

**STANDING COMMITTEE ON  
ENVIRONMENT AND PUBLIC AFFAIRS**

**INQUIRY INTO THE IMPLICATIONS FOR WESTERN AUSTRALIA OF  
HYDRAULIC FRACTURING FOR UNCONVENTIONAL GAS**

**TRANSCRIPT OF EVIDENCE  
TAKEN AT PERTH  
MONDAY, 31 MARCH 2014**

**SESSION TWO**

**Members**

**Hon Simon O'Brien (Chairman)  
Hon Stephen Dawson (Deputy Chairman)  
Hon Brian Ellis  
Hon Paul Brown  
Hon Samantha Rowe**

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**Hearing commenced at 11.37 am**

**Mr COLIN CRUICKSHANK,**  
**General Manager, Unconventional Resources and Exploration, Santos Ltd, sworn and examined:**

**Mr NICHOLAS FOX,**  
**Chief Environment Manager, Santos Ltd, sworn and examined:**

**Mr MATTHEW DOMAN,**  
**Manager, Public Affairs Eastern Australia, Santos Ltd, sworn and examined:**

**The CHAIRMAN:** On behalf of the committee I welcome you to the meeting today. Before we begin, I ask each of our witnesses to take either the oath or affirmation.

[Witnesses took the oath or affirmation.]

**The CHAIRMAN:** Gentlemen, you will have signed a document titled “Information for witnesses”. Have you all read and understood that document?

**The Witnesses:** Yes.

**The CHAIRMAN:** These proceedings are being recorded by Hansard. A transcript of your evidence will be provided to you. To assist the committee and Hansard, I ask you to quote the full title of any document that you may refer to during the course of the hearing, for the record. I remind you that your transcript will become a matter for the public record and if for some reason you wish to make a confidential statement during today’s proceedings, you should request the evidence be taken in closed session. If the committee grants your request, any public or media in attendance will be excluded from the hearing. Please note that until such time as the transcript of your public evidence is finalised it should not be made public. I advise that the publication or disclosure of the uncorrected transcript of evidence may constitute a contempt of Parliament and may mean that the material published or disclosed is not subject to parliamentary privilege.

Mr Cruickshank, I invite you to make an opening statement.

[11.40 am]

**Mr Cruickshank:** Thank you, Mr Chairman, and committee members; we would like to make an opening statement. We thank you for the opportunity to appear before you. We believe from our many years of experience of hydraulic fracturing in Australia that we are well placed to assist you in your inquiry. My name is Colin Cruickshank. My position is the general manager of unconventional resources and exploration for Santos’ eastern Australian business unit. In this role I am responsible for the exploration and appraisal of the deeper, unconventional—as in shale, tight gas et cetera—hydrocarbon resources in onshore Australia for Santos. I am joined by Mr Nick Fox, our company’s chief environment manager, and Mr Matthew Doman, our eastern Australian public affairs manager for Santos.

Santos has a significant oil and gas business in Western Australia; in fact, we are one of the state’s biggest domestic gas producers. All of our oil and gas production here is sourced from offshore. We have no onshore-operated exploration and production interest in Western Australia. However, the reason we have made a written submission to the inquiry and then asked to appear before the committee is because we have hydraulically fractured more wells in Australia than any other oil and gas operator, and we believe it is important that the committee hear from a company with many years of experience of employing this technology in Australia. In fact, in over 50 years of

exploration and production in Australia, we at Santos have drilled more than 2 700 wells in the Cooper basin, where we have fracture-stimulated over 900. In the Amadeus basin in Northern Territory, we have drilled in excess of 60 wells and we have stimulated almost half of those. In Queensland's Surat and Bowen basins, we have also fracture-stimulated more than 150 wells. We have undertaken this activity safely and with no harm to the environment over those 50 years of activities. In fact, we have an open invitation to the committee to come and witness fracture-stimulation operations in the Cooper basin, because that is probably the only jurisdiction in Australia in which fracture-stimulation operations are going on every day. That is what we do in the Cooper basin.

It is important to be clear from the outset that although we have not hydraulically fractured in Western Australia and we therefore do not have a detailed working knowledge of the regulatory system that manages the onshore exploration and production activities in this state, a robust, consistent and efficient regulatory regime is critical to the safe and sustainable management of hydraulic fracturing in Western Australia and also in Australia. Santos supports a strong regulatory framework with well integrity at its core. We also believe in working closely with our landholders to ensure agriculture and other land users can coexist with gas exploration and development activities.

We believe a great opportunity awaits not only Western Australia but also Australia in the development of the nation's tight, shale and coal seam gas resources. We welcome any questions that the committee might have to assist in reaching sound conclusions, not coloured by misunderstandings, misrepresentations or philosophical opposition to the use of natural gas in Australia.

**The CHAIRMAN:** Mr Cruickshank, thank you very much for that opening statement and to you and your colleagues for making yourselves available. Obviously from your contact address you are from the wild country east of the Nullarbor! You are very welcome here. Did I interpret your initial submission from October to indicate that you have had some activities on Barrow Island?

**Mr Cruickshank:** We have an interest in Barrow Island but we do not operate on Barrow Island.

**The CHAIRMAN:** Do you class Barrow Island as onshore or offshore?

**Mr Cruickshank:** We class it as onshore activities. Chevron or WAPET is the operator there which has undertaken all those activities on behalf of us as a joint-interest partner.

**The CHAIRMAN:** It is an important technicality. In many aspects of various laws in Western Australia of course, offshore islands have a different status perhaps from the mainland for some purposes.

**Mr Cruickshank:** Yes.

**The CHAIRMAN:** How would you characterise the Cooper Basin where you are operating quite extensively in terms of its relation to population centres; is it a very remote place?

**Mr Cruickshank:** Yes; it is a very remote place. We share the land with the pastoral community; they are very large pastoral stations. We have one township within our jurisdiction; that is, the township of Innamincka, which I think has a population of fewer than 20 the majority of the time. It is very remote, probably not too dissimilar to some of the areas of the Canning Basin of Western Australia.

**The CHAIRMAN:** That would contrast, I would think, with the United States' experience where a lot of fracking operations have been carried out on privately owned land and with greater levels of population in and around the operations, whether they be townships or small holdings, farmers and the like?

**Mr Cruickshank:** Yes.

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**The CHAIRMAN:** In your submission you stress that Santos is committed to working with the landholders that may be impacted by operations. You emphasise how crucial that is. Has that been a major feature of what you have had to do or has it been easier because it is such a remote area?

**Mr Cruickshank:** We do not take it for granted that it is easier. We talk extensively with our pastoral community and, in fact, we have worked so closely with them that a number of them—I think the majority of the land in the Cooper Basin—has now been organically beef certified, which is a very stringent mechanism so that when they sell to an overseas market, they have very clean certified beef. They have been able to obtain and retain that certification while we have been undertaking our oil and gas operations in close proximity and close harmony with them.

**The CHAIRMAN:** A number of issues have been raised by interested parties in their submissions to this inquiry. You probably viewed a number of them and might well be familiar with the general nature of many of the concerns that have been raised, sometimes as questions, sometimes as assertions from members of the public. In view of the extensive experience you have in fracking operations here in Australia, my colleagues and I have a number of questions we would like to put to you to take advantage of that.

**Hon STEPHEN DAWSON:** Thank you very much for your attendance today and for your submission. In evidence we have heard so far and in submissions we have received, there has been lots of stuff about well failure, and when we take evidence we hear horror stories of wells failing in America with a six per cent and seven per cent failure rate. Can you give us a Santos perspective and perhaps you can talk to us about what well failure is and from your understanding and operation, how many wells do fail?

**Mr Cruickshank:** Thank you for that question, Deputy Chair, and as we have said in our opening statement, we believe that the regulation, the management and the operation of well integrity is central to ensuring that fracking stimulation can be undertaken safely and environmentally responsibly. Our experience in the Cooper Basin with, as I said, approximately 2 700 wells drilled to date, we have put on production, I think, in excess of 2 000 of those wells and, as I have said also, we have fracture-stimulated over 900 of those wells. We have an extremely low failure rate, as we would class it, from our operations. You will hear different definitions of what is a failure because, as you will be familiar, the construction of a well involves a number of concentric pieces of pipe that are then cemented in place as you go deeper. Those pieces of pipe with the cement then hold back or protect the aquifer systems as well as providing structural integrity for the well.

[11.50 am]

Ultimately, at the end of the day you then have a tubing stream, which is the production conduit once you have the well in production. We have at least three—sometimes in excess of five—barriers that we work through. We will class a well failure as one of those barriers that is potentially compromised. To get to where you may have an absolute failure of a well, we see that in the Cooper as being extremely remote. In the numbers reported in the ACOLA report, which I believe has been referenced to you—they referenced I think it was less than 0.05 per cent of wells having failure—our numbers in the Cooper Basin are around that level.

**Hon STEPHEN DAWSON:** That is really helpful; thank you. In your submission under the term of reference 4 on page 11 you talk about wells that have reached the end of their productive life and get shut down and abandoned. Can you explain to us the process you go through once you decide that a well has come to the end of its life? What is the process you go through and then what monitoring or ongoing monitoring may happen in relation to that well?

**Mr Cruickshank:** That is, again, a very important topic and a piece that needs to be well explained. The actual process of abandonment or decommissioning actually takes place before we even start to drill. Before we actually even start drilling, we will also have worked out with our regulatory jurisdiction—whether it is in the Northern Territory, Queensland or South Australia—what is the

process that we need to undertake not only to drill the well, but also to abandon that well once it has reached the end of its production life. That will determine what formations we need to isolate from each other—whether they be hydrocarbon bearing or whether they be aquifer, be it fresh, be it hot or be it saline. We work with the regulatory agencies about which ones we need to make sure are abandoned appropriately from each other. That process involves us then determining from our subsurface logs exactly where the formations are, what are their depths, what pressures they are at and what fluids they contain. We will then work with the regulatory agency to then determine how we go about that operation. In terms of how we determine whether the well is ready for abandonment or not, that is typically when it has reached the end of its economic productive life. That would still mean that it may still be able to produce hydrocarbons to surface, but it will not be able to sustain economic production on an ongoing basis. Once we have reached that level, we will then do a thorough internal check to make sure there is nothing we can do to sustain production. We will then talk with our regulatory authority to tell it that we have reached the end of production life and we then request approval to abandon that well to the approved guidelines. We will then submit a program about how we go about that, to ensure that we adhere to the guidelines they have put in place, and that involves us then setting a series of what we call cement plugs within the well wall. That will then be tested in two ways: one by a tag to make sure that the plug is stable and will stay in place; and then also by a pressure-testing regime to make sure that no fluid can either leak past it or back from it as we go up and plug those successive layers. Once we have then finished plugging the well, we will then remove the equipment from surface et cetera, and while we still have jurisdiction or tenure of that land, we will then have an ongoing surveillance operation to ensure that that well has been abandoned in a sound manner.

**Hon STEPHEN DAWSON:** How often would you go back and have a look to just check and to undertake surveillance to see if the well is in good condition?

**Mr Cruickshank:** If it is in one of our producing areas, and typically I am assuming that you are talking about the abandoning of a well that has reached the end of its production life as opposed to a failed exploration —

**Hon STEPHEN DAWSON:** Yes.

**Mr Cruickshank:** So, because that would be in the middle of our operations, we would have people passing by it on a very routine basis—probably at least monthly—but we would undertake routine inspections of those sites either yearly or two yearly, depending on what we assess as the risk of that operation. In all of our producing wells in the Cooper Basin, in all of our producing environments in Australia, we have what we call an independent risk assessment of each of those wells. Depending on how we assess that risk—what is the status of that well—we will then determine a frequency of visits to check on the health of that well.

**The CHAIRMAN:** Just to pursue that point, if you achieve best practice in retiring or shutting down the no-longer-productive well and you do all those things that you have described, if it is still in an operational field it is easy for you to maintain an ongoing examination of that well so that, presumably, over a period of time you can ascertain that it is indeed well and truly shut down.

**Mr Cruickshank:** Yes.

**The CHAIRMAN:** But what happens then? What happens in 20 years or 50 years or 100 years or 500 years? It is a concern that has been expressed—I am sure you have heard it expressed before—by some people who have concerns about fracking operations. At what point can we determine that a well is completely closed off permanently, or is there always some enduring risk there that it may release some contaminant?

**Mr Cruickshank:** Again, the basis of sound decommissioning, abandonment or retirement, as you have just highlighted, is steeped in how you have designed and constructed the well in the first place and making sure you have leading practice on not only choosing what grade of casing to make

sure it can withstand the pressures through perpetuity of what that well is due to encounter, but also the cement that is required based on the fluids that will be both internal and external to the well. Then in abandoning or decommissioning, again they are similar processes. Because we pressure test and make sure that the plugs are in the right place with our sound et cetera, as I said we would then do a visual or a surveillance check on those wells while we still have tenure of the land. If we abandon or decommission the whole field, that production licence is then handed back to the regulator. In handing back to the regulator, they have to be assured that we have carried out our operations and abandoned the wells according to best practice principles that they have laid down in the guidelines in the regulatory authority. In terms of what happens within 50 years or 100 years or so, the process of constructing and abandoning the well properly means that it is what we call an anaerobic environment, and also fluid would not be moving backwards and forwards. People have talked about where cement degrades, but typically that is an aerobic environment, as in open to the elements; or you have fluid being able to pass through it, being out here where you have the rain, the wind and those elements. In a properly constructed down-hole environment where you are isolating fluids so that they cannot flow from one zone to another, it is also an anaerobic environment and we would class that if you do it properly it will be that way in perpetuity.

**Hon STEPHEN DAWSON:** Mr Cruickshank, another concern that we have heard expressed to us relates to the regulation of chemicals that are used in the fracking process. In your submission you talk about how committed you are to keeping people informed about your activities.

**Mr Cruickshank:** Yes.

**Hon STEPHEN DAWSON:** A concern that has been expressed to us is that there needs to be full disclosure of the chemicals used. What is Santos's view on that? How do you get around the issue of potentially somebody's IP being made known to others if you properly disclose?

**Mr Cruickshank:** Thank you for that question, Deputy Chair. It is a key question that we face in the industry and also with the regulatory bodies. Santos's position is that we support full disclosure. We fully support making sure the public knows of what we are pumping, when we are pumping and how we are pumping it. We support that those chemicals should have full eco-toxicological reports that are available to the public, and also full what we call material safety data sheets that stress how you should handle it and what happens if something goes wrong with the handling of that chemical. Again, they should be then open for the public. We do understand and we support, as per what APPEA have said in their submission to you, that to enable the industry to develop best-practice chemicals, improved chemicals, be that from an environmentally more friendly chemical or one that enhances what we are trying to do in terms of production from a down-hole environment, we support working our way around to enable protection of the intellectual property that has been developed by one company or another to where they cannot be reverse engineered. But we do support and understand that the public needs to know what we are pumping, as I said, by having access to full eco-toxicological reports as well as the MSDS for them.

We want to make sure that companies that invest in the best chemicals are able to pump them for us and also have their IP protected to where, when they have invested in a particular fluid brand that they believe and we believe is best in the class, that is protected so it cannot be reverse-engineered, but also making sure that the public is fully aware of what is going on.

[12 noon]

**Hon BRIAN ELLIS:** Just following on with the chemicals, I note in your submission that you support public disclosure. Do you support it being compulsory that you disclose or, as in America, it is voluntary? I just want to know which way you would prefer to see it.

**Mr Cruickshank:** We would prefer it to be voluntary, but we would not have a concern with it being compulsory. I believe in Queensland, that is the case, and we do then follow that there. I am not exactly familiar, as I said in the opening statement, regarding Western Australia, but in the

Northern Territory also we have full disclosure to the regulator and I believe that is on the public record as well. We do not have a concern with it.

**Hon BRIAN ELLIS:** Just going back to the farmers, do you find it any different to negotiate for access for fracking compared with any other mining activity? You are a big company and are involved in other mines. I would imagine you have had to negotiate access. I do not know what the regulations are in South Australia, but are there any obstacles you have encountered with farmers in negotiating for fracking of gas?

**Mr Cruickshank:** Thank you, Mr Ellis. I will hand over to Matt Doman, our public affairs manager, to provide a full response to that.

**Mr Doman:** Thank you, Mr Ellis. We have not in our experience in the Cooper Basin, I believe. Any discussion with the landholders there is typically around the impact on their activities, and I think there has not been a great level of concern about the specifics of the activities that occur on that land. Fracking has been part and parcel of our activities in the Cooper Basin for many years. The first fracks in that area were performed in the early 1970s. It has become very much a common part of our production since the early 1980s. You also referred, Mr Chairman, to, I guess, the sparse nature of the population in the Cooper Basin where most of our fracking activity has occurred. We operate more closely with a more closely populated regional community in both Queensland and New South Wales. We have a very open dialogue with landholders there. As it happens, fracking is a much smaller part of our activities in coal seam gas than it is in the operations in the Cooper Basin, as we have discussed.

**Hon BRIAN ELLIS:** This has been put to us a number of times. I do not know whether the Cooper Basin is any different from the Canning Basin in the potential for flooding. I am referring now to spills from surface ponds. It has been put to us that, particularly in the Canning Basin, that could be a possibility from cyclones causing spills out of ponds. Have you come across that in your operations? How do you handle it if it does occur?

**Mr Cruickshank:** Thank you, Mr Ellis; you are correct. The Cooper Basin is somewhat analogous to the Canning, although we do not get cyclones coming through the Cooper, but we have had extensive rain events. You may have heard that we had extensive flooding in the years 2010 and 2011, when we had extensive local rain as well as flood waters coming down the Cooper Creek system and then spreading out across the areas that we operate in. The fundamental answer to your question is in how you design and build your holding pond, your flow-back pond et cetera, and making sure that you have enough freeboard to enable it to withstand whatever rain event that you have designed for. Again, that is how we work with that. We look at the rain events, the design criteria and how much freeboard we have got to ensure that we maintain so that that pond can withstand whatever rain event is going to go on and, then, obviously, making sure that it is lined appropriately so that it cannot infiltrate below and also making sure that it is robust at surface with enough freeboard to make sure that that fluid cannot leak or spill out unwarrantedly at the surface.

**The CHAIRMAN:** What happens if that pond, despite all its lining, its bunding, its freeboard and everything else, fills up with torrential rain and overflows? Is that a problem? How do you deal with that?

**Mr Fox:** Thank you for that question, Mr Chairman. We manage and monitor those ponds all the time; we have operators in the field 24/7, so we can monitor that freeboard. We have got plenty of other holding facilities around the basin where we can truck volumes of water for treatment for storage. We can manage that.

**The CHAIRMAN:** So you would actually remove some of your produced water —

**Mr Fox:** We are fortunate enough that we get plenty of warning when the floods are coming. We do get affected by tropical cyclones, but we get about seven days' notice when it is coming down the catchment. We would then do a pre-emptive monitoring of the ponds that may be affected by

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flood waters. We do not have any infrastructure in flood-prone areas; we keep that out. That is part of our design criteria; we select appropriate land. We can monitor that. If there is concern about what local rain may impact that, we will remove water to other facilities.

**Hon PAUL BROWN:** Can I follow on from that? Last week we flew over the Buru Energy pads, but one of the things you cannot see from the air is if the pads are level or if they are raised. When you are developing pads for drilling, are they level with the current land use or are they actually raised and then you have got the pits inside that raised area as well?

**Mr Cruickshank:** Thank you, Mr Brown, for that question. I would say that they are slightly elevated. Obviously, we need to level the ground to make it safe from the workers' perspective. We also line them to make sure that nothing that may be spilt on the surface can impact on the groundwater et cetera. They are slightly raised to make sure that, if there is a local rain event, that is not going to fill up and be a concern there. But when we say "raised", it is centimetres; it is not metres.

**Hon PAUL BROWN:** It was hard to get a perspective from the air when we went to Buru about whether or not they were raised. I was not too sure what the industry's example was.

**Mr Cruickshank:** Just on that one, I reiterate our standing offer to the committee to come and visit our Cooper Basin operations to look at how we drill, when we drill, what the pads are, how big they are, and how we reclaim those at the end of drilling at the end of production. We can tour those facilities with you and show you those things and you can see it and ask our people how we go about those operations.

**The CHAIRMAN:** Thanks again for that invitation. You have not got any operations on the Gold Coast or anything like that, have you!

**Mr Cruickshank:** No!

**The CHAIRMAN:** It looks like the Cooper Basin it is, then! We will look forward to visiting you in due course.

**Hon PAUL BROWN:** You talk in your submission about the energy security for WA and for Australia through unconventional gas operations. In your proof of concept when you started in the Cooper Basin, you obviously identified X number of trillion cubic feet of gas or whatever that number was. In your commercial operations, has that actually borne out? Have your investigations and your identification of that gas borne out to be within the bounds of that calculation or are we looking at areas where you have got, say, 500 trillion cubic feet but once you put your wells down, you found that that is not really the case and it is considerably less?

**Mr Cruickshank:** Thank you for the question. I will try to answer it and please get back to me if I do not answer it fully. When we started operations in the Cooper Basin, we were after what we call conventional gas horizons to where the gas we were after was trapped in conventional sandstone, which, once you drilled into it, would flow out at economic rates. We could then quickly and easily determine the size of those deposits through a combination of seismic surveys and then exploration and appraisal drilling to get the extent of how wide and how deep—how big—that deposit was. We would then have a good understanding of how much that would flow out. To commercialise that gas way back in the early to mid-1960s, obviously you needed a certain amount of volume to be able to underpin the facilities to extract the gas at surface in the Cooper Basin, build the facilities to process it to a saleable commodity and then, obviously transport the gas to the market. I think when we started there, we probably had thoughts that there were at least a couple of what we call trillion cubic feet of gas that would be available. We have now produced in excess of six or seven trillion cubic feet in the Cooper Basin and we still have in excess of one and a half trillion cubic feet of conventional gas. In terms of whether it has borne out, we have actually got more gas than when we started and we are still exploring for conventional, but we see that there is equal or more

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prospectivity for the unconventional gas—the gas that is trapped in the tighter sections of sandstone and/or shale—in terms of volume than the conventional gas in the Cooper.

We are still looking to prove up the commerciality of the unconventional gas, but we are very hopeful that we would have in excess of that six trillion or eight trillion cubic feet of gas in the Cooper still to be arrived at with unconventional sources. However, we have to explore, appraise and develop that accordingly.

[12.10 pm]

**Hon PAUL BROWN:** But your confidence is there that what your technology tells you is likely to be the commercial reality.

**Mr Cruickshank:** Yes. Well, we hope it to be. I cannot say to you today that we are fully confident it is a commercial reality. The Cooper Basin is probably the most advanced in terms of what we would class as the unconventional reservoirs—be they tight gas or shale—in Australia simply because we have been operating them for 40 years. We have a more extensive knowledge of those horizons because we have drilled through a lot of those horizons as we were drilling for the conventional underlying deposits of gas in the 40 years we have been there. We already had a reasonable idea of the depths and what was there, and now with the latest techniques of fracture stimulation and horizontal drilling, we believe it is highly prospective to be able to now commercialise that gas. We have undertaken ourselves approximately a dozen to 15 wells in which we have had successful flows of gas to surface, but we still have to work through the commerciality of developing that gas. Other proponents in the Cooper Basin have drilled a number of wells—that is, Beach Energy, Senex and other companies of the like.

**Hon PAUL BROWN:** You talked before about the agriculturists in your area with their organic certification. Do you provide a buffer zone around your operations? Generally, with organic certification you provide a buffer zone, so in that way there is no likelihood of contamination or interaction. As part of your land access agreements with the landowners, do you go beyond what is required and actually provide a buffer zone to allow that to happen?

**Mr Cruickshank:** We do not have what you might call a strict legislative or regulated buffer zone. We work very closely with our landholders to ensure that our development is done in keeping with their plans and where their stock will be et cetera. Where we see that their stock may be coming in—in particular, where it happens is around our ponds, because the cattle are after water and they see that these ponds may be drinking water for them. We work with the landholder to ensure that the ponds that may contain some flow-back to where their organic certification may be in question are fenced off and make sure that the cattle et cetera cannot get into those areas. We work very closely with the landholders to ensure that is maintained.

**The CHAIRMAN:** Would a similar consideration arise for wild fauna as well—that is, native animals being at risk from settlement ponds? What has been your experience with the environmental authorities?

**Mr Fox:** Yes, there are some times when we do impact native animals—they are drawn to water sources—and that is more from drowning rather than anything else. We do have certain regulatory requirements to have ponds fenced for cattle, but obviously native fauna is not the size of a cow, so they get in sometimes, especially kangaroos. Our ponds are designed so that stock can actually get out or native fauna can climb out of the ponds because we put surfaces on one side. We also provide alternative drinking sources that are not in the ponds, so we maybe have a stock trough or something of the like to prevent that. Unfortunately, these things do happen and we report them to the regulator or native fauna person.

**The CHAIRMAN:** What is the hazard generally? Is it drowning, not poison?

**Mr Fox:** Drowning, not poison. They cannot get out, so they drown in many of our ponds if they get in.

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**Hon PAUL BROWN:** Because the freeboard is a lot lower, they obviously just cannot get access to the water, so they actually have to hop in.

**Mr Fox:** They actually have to go down a certain distance to get in. They are virtually designed so they have to climb out again, and sometimes they cannot make it that far. We do have it on each surface, but our ponds are quite large.

**Hon SAMANTHA ROWE:** Apologies, gentlemen, for coming in midway through your hearing. I just want to refer to page 7 of your submission, under the heading relating to potential water impacts. The first dot point refers to spills and leaks at the surface. It states that these risks are relatively easy to manage through good practice, response procedures and personnel training. Maybe you could just go through what you do in terms of what the good practice is, your response procedures and the like.

**Mr Cruickshank:** Thank you, Ms Rowe, for the question. Yes, good practice would involve us making sure that we adhere to storage and holding requirements for all the chemicals—that we segregate the chemicals where applicable from each other in terms of the hazardous waste material regulations. We would be storing them in a lined facility so that if we did get a spill while we were handling at the surface, it is contained in a lined environment and is not able to infiltrate the groundwater. As we then use those chemicals across the lease with the service companies, the operators and the people who are handling them, we train them in how they can manage those chemicals appropriately. Obviously, the material safety data sheet is a key concern, and we make sure that they are fully familiar with that in terms of what we call the personal protective equipment that they have to handle it, and if a spill was to eventuate, what they are to do about it immediately. That involves, obviously, informing both their supervision and Santos's supervision on site, so then remediation can be undertaken quickly. If that did happen, we would also be involving our regulatory authorities so they could come and visit and make sure that we are remediating whatever happens to their satisfaction as well as our own satisfaction. Typically, we have found that our standards are equal to or better than what the regulatory authority is after.

**Hon SAMANTHA ROWE:** Have you had to have them come out before?

**Mr Cruickshank:** Our environment health safety management system stipulates that we have a full audit and surveillance checks on all our operations, not only from our own people—that is independent to operations. For instance, for the operations that would operate under me, Nick and his environment team come out and do an independent audit and assessment to make sure that we are adhering to the guidelines and procedures in how we do our work, and we also have full visitation, audits et cetera from our regulatory authorities, whether they be in South Australia, Queensland or the Northern Territory. Typically, those ones are essentially unannounced. The only announcement that they make to us is, “We are coming up tomorrow. Please book a plane flight for us and we are going to come out and visit la-da-da.” That is how they do it, and so they essentially come unannounced.

**Hon SAMANTHA ROWE:** How regular are those audit checks?

**Mr Fox:** With the audit checks we do internally, we will do at least an annual program to look at the assets, but they are probably more frequent. We do ensure that the assets actually do some self-audits as well, and we check that they have been undertaken and what is done about them. There is at least an annual audit of all operations.

**Hon SAMANTHA ROWE:** And when you go on site unannounced, how often is that?

**Mr Cruickshank:** The regulatory authority operates in South Australia on what they call a tiered supervision level, depending on whether you are a high-level, medium-level or low-level supervision operator. Because of our past practices and our record of how we operate, we are classed as a low-supervision operator by the South Australian jurisdiction. As a result, they visit our operations less than they would for some other companies, which they might visit more frequently.

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They visit our facilities numerous times per year. I cannot give you the exact answer; we could find that out, but it is certainly more than once per year.

**Mr Fox:** I can explain it for Queensland. It is proportionate to risk, as you would be aware. On tier 2 fields in Queensland, there have been 20 audits planned by the regulator this year across those fields on different aspects.

**Hon BRIAN ELLIS:** This technology has been around for a long time, and we heard last week that it celebrated its sixty-fifth birthday. Santos has been a leader in Australia in this technology for, as you just said, 40 years. Have you seen a change in the understanding of the general public of what fracking is about? I do not think that is coming through in our inquiries at the moment. The public does not seem to understand the industry and actually has certain fears about it. I am just interested to know, seeing that you have been operating for a long time, in your community, and particularly in South Australia, whether they have come along with the industry and are more understanding than in WA perhaps. I put it to you that maybe it is the fault of the industry that it has not communicated very well in the past. I think we are in agreement here that there are varying degrees of concern from “it should never go ahead” to “it’s the safest thing in the world; don’t worry about it”.

**Mr Cruickshank:** Thank you, Mr Ellis. It is one that we are working very closely with them on at the moment. As you indicated, we have been operating for over 40 years in the Cooper Basin with our landholders and with our regulators there. We have been operating there successfully. They are aware of what we do and how we do it, and they visit with us and are familiar with the operation. Regarding how we have gone about that in new areas that are opening up et cetera, I will hand over to Mr Matt Doman to talk about that.

[12.20 pm]

**Mr Doman:** It is a good question, Mr Ellis. It has been, as we said, part and parcel of what we do for a very long time. We have seen in more recent years opponents of this industry—whether they are opponents of the fossil fuels industry in general or whether they are opposed to our activities in the areas that they take place—focus on fracking and sought to, I would say, demonise that process in particular. That has also been observed in the United States where there have been various vehicles, including a documentary film called *Gasland*, which sought particularly to focus on fracking. I think it is fair to say that the advancements in fracking technology have been the main issue in the rapid expansion of gas production in the United States in recent years. Therefore, those that are opposed to that, for whatever reasons, have focused in on fracking. We believe all our processes have to be done in a safe and sustainable manner. Drilling is absolutely the thing that has to be always done at the highest level; well integrity, as we said in our submission, is critical. Fracking is but one of the processes that we use to produce gas. So, the discussion—it has really become a bit, I suppose, fashionable to focus in on fracking. We do not think that that is in any way justified or warranted by the track record of using that technology in Australia. But responding to the concern about it, we have increased our communications in relation to describing that activity to stakeholders, be they in government, in communities or more broadly. But the irony is that the hottest debate around fracking in Australia that we would observe at the moment is probably taking place in New South Wales where we do not use fracking and our operations have no plans to do so.

**The CHAIRMAN:** On that, Mr Doman, I think the point you are making is that the actual technique of fracking is seized upon by opponents of the practice as the source of many evils, particularly in the United States. Were you indicating by that remark that perhaps some of the problems that are attributed to fracking and given voice through anti-fracking campaigns are perhaps something else, a side effect, whether it is more truck movements in the neighbourhood or some other feature?

**Mr Doman:** I think that is a fair question. I think if you, as I have done and I think my colleagues as well, have travelled to the United States to look at some of the areas where gas production is

taking place, the thing that you do notice is the activity. The activity in terms of vehicle movements—in some communities, difficulty in obtaining accommodation—they are all some of those, I guess, side effects of success that are very evident and they do create some discussion —

**The CHAIRMAN:** What are they?

**Mr Doman:** As you said, the vehicle movements in and out of these areas, accommodation in town, demand for skilled labour and, therefore—we have seen this in Queensland—the difficulty of some businesses in some of the areas in the gas fields there to obtain labour, whether it be a mechanic or someone to work in the local pizza shop, it becomes more difficult when there is an industry there that is employing a lot of people with a wide range of skill sets. Those things all can represent challenges for communities. I think most would say they are problems that they like to have, but they are still things that require management. The production of natural gas, the management of water, is of ongoing importance and absolutely critical that it be done properly. We stand on our track record of having done it properly for approaching 60 years now. The recent focus on fracking I think, as I referred to earlier on, has become somewhat a fashionable activity; it is a word that enables various wordplays that have been used in sloganeering against our industry—“Don’t frack California” or similar phrases that we have all seen. But we think there is no scientific basis for that focus on fracking. It is, frankly, part of the campaign tactics against the industry.

**Hon PAUL BROWN:** One of the things that I did not see in your submission and I have not heard here today is I want to know what the lifespan of your wells are; not the integrity, but how long you expect to get commercial production out of wells. You obviously put a lot of money and a lot of effort into putting holes down a long way, what sort of lifespan can we expect to see in relation to land disturbance and ongoing environmental concern from these activities on any particular pad or any particular site? Are we looking at 10, 20, 30 or 40 years’ worth of production on a particular site?

**Mr Cruickshank:** Thank you for the question. It depends on what we actually find in the subsurface, how productive the area is and how we can extract it. Our preference will be to try and extract whatever productive gas as quick as we can, because obviously that is the most economic scenario. But we would expect that an unconventional well would typically have a lifetime of probably 20 to 40 years, depending on the formation that you are going through. So, the life cycle that we would start is we would then work very closely with the landholder and our regulators about where we site, how we site and how we construct the surface pad. If we were in development mode, we would typically be using what we call multi-well pad technology, where instead of just drilling one well, we would be drilling six, eight, 10 or 12 wells. So, that minimises the land disturbance immediately. It also means that instead of having single wells where you have got one and a half hectares per well and a road and a pipeline et cetera, you have one road, one pipeline and you have got six, eight, 10, 12 or 15 wells et cetera. So, you are minimising the land disturbance on multiple counts already. Once you have constructed the well and you have got the wells on production, we would then reclaim that lease pad back to probably something like a tenth of its size. So, it might start out at five or 10 hectares, depending on how many wells we are on that area for, and we would then bring that down to the minimum requirement for ongoing maintenance, surveillance and production activities. That would be done within probably 12 to 18 months of first starting until when we have finished what we call our well construction or development operations. We would then reclaim back. That involves returning the land back to its natural contours, putting the topsoil back on that we have disturbed, reseeding it, and that would typically be probably reclaimed within months of us finishing an operation. Then, whether it be for 10, 20, 30 or 40 years, we have that minimum area that we are working on. That would be in consultation with the landholder to ensure that that area is appropriate for what we are doing.

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**The CHAIRMAN:** My question to follow on that is related, as is most of what I had down here. You have been speaking about 2 000 or so wells in your area of operations. I was just wondering how many pads that would involve for that number of wells. How far apart would they be?

**Mr Cruickshank:** Thank you, Mr Chairman. If you are able to visit the Cooper Basin, you will see the transformation of what the industry has been able to work through as the technology has developed. The original Cooper Basin for the first probably 30 years was developed with what we call single-well pad technology—typically, vertical wells drilled from a surface location straight down and, with success, an individual road and an individual pipeline. With the development of fracture stimulation, with the development of being able to drill economically—what we call either deviated drilling or horizontal drilling—we are now able to use multi-well pads on there. For instance, just last year, we did extensive multi-well pad technology in what we call our Cowralli field where we drilled 16 wells off two pads. The land disturbance from that was less than 50 per cent of what it would have been if we had employed the previous technology, so we see that that is going on there. Currently, in other operations, we are now making use of multi-well pad technology extensively in our Big Lake field, so as the techniques have moved on, we are using them more and more. We are finding that it is not only more environmentally better, but also economically better for us as well.

**Hon STEPHEN DAWSON:** In relation to your operations in South Australia in the Cooper Basin, has Santos had the need to interact or consult with local Aboriginal traditional owners; and, if so, I guess, how did you go about those discussions? Do those TOs get any ongoing benefit or have there been kind of local jobs for Aboriginal people out of that?

[12.30 pm]

**Mr Fox:** Thank you for the question. We have a longstanding relationship with the traditional owners in the area. We have different groups that work across our operations. We employ them as clearance scouts when we are doing our activities, and we have permanent employees as well as contractors as we require them for the workload. So, yes, they do have ongoing work. There is an extremely productive relationship between Santos and the traditional owners.

**Mr Cruickshank:** Further to that, we work out with them access agreements, cultural and heritage agreements, how we clear the land, and what monitoring we do on an ongoing basis, and then we involve them in all facets of our operations from there on in to make sure that their traditional values and our work can coexist.

**Hon STEPHEN DAWSON:** Do they have a veto on certain sites or certain operations?

**Mr Cruickshank:** I am not sure that you would use the term “veto”, but we work out an access arrangement with them up-front, which, as Nick has indicated, we would prefer to be in the form of employment or ability to enhance their use of the land et cetera. Recent agreements in certain jurisdictions are now coming in with what we call in monetary terms an overriding royalty payment to the traditional owner group.

**The CHAIRMAN:** Before we draw to a close with the time that we have available to us, I want to ask you to help us reconcile some possibly irreconcilable views that have been expressed to us. This relates to the chemicals that are used in fracking fluid. On the one hand, it has been advanced to us that inevitably the chemicals that are used are dangerous and pose a quite unacceptable risk to humans and others, and words like toxic and carcinogenic are used. Conversely, we are also told by the proponents of unconventional gas that these chemicals are innocuous things such as the ingredients that are used to make ice-cream. I am sure both those arguments have some basis. But, clearly, they are widely opposed, and we are trying to make sense of it. By way of further preamble, I think you were here for our previous session with the head of the EPA, Dr Vogel, who made the observation that there were those extremes but noted that there appear to be some developments in technology that have taken the industry closer to the more benign materials and away from the more

dangerous. What is the truth, from your point of view, about the toxicity of the chemicals that are used; and is there a trend, as the industry develops, to find more benign chemicals that can be used?

**Mr Cruickshank:** Thank you, Mr Chairman, for the question. It is a case of having to understand what the chemicals are and how we use them. It is true that some of the chemicals that we use are found in general household goods. I have read and heard a number of them described in earlier years as acids that are very toxic, biocides, which are toxic, and corrosion inhibitors, which are toxic. However, the majority of the chemicals that we use are, in their base format, the same as the ones that we use in and around our homes, and potentially on land et cetera. I have a swimming pool at home. The acid that I put into my swimming pool to maintain the water that my family swims in is actually at a higher concentration than the acid that we use in our fracture stimulation operations. Any chemical in its full undiluted form may be toxic. That includes the disinfectants that we use in our households. It is a matter of handling those chemicals correctly. We dilute them quite substantially. You would have seen various submissions with regard to the percentage of chemicals that we use—less than one per cent, or less than 0.5 per cent on an average basis. If people were to drink the undiluted formula of any chemical, it would be toxic. It is the same as if people opened their medicine cabinet at home and drank the undiluted stuff; it would be dangerous.

The second part of your question was: are we moving towards the use of improved chemicals? Yes, we are. It is like any industrial process. We are seeing that we can use fewer chemicals. We used to have to use full potable water to undertake fracture stimulation operations. We now do not need to do that because of the advances in fluid chemistry. We are now able to re-use a lot of produced water from our fields and recycle that water so that we have less take from the groundwater. We also do not need to use potable water sources from deep in the ground but will take water from what we call brackish and non-potable sources—not even stock water quality—if it is available in the area in which we are undertaking operations. The industry is always developing new and greener chemicals. People will say what is wrong with the previous ones. They are perfectly acceptable from our point of view. However, we are always looking to go to a safer chemical that we can handle at surface, with benefits that will make it greener in the outcome, and also that will improve the productive nature of the reservoir so that we can ultimately extract the oil and gas in a more efficient manner and will need fewer wells to drill with on an ongoing basis.

**The CHAIRMAN:** Thank you very much for your assistance with this inquiry. Would you like to make any concluding remarks?

**Mr Cruickshank:** Yes, thank you. Just in closing, as we said at the outset, we are probably the most experienced fracture stimulation exploration–production company in Australia. We have undertaken these operations safely and sustainably with our landholders and with our regulators over that time period. We stand on our track record. We know we have a good track record because when we talk with our regulators when they come and visit, we have no ongoing lasting environmental issues as a result. Our operations are there for you to see, and we would encourage you, if you can find the time, to come and visit with us. I think that when you see it, you would be able to get a better impression. I represented Santos on the working groups for the Australian Council of Learned Academies report, and we hosted a subset of ACOLA to visit our operations, and the three people who visited all made the comment that they had read about it and had seen photos of it, but when they came on the ground and saw what we do and how we go about our operations, it became much clearer to them that what we are saying is exactly what does happen. So if you do have the time, I would encourage you to visit our operations.

**The CHAIRMAN:** I think the committee members all understand that there is a need to go and see things on the ground in anything that we are investigating. We have already embarked on some of that, and I thank you for your invitation to come to your field, which we will discuss further out of session. With that, I will say once again, thank you very much for your assistance and cooperation, and we bid you a good day.

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**Hearing concluded at 12.37 pm**

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