Alice Springs - Jason Trevers

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Alice Springs Convention Centre

Speaker: Jason Trevers

Jason Trevers: My name's Jason. I'm just representing-

Hon. Justice Pepper: And your surname?

Jason Trevers: Trevers.

Hon. Justice Pepper: Thank you.

Jason Trevers: I originally put down for an hour, and I notice I'm starting 10 minutes early. Does that give me allocation for a few extra minutes-

Hon. Justice Pepper: Well, as long as we're finished by 12:30, that's fine.

Jason Trevers: Yeah.

Hon. Justice Pepper: Thank you.

Jason Trevers: Cool. I'll just grab water.

Hon. Justice Pepper: When I say finish by 12:30, that includes questions. Thank you.

Jason Trevers: Cool. Yeah, if you can give me a card at 10 minutes to go, then I'll play my video.

Hon. Justice Pepper: You'll get one of these at five minutes to go.

Jason Trevers: Oh.

Hon. Justice Pepper: Thank you.

Jason Trevers: I'll just start a stopwatch for myself so I can keep track.

Well, hello Panel. Yeah, my name's Jason. I've presented to you a few times before. I think this is my third time now. I've become deeply disappointed at the process in the outcome of the final draft of the inquiry. I feel the Inquiry has no integrity and as an independent Inquiry it was initially portrayed as. It has been a waste of time and money. I've personally invested a great deal

into gathering information for this Inquiry and presenting before you. I've been commended for my presentations, but it has amounted to nothing. The Chief Minister, Michael Gunner, appointed the Independent Scientific Panel to inquire into the environmental impacts and risks associated with hydraulic fracturing. It is your job to assess the risks with regard to the most relevant, current, and available scientific information.

Fracking has many risks and potential things it can go catastrophically wrong. Not a single unconventional gas field has completed its life cycle of the gas field. It is a new, experimental technology. Already, there is evidence of countless incidences where the environment has been detrimentally affected, habitats destroyed, surface and ground water contaminated, drinking water contaminated, just to name a few.

I've personally spent many hours to the early hours of the morning researching fracking to present my findings before you. I do not have time to look at all the issues, so I will just look at one, which I think is a pivotal point: well integrity. In my first presentation, I presented to you the facts that 7% of new wells leak, and as well's age that percentage increases to 30 - 50% at the end of the well's life. I provided a video of Dr. Ingraffea, a world-renowned authority and respected scientist on the subject of fracking, and other documentation to back up my claim.

I was shocked to read your report where you printed APPEA's figures of .004%, one in 20,000 well integrity failures. I challenge this in my next presentation to you, providing peer-reviewed scientific papers. One of them titled, "Implications for Shale and Unconventional Reserve-" oh, no that wasn't the title. "Oil and Gas Well and their Integrity Implications for Shale and Unconventional Resource Exploration." This peer-reviewed article was written by nine scientists from five different universities or institutions, compiled from 25 reliable data sets from around the world. Its conclusion sort of showed there was large variability between 2% and 5% of instances were well integrity failures over the 4 million relative of the reliable data sets.

APPEA's data must have missed this exclusive study and other well documented factors that the rate of well failure increases with age, steel rust, and centigrades. It's an unsolved problem. 30 - 50% that are fracked at the end of their life are leaking. When a well is capped or plugged, it will continue to leak on the outside layer where degradation continues to rapidly and eventually the steel and cement will decay completely.

Dr. Matthew Carroll, Senior Lecturer, Environment Engineering RMIT University also responded to your Interim Report. Where was that? He said, "There is clearly a large discrepancy in the rate of well integrity failures reported in academic literature, e.g. Ingraffea et al. 2014 and Jackson studies cited in the Interim report, literature produced by the oil company and gas industry APPEA. The Inquiry's Interim Report quotes well failure rates ranging as high as 6% based on academic sources, to as low as .004% according to petroleum gas industry sources. The reasons for this

discrepancy should be thoroughly investigated and resolved by the Inquiry prior to any judgement about risk levels."

Part of APPEA's information used derive this figure came from the Society of Petroleum Engineers. In a video I'll show you later, the Society of Petroleum Engineers also has documentation quoting 5% well failure rate. So, the same organisation is quoting very different figures, depending on who they want to target.

Dr. Matthew Carroll said that the EPA figures point derived from an article from the Society of Petroleum Engineers. The article was not available to the public or academics. That did not stack up against a multitude of peer-reviewed articles and world-wide data sets. To get their low, unrealistic data, APPEA used a hand-selected data from ground water protection camps in 2011 study of onshore conventional gas fields, not unconventional gas fields. Quoting from Kim Keeran, et al. 2017 review of well integrity issues, it is clear that unconventional oil and gas resources present particular challenges with respect to maintaining well integrity.

The oil and gas industry have spent millions of dollars and decades trying to improve well integrity issues, and have been unable to improve the technology significantly to reduce well barrier failure. So they have resorted to spending millions of dollars intentionally misleading the public to make people believe that their extra layers of steel and cement will keep the hydrocarbons and toxic chemicals separate from our water and atmosphere forever. The Panel have misled the public by ignoring scientific evidence and data and facts presented and running with the gas industry's misleading campaign. The Panel has been presented with large amounts of information and has shown prejudice towards APPEA and their fantasy fool delusional unrealistic statistics of .004%. By printing it in their Interim Report, when challenged by myself, Dr. Matthew Carroll, and others to get to the bottom of the 1,000-fold discrepancy in statistics from the EPA, the multiple peer-reviewed articles and world-wide data sets, the independent panel, charged with the responsibility of assessing the risks and report to the public, decide to sidestep this integral issue and appoint the Commonwealth Scientific Industrial Research Organisation.

Wikipedia say that the chief role of CSIRO is to improve the economic and social performance of industry. CSIRO in recent times has had 115 million dollar budget cut. It is not about to produce information and statistics that are contrary to the will of the commonwealth and the economy. So it's no surprise that the CSIRO statistics do not match world-wide data sets. .01% well failure, one in a thousand well integrity as compared to 5%, one in 20, is a 50-fold differential. Much better than a thousand-fold, but still nowhere close.

CSIRO also failed to acknowledge a well-documented problem in the industry that well failure rate increases as they age, they degrade over time. CSIRO found some study that seemed to ascertain or suggest that cement should remain intact for a thousand years. I'm sure the statistics of the CSIRO did not show the collapsed well at the dingo gas field 40 km south of

town, or the falsely fracked well at Lucy Creek. Due to the fact that we have a completely unregulated industry at the moment, they can basically pull out whatever figures they want, so it's not surprising that they got close to 0% well failure rates.

As members of the Panel you will be aware that the process and construction of a well, you would know how impossible it is to drill a well without contaminating local aquifers. Drilling the well contaminates the local aquifer with the local soil and contaminates with the drilling mud, which is pumped at pressure in large quantities into the aquifers as the initial well is drilled. Drilling mud contains chemicals toxic to human and animal health. So, yeah, before all the concrete and steel can be put in there, you're drilling straight into the aquifers.

More layers of steel and cement means larger drill holes, which means more contamination to the aquifer. Multi-wells compound the local contamination aquifers ten-fold. Multiple layers of steel and cement are added as a protection around the shallow aquifer, but often the deeper aquifers are not protected by additional layers of cement and steel. Not only are these often multiple layers of aquifers under the surface, there are also often multiple layers of shale deposits then the target layers containing pressurised hydrocarbon gases. While the production casing is being drilled, hydrocarbons have free access to lower, unprotected aquifers.

CSIRO did a 6.25 million dollar study in the Great Artesian Basin, GABWRA, taking 2.5 years to complete. Their finding demonstrates that ground water has a greater potential to mover vertically between aquifers than first thought. It cannot be assumed that deeper aquifers and superficial aquifers are not connected.

When the cement is actually put down in the well, it has to travel three or four kilometres down and maybe another three or four kilometres across, where it's pumped back, trying to seal up to the surface back up to the top. This is where you want your strongest cement and your strongest fixing because this is what's protecting the water layers above. But this is the poorest quality cement. It is pumped through the drillings of the open sort of ... It picks up debris from the hydrocarbons, the oily based substances, and multiple layers of chemicals or particles as it goes up there. So your poorest quality of cement is where you want the strongest bond to last for eternity. When it gets to the shallow shale layers as a liquid cement with high pressure gas, which deviate and reduce the bond. That high pressurised gas can actually add to bubble sort of effects, going further up the tube and column into where you need the strongest bond of cement.

The judgement made by the people doing the cementing because it costs a lot to run a drill rig and they don't want hours and hours going by, waiting for the cement to go off. So it takes a couple hours, but it's a fine line. And if they get it wrong on the other side, you get lock up, where the cement doesn't get all the way up to where you want it to go and you have open annuluses going up to the water aquifers.

In a well the steel and cement are exposed to a large amount of corrosive chemicals. Truckloads of hydrochloric acid are pumped into the well during the fracking, and they're pumped in pure, not diluted. There is a high salt content in the target shale and the product water that flows through the steel pipe for decades. In a saline environment, steel rusts and corrodes, calcifies and cements loses strength and integrity and turns to powder.

I'd just like to introduce my first video. This is one I tried to have presented to the panel a few times now, and tried to play last time. This is Dr. Ingraffea, he's been working for four decades within the industry.

Hon. Justice Pepper: Is this the same video that you presented last time?

Jason Trevers: I tried to, but it didn't work.

Hon. Justice Pepper: Ah. Okay. Thank you.

Jason Trevers: Yeah.

Hon. Justice Pepper: Good. Excellent.

Video-Ingraffea: Is not shown. I want to make sure you understand this because millions of dollars are being spent by the oil and gas industry on television ads and on newspaper ads right now that want you to believe that four layers of steel and four layers of cement are better than three layers of steel and three layers of cement. And three layers of steel and three layers of cement are better than two layers of steel and two layers of cement. And they want you to know that now using up to four or five or six layers of steel and cement.

Doesn't make a damn bit of difference. There's always an outermost layer. There's always an outermost layer. I don't care how many you have, there's always a contact layer between the cement and the rock. That's the contact. That bond, they can't accept it. They can't measure it. They can't observe it.

There are techniques of figuring out whether the cement is in contact with the steel casement. Lots of good technology can tell them that, but what they can't tell is whether it's a good bond between the outside of the cement and the inside rock. And by the way, it's not just one kind of rock. You might be seven or eight thousand feet down, and it'd be hundreds of different kinds of rock, each that would possess its own chemistry, its own [inaudible] of friction, its own bonding chemistry with the cement. And you've got one kind of cement you want to bond to all those different kinds of rock.

So it doesn't make any difference. That is disingenuous on the part of the industry to say "We're now using more steel and more casing to give you more protection." Totally irrelevant. Doesn't make a damn bit of difference.

How do I know that the industry knows this? Because the industry publishes its own statistics, it has its own culture. It has its own journals. It has its own review, its own evidence. So I know how much on a Saturday morning you

want to spend time looking at bar charts, but you're going to spend some time with bar charts. This one is from Schlumberger in their journal. They went out and they surveyed 45,000 offshore oil and gas wells and asked a very simple question: how many of them are leaking? Simple question, right? And they categorised all data into a bar chart. So horizontal axis is how old the well was when they investigated, ranging from brand new wells to wells that were 30 years old. And the vertical axis represented the wells that were effected by sustained casing pressure. In other words, there was gas coming up through one or more of the annulus outside the production casing. In other words, the well had failed. Construction integrity was not there.

Alright. This could be a graph of my age versus the number of pains that I have. And as you well know, even at birth, sometimes we hurt. But as we get older, we hurt more. More things go- Same thing. Look. Young wells fail at the rate of one in 20. Young wells, brand new wells fail at the rate of one in 20. Remember that number, 5%. And as wells age, the failure rate goes up, because that cement starts to degrade, the ground motions cause the cement to crack. Cracked cement shrinks over time, the casing starts to corrode, the degradation between the casing and cement goes to hell, the degradation between the cement and the rock goes to hell, and pretty soon, more than half of your wells are leaking. And how long are these Marcellus wells supposed to be in existence? Be careful how you answer this question. How long does every Marcellus continue to have to exist in the state of Pennsylvania? Thank you. Forever on this graph. So the reasonable expectation is eventually all wells lose their integrity.

Alright. So I showed this once and somebody, Haliburton, said "Your graph can go up your you-know-what, because this is for offshore wells." This guys from Haliburton and I turned to him and I said, "You should know about offshore wells. You should know about cement jobs in all of your wells. You should know about a cement job on an offshore well built in the Congo, where there's a billion dollar investment in that well and failed because of a faulty cement job."

So, let's go onshore. This data, again this is industry data, Society of Petroleum Engineering referee journal paper from 2009. These researchers might survey 347,000 oil and gas wells in Canada. And again, they did the same thing. How many of them are leaking? They find out that somewhere around four and a half percent of them, older wells are leaking more than younger wells. You can see that here. Remember that four and a half percent, 5%.

Earlier this week, I went to the Pennsylvania Department of Environmental Protection Compliance Database, which now is in pretty good shape. It took four years for them to get a reasonable, competent, professional database managing system so that you, the public, can figure out what's actually going on. I surveyed and I asked how many violations were issued in 2011, of all the operators in Pennsylvania for a loss of well integrity. Let's go backwards first. Let's look at 2010. In 2010 there are 14,054 well drilled by Marcellus in Pennsylvania. 90 of those wells were cited for well integrity

failure. Migration. Of the type I just showed you. That's a 6.2% rate of failure. That number sound familiar?

Industry says "We're improving all the time. We did tell you we were perfect when we got here, and we weren't. We admit it. We have learned." My buddy [Terry] at Penn State says that the drilling industry has got to learn by actually experimenting in your backyards. Let's go to 2011, there 19,037 wells were drilled, and 121 well failures. Exactly the same failure rate, to within three decimal places. Isn't that amazing?

I've concluded that this data is consistent with previous industry data I showed you. In other words, this is a chronic problem the industry is always known about it and has never been able to fix, for obvious reasons. It's too damn complex to fix it.

So what's rare? Rare is 6%. Early. Remember, these are wells that were drilled in the year in which the violation was issued. This isn't talking about what are those wells going to be doing 10 years from now, 20 years from now, 30 years from now. So the myth is fluid migration from faulty wells is a rare phenomenon. They'd like you to believe it only happens once in a million times, once in a thousand times, once in ten thousand times. But they're going to get a hundred thousand wells in the Marcellus in Pennsylvania. That’s what most these experts say. In the Marcellus alone.

So the truth is that fluid migration from faulty wells is a well-known chronic problem, and there's an expected rate of occurrence. You're going to have a hundred thousand wells, you’re going to have 6% of those wells 60,000 wells is that right. 6,000 wells are going to fail. How many people's well water contamination incidences is that going cause? And what's the cost to the state?

So, health impact, there will be contamination, there has been, and there will continue to be contamination of underground sources of drinking water with methane, perhaps drilling fluids, released hydrocarbon and other things that are down there that are supposed to come up inside of the well and not the outside. So, truth? Myth? you decide.

The most common problem here is not shown-

Jason Trevers: Okay, that's gone back from start again.

Video-Ingraffea: [video replays in background]

Hon. Justice Pepper: You want to stop there.

Jason Trevers: Yeah, I think it's gone back to the start. It's jumped back to the start. It's finished.

Hon. Justice Pepper: Okay. Alright. Thank you.

Jason Trevers: So, yeah, Ingraffea sort of points out that the industry very much well knows about the chronic problems with well integrity failure and they've just been trying to cover it and do a propaganda, or basically spread mistruths.

Hon. Justice Pepper: Sorry, what was the date of that video?

Jason Trevers: What was the date?

Hon. Justice Pepper: Yeah, the lecture that he's given. When?

Jason Trevers: I think that was 2012.

Hon. Justice Pepper: Thank you.

Jason Trevers: Where was I? Yeah. One of the problems is steel and cement corrode over time and rust. I was going to show you some photos of where I was on holidays and there was a shipwreck on the side of the beach in the Ethel shipwreck. 50 years ago there was a 600 tonne massive steel ship on the beach and now there's just this tiny, skeletal rust that sort of left over a 50 or 60 year time that it just completely disappears in a saline environment. There's many cattle stations at the moment that are replacing all their water bores with drinking quality water that have completely gone and corroded, and they're having to re-drill, re-bore, add casing, and they're using plastic these days because of the effects that the drinking quality water has on the steel, let alone what is going to happen when you get the salty, deeper under layers with other corrosive contaminants.

One of the chemicals that they often use in the fracking fluid used try and contact that is anticorrosive things like you get radiator fluid. That's probably one of the reasons why the frack fluid ponds are so green and just look like radiator fluid because it's a chronic problem, trying to stop things corroding.

It's a bit of a concern when you're thinking they're trying to plug up a well for abandonment and the steel that their cementing or plugging into is completely corroded and lost its integrity and calcified and that's meant to be a strong bond.

I might move on to my second video here. This was me yesterday at the back of my air conditioner.

Hon. Justice Pepper: Mr. Travers, you have five minutes left.

Jason Trevers: Cool.

Video-Trevers: I'd like to provide a bit more anecdotal evidence of what happens to cement when it is in contact with salt and moisture. Everyone knows steel with cement rusts. So you've got a barrier of steel, and a barrier of cement protecting us, protecting the water aquifers from the contamination from all the hydrocarbons and all the toxins that are out in the shale layer. Everyone

knows steel rusts. What everyone doesn't know is what happens to cement when it gets exposed.

This is cement here I would like to show you has been exposed to drinking quality water over a short period of time. When we open this up, we can actually see the strength and the quality of the cement. This is high-quality building cement and the cement that is protecting the vital aspect at the top of the well what's underneath and being pushed through about seven kilometres worth of drill holes first and contaminated with hydrocarbons, oils, and all sorts of different sorts of minerals along the way. So you expect that the cement at the top of the well isn't anywhere near the quality. The quantity and salinity of the salt and other corrosive materials is high. I mean that the hydrochloric acid they pump down pure into these well, is exposed to extremely high pressures. One of the barriers is the cement. And the cement is only really at the top of the vertical part of the shaft, the horizontal part of the shaft, the steel tubing sits on the bottom and the corners as well so there is no cement protecting most of the shaft and the cement at the top of the shaft is of poorer quality. It's exposed to all different sort of salts. I'll show you again, right here, this is the powdery sort of effect of what happens to the cement when it gets in contact with salt and water. And this is to protect us from, to protect water supplies and escaping hydrocarbons in the atmosphere for eternity.

Jason Trevers: Okay. Yeah.

Hon. Justice Pepper: Thank you. Alright, you've got about one minute to conclude, Mr. Trevers.

Jason Trevers: No worries, thank you. I was really disappointed to start seeing these articles here in the thing saying the new territory report showed fracking can be done safely in the Northern Territory and the risk can be mitigated. I'm not sure how regulations are going to stop steel rusting or cement corroding. I'm just concerned

Hon. Justice Pepper: Thank you very much. Thank you. Mr. Trevers, I do want to assure you that this panel has taken the issue of well integrity very, very seriously.

Jason Trevers: Mm-hmm (affirmative)

Hon. Justice Pepper: For good reason, given its criticality. And indeed it was for that reason that we engaged CSIRO to do an independent study. Now, I appreciate you take issue with that study, but I do need to, I guess, perhaps just clarify that the figures that we have used in our draft final report, and I'll take an example, let's say, for example page 71 and section 5.5, come exactly from that CSI report. They do not come from any APPEA report as you, perhaps I misunderstood, have suggested.

Now, as I said- [crosstalk] Hang on a second. You may take issue with the CSIRO analysis and their report, but we have based the figures that we have quoted, and we've relied on are taken from the CSIRO report, and if you need any confirmation of that, as I said, you can turn to page 71 of our draft final report 5.11 and that corresponds with the draft final appendices at

page 112. So, just in case there was any misunderstanding, [crosstalk] we have taken our data and, as I said, you may disagree with that data, but we have taken our data not from an APPEA report, but from CSIRO report.

Jason Trevers: Yes, you have, but there is a large discrepancy between a lot of peer-reviewed scientific data and evidence that's been here that the presentations, at 50-fold differences between what CSIRO's given, and what many people have issued and found clear, relevant, scientific data, which is what you put in you put in interim of how you will judge and look at ... Clear, relevant scientific data hasn't been given any weight, whereas the CSIRO has been full, we'll believe you and we won't actually cross reference with multitudes of peer-reviewed scientific data and facts, world-wide data figures. So there's a weight of peer-reviewed data that hasn't been given any weight, really, or any view and you just, "CSIRO, deal with this." It's a side-step

Hon. Justice Pepper: Well, that material was before CSIRO, who, in our view, certainly have the expertise and certainly do have the independence. As I said, I accept and it's an absolutely valid position to take. You disagree with the CSIRO analysis, but I do need to emphasise that we took our data from the CSIRO report, not the APPEA report. Do you wish to clarify that part of your presentation, or retract any part of it?

Jason Trevers: No. Definitely, no. There's a difference through the APPEA, but the way they've the ... Where CSIRO have gathered their information is not in alignment with a lot of the world data of 4 million wells that's been ascertained. It seems to me that there's very clear evidence, matter-of-fact, about well integrity that can be calculated and the CSIRO's where they've gathered their data from is not in alignment, it's very specific and it's very targeted to reach a certain outcome. It doesn't align with world data studies and peer-reviewed scientific journals and data that I've seen.

Hon. Justice Pepper: There is sort of a review of well failure rates, including total well failure rates, total barrier failure rates from other jurisdictions in the CSIRO report. You're aware of that, aren't you?

Jason Trevers: Yep.

Hon. Justice Pepper: Okay. Well, again, I just want to- It's not unimportant, Mr. Trevers, because you have suggested, and maybe I misunderstood, misheard you, but I had rather heard that you had told us that we had got our data from an APPEA report. Did I misunderstand you?

Jason Trevers: You did, in the Interim Report. The Interim Report was definitely-

Hon. Justice Pepper: Well, I'm talking about the draft final report.

Jason Trevers: Yeah. There was a part where I was talking about the Interim Report and my response to it, and I read out part of that, so that was part of my providing evidence and data to the panel about the APPEA report, and then it flicked

over to actually the CSIRO and that was a differentiation. So, I'm sorry if there was any confusion- [crosstalk]

Hon. Justice Pepper: So you accept that in the draft final report we have based our, basically we have based our conclusions and we've taken our data and our percentages from the CSIRO report.

Jason Trevers: Yes.

Hon. Justice Pepper: Thank you.

Jason Trevers: It was in my opinion that instead of actually getting to the bottom of the discrepancies yourself and actually analysing the risks, you've actually sidestepped to include the CSIRO, because there was very clear evidence in different reports of literature in American Department of Environments and other different sort of resources where you could confirm or de-confirm where there's a thousand-fold discrepancy, but instead CSIRO were brought in and the panel as having to assess the risk and report and give back to the public has sort of sidestepped their responsibility, in my opinion, to ... the deviations or the discrepancies between different-

Hon. Justice Pepper: So you don't accept that it was part of the responsibility of the panel to go to experts that are considered to be leading experts in this area and independent experts in this area, you consider that to be an abrogation by the Panel of their responsibility?

Jason Trevers: I consider the Panel to be an independent Panel, and-

Hon. Justice Pepper: That's not what you said earlier, Mr. Trevers.

Jason Trevers: The Panel has been portrayed as an independent, when you came it was a really strong factor that you presented to the community as being an independent Inquiry as different to the Hawke Report and other different reports. Then as being an independent inquiry taking on the responsibility for presenting the facts and getting rid of the myths, when it came to some of those crunch points, by bringing on the CSIRO, you've actually engaged a Government, Commonwealth Government organisation to actually look at a key factor point and therefore the integrity of the independence has, in my view, been compromised by giving it off to-

Hon. Justice Pepper: So you don't consider CSIRO to be independent, is that the bottom line?

Jason Trevers: It's funded by the Commonwealth. It's had 115 million dollars pulled out of its budgets in the last few years and it is actually been designed to support industry. That's one of its main roles or focus.

Hon. Justice Pepper: So, Mr. Trevers, you don't consider, I just need a clear answer to this, you don't consider CSIRO to be an independent organisation?

Jason Trevers: No.

Hon. Justice Pepper: I understand the submission. Thank you.

Anyone else have any comments? We'll start with Dr. Anderson and then we'll come down. Yes, Dr. Anderson?

Dr. Alan Anderson: Yeah. Thank you. So I don't work for CSIRO as senior scientist for 30 years, so I think I do have some understanding of how the organisation works. And I just wanted to reassure you that if CSIRO reported what it did, it did so on the basis of the best available scientific evidence and it would not have deliberately provided misleading information to the panel. Also note that you referred to another CSIRO study on groundwater in the Great Artesian Basin, and you accept that those findings, and I would say that you are correct in accepting those findings, and if there were errors, they would be genuine technical errors, not politically motivated misleading information. Just wanted to reassure you that.

Jason Trevers: Thank you.

Hon. Justice Pepper: Dr. Jones?

Dr. David Jones: With the issue of well barrier failure rates, what Professor Ingraffea failed to mention was that most of those failure rates are actually single barrier failure rates, they're not total failures of well integrity that actually lead to groundwater contamination. That's a really important distinction. We did take your initial comments very seriously about this issue of integrity, very seriously. And in fact, that's why we decided we'd get the best expert opinion externally to advise us on this matter. And so we went to CSIRO and indeed their conclusion is that the single barrier failure rate is between one and 10%, which is quite consistent with what you were telling us. But the total well failure rate, which in other words, reaches all barriers and gets out laterally into groundwater, is only about .1%.

So, yes, I think that's been one of our problems, and your problem as well, that certain publications say this, other publications say that. The question is how do you balance them? The CSIRO they didn't manufacture this information. They actually reviewed the broad base of literature, including the Ingraffea reports and the most recent analysis that has been done and reached this conclusion, which basically says, "Yes, single barrier failures about one to 10%, which is consistent. Total barrier failure is much less than that than there the ones, which can really impact groundwater quality." That's what we took away from the advice we were given.

Jason Trevers: Yeah.

Hon. Justice Pepper: Sorry, did you want to comment on that? Or, you don't have to, I'm just- You looked as if you were about to.

Jason Trevers: One of the big ... If you get to single barrier failure, it just opens up an avenue. But it's just a potential for later on, once degradation of steel and cement start to go, there's a larger path. The whole vertical column of that steel sits on the ground, its integrity is not going to be there.

Dr. David Jones: One of the issues, certainly, that we do take very seriously and are still to a certain extent grappling with is okay, you can say the well is maintained well say to 40 years by the company as they are doing work. It's decommissioned and then you've got a long time after that. What happens then? And that is one of the issues we asked CSIRO to look at as well, as well as their own research. The issue is that the conclusion we've come to, basically, is that it's very unlikely you'll get vertical fluid migration, but there still is a possibility of methane migration. Now the question is, what are the consequences of that available methane migration? Arguably it could have an impact on fugitive emissions to the atmosphere, which is a greenhouse effect. As far as contaminating groundwater, per se, we believe that there's a relatively low risk because of the low toxicity of methane. Methane is the most easily measured indicator of issues happening with barrier failures and well bore integrity. But it is not necessarily good indicator of toxic groundwater contamination, which a lot of people are very concerned about.

Jason Trevers: Yeah, but within that you get the methane that comes up and actually ignite tap water like you have seen and different sort of things if it's coming up in a bore. You get flammable water coming up with methane sort of things, and benzenes have been noted to sort of be carried along with that migration.

Dr. David Jones: I don't know about benzene being carried with methane, but that's-

Jason Trevers: Yeah, well. Sorry.

Hon. Justice Pepper: Yes, Professor Hart.

Prof. Barry Hart: Mr. Trevers, you're very, very correct to focus on well integrity. It's a crucial issue, no question at all about that. Dr. Ingraffea's publications and his video, he focused on leakage, primarily hydrocarbons, primarily methane. Yet there's no question that that occurs. The scale of it we can discuss, but there's no question that that does occur and it's the most likely pathway, and as you pointed out, he pointed out, everyone points out, it's mostly the cement rock interface. Difficult. But, as Dr. Jones pointed out, the other point, certainly that's important and it's important for greenhouse gases because methane is. But we're also probably more concerned about fluids, fracking fluids, wastewater coming back up there the two to four kilometres. Certainly, CSIRO's evidence and the other evidence that we've collected suggests that that is very, very much less than methane. Are you familiar with that?

Jason Trevers: Yeah. You're much more likely to get contamination of fluids from the storage ponds and pipelines and all the other different things that can go wrong with manmade sort of things, trucks going through, different sorts of spills. Contamination is more likely to happen to the water surface from above.

Prof. Barry Hart: We're on the same page there. And we've said so in our draft report. The other point that I just wanted to canvas with you is the question of cement. Are you familiar with the types of cement that the Shale gas industry use?

Jason Trevers: Not 100%, I must be ... I know that there's cement water, and a few additives. You get hardeners and you can actually delay the setting process, you can have other different sort of chemicals and formulations to actually speed up the process.

Prof. Barry Hart: I think it's a little more than that, though.

Jason Trevers: Okay.

Prof. Barry Hart: They've got some real challenges. The temperatures when you get down to three to four Km are at least a 150 to 200. That's a hell of a lot more (200 C – Celsius) - a heck of a lot higher than any of our cements. There are special formulations. I'd urge you to have a look at some of that. There are a number of, huge number, because the gas industry sees that, as you've pointed out and Dr. Ingraffea's pointed out, as a crucial component. Steel's one thing, cement's another one. We'd be very interested in anything you're able to discover on that that you feel is good or bad because we recognise that that's a crucial issue for the industry and of course for us, too, in terms of trying to work out the risks that are there. I think that's probably all I wanted to say about the cements, without going to detail.

Given that you've said this, because what we do is we pick up from people who are critical of various components and so forth, I think probably we need to look a little bit more. I don't know that we've got that much on the special nature of the cements. We're not apologising for the gas industry, but it's a little bit more than just cement in your home up here. But I think it's probably on us to put a bit more down there to give people reassurance if we can.

Dr. David Jones: Especially with these cements, often they're designed specifically for particular corrosive environments. For example, the nature of the groundwater as you quite rightly point out, if it's exposed to normal cement like this, and I've got a situation like that in my house in well, so I know exactly what you mean by that, but these cements are tested and CSIRO report they were actually grappling with this issue of longevity. I actually found one of the best analogues with the wells that had been put down for carbon capture and storage, where you're basically pumping CO_2 at high pressure through these systems, and high pressure CO_2 when it mixes with water is actually a very corrosive environment. They were drawing on the quite extensive research that's been done on that industry, which is related but not obviously the same as what we're talking about. But it's extremely relevant in terms of the fact of a highly corrosive environment on cement longevity. They did draw on that work, and that's probably some of the best evidence we've got about how long cement might last, because some of these types of cements, unlike this type of cement, when they're reacted with groundwater or with carbon dioxide the cement does change. But the crystal structure is actually replaced by another mineral, which is actually quite impervious as well. It doesn't exfoliate like this, it can actually maintain its integrity. Cements aren’t cements.

Hon. Justice Pepper: Any further questions?

Mr. Trevers, you have come three times now and presented to the Panel. The Panel certainly appreciates, you've always put a lot of effort in as well, which is fantastic. You've done your research; you've presented us with evidence. That evidence, I can assure you, has been taken seriously and has been examined. We're very appreciative of your engagement with the Inquiry and the Panel has welcomed your contribution and thank you very much.

Jason Trevers: Thank you.