is a lot of data we do not have — gaps in the existing data — that we need before we rush in and start tinkering with the environment, so to speak.

Mr DALLA-RIVA — Thank you, Doctor, for your presentation. A couple of issues that we have been following are policy and regulatory safeguards. I note in your presentation some of the preliminary works. The remainder of the works are pretty average. I am trying to get a feel for whether there are sufficient policy and regulatory safeguards in terms of enabling the exploration and development of unconventional gas. Would that in some way allay your concerns?

Dr McCUBBIN — I am glad you asked that, because I think we have appalling levels of regulation. It has entertained me that state by state some minister or other has come out and said, 'Ah, but we have the best regulations in the nation'. That is funny; you cannot all have the best. That immediately makes you suspicious. It is a silly, throwaway line.

I think the regulation is hugely important, and it has to go to the legacy effect, because you might get gas out of a well for 10 or 15 years, and then you walk away. By the time people start having a problem, the company may no longer exist. What do you do about that? We really need tight regulation that makes the people who cause damage responsible into the future, or certainly hefty insurance policies that can respond to that. I have seen pictures of a well that was just an exploratory well looking at coal, I think, in South Australia. That was done in the 1980s. A young couple that took over a property discovered this well. There was a hole about this big around a pipe sticking out of the ground, and you could just do that and the water swished around somewhere down in the dark. You think, 'That can't be good'. They asked the South Australian government want to do about it, and the government said, 'Since the company that did it no longer exists, you have to pay to fix that problem to our satisfaction, and that will cost you $10 000'. That is huge.

You cannot do that to future generations, and that is just about a financial, fixable problem. What about the health of future generations? That is the thing that really worries me. There needs to be very tight regulation, but it also needs to be enforced. That means there are going to need to be more EPA people who can go out and sample the air quality and check water. There should be water sampling bores perhaps so you can check there has been no leakage. I have had quite a bit to do with the EPA over toxic waste and stuff, and I find that when you swap departments and get into mining and petroleum, they are not so used to the community consultation aspect. In a radio interview they admitted that they were not used to the community being interested. That need to talk to the community and really police things in a way that the community sees it is happening I think is essential to getting any sort of trust of this industry.

The CHAIR — Jo, thank you. We are very appreciative of your material. The secretariat may want to talk to you as we go forward.

Dr McCUBBIN — Thank you for having me, everybody.

Witness withdrew.