

17th September 2009

Dr Ian Holland

Committee Secretary

Standing Committee on Environment, Communications and the Arts.

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Dear Sir

Submission for the Inquiry into the Impacts of Mining and Coal Seam Methane Extraction in the Murray-Darling Basin.

On behalf of the Caroon Coal Action Group (CCAG) and the landholders and supporting industries of the Liverpool Plains, I welcome the opportunity to make this submission to the Senate Select Committee on the impacts of coal seam methane gas extraction in the Murray-Darling Basin.

The Caroon Coal Action Group was formed over three years ago in response to the exploration licenses granted by State Government to explore for coal on the Liverpool Plains. Exploration licenses have also been granted to various companies for the Coal Seam Methane Extraction (CSM) Industry. As a result of this, many concerned landholders have come together to preserve Australia's most reliable and productive agricultural area with its related aquifers and waterways. Issues raised in this submission relate specifically to the CSM extraction industry.

Please do not hesitate to contact me to discuss this paper.

Yours faithfully

ROSEMARY NANKIVELL

CHAIRMAN

COAL SEAM METHANE SUBCOMMITTEE

CAROON COAL ACTION GROUP

Impacts of Coal Seam Methane Extraction in the Murray-Darling Basin.

The Contribution of the Liverpool Plains to food production and security in Australia and Globally.

The Liverpool Plains, approximately 450kms north-east of Sydney, covers 1.2 million hectares of the north-western slopes of New South Wales. The area is prime agricultural land and recognized by many to be the best farming country in the world. The landholders are well respected for their innovative and advanced farming practices.

The Liverpool Plains is renowned for its high yields and crops security relative to other farming regions in Australia. Its fertile black soils have a high water holding capacity with reliable summer and winter rainfall. It is an area which yields 40% above the national average and grows a diverse range of crops such as wheat, sorghum, oats, soybeans, barley, corn, sunflowers and cotton. It has a beef industry worth over \$110 million per annum. It also produces chickpeas, soybeans, mungbeans, canola, olives, turkeys, chickens, pigs, lamb and wool. The area is unique in that it produces two crops per year, unlike the majority of farming areas. The Liverpool Plains contribute **\$332 million to the GDP** annually.

The Importance of the Namoi Catchment to the Liverpool Plains and the Murray-Darling Basin.

The Liverpool Plains are located in the Namoi Catchment which feeds into the Murray Darling Basin. The area is bounded to the east by the Great Dividing Ranges, to the south by the Liverpool Ranges and to the west by the Warrumbungle Ranges. These ranges provide a huge recharge to the area. The catchment area is drained by the Namoi River and its tributaries, the Mooki and the Peel Rivers which flow into the Murray-Darling waterways.

Agriculture in this area relies on the sound management of high output aquifers which contribute immensely to its productivity as well as the ability for the soils to retain moisture. While there are many successful irrigated properties, there are even more properties without irrigation where dryland farming techniques are employed. These farms rely on skilful management, innovative practices such as no-till cultivation and a reliable rainfall pattern.

However, the preservation of the aquifers, and hence our water supplies for domestic, stock and farming use is the overriding concern of those who have farmed successfully and innovatively for decades. The National Pollutant Inventory confirms that the Liverpool Plains does not produce food in an environment contaminated by any industry that liberates tonnes of toxic metals, fine silica dusts or carcinogenic petroleum hydrocarbons. It is a pristine area that is not polluted by any industries that leave a legacy of mine drainage, poisoned rivers and creeks, highly saline evaporation ponds and unpredictable methane scalds. This enviable situation must be preserved. If CSM extraction occurs, the Liverpool Plains will lose the purity and volume of its aquifers. The productivity of these plains will be irreparably damaged. Australia's ability to produce clean, uncontaminated food will be damaged irrevocably. The destruction and damage by CSM extraction in this vital area in the Namoi Catchment will diminish and contaminate flows of both surficial and underground water into the Murray-Darling Basin.

The CSM Extraction process – impacts of an unproven technology.

The extraction of CSM is a relatively new industry in Australia. Commercial production was not significant until 2004 in Queensland. The following is a simple explanation of the CSM extraction process.

Coal seam gas is bonded (through geological and hydrological pressure) to cleats and fractures of the coal. It is held in the coal by burial pressure and water. To extract gas, drilling rigs drill numerous holes into the coal seam aquifer at depths of over 3,500 metres. The aquifer is then dewatered, reducing pressure and causing methane flow in cleats to the well.¹ The process of “fracking” involves explosives being put down these well holes to fracture the coal seam aquifers. Then a mixture of sand, water and synthetic polymers is forced at great pressure into the coal seam to push the coal seam methane water to the surface. The bulk of the water is extracted at the top of the well. The gas is then piped away to a compressor station for further treatment.

The fallacy of CSM extraction as a clean green industry.

There is ample evidence from America and other countries which illustrates the fallacy that CSM is a new clean green and renewable energy source. There is alarming evidence in Australia of the environmental destruction that has already occurred. Methane gas (CH₄) is a highly volatile and soluble gas held in the earth under extreme pressure. It escapes and migrates very easily when disturbed. As a greenhouse gas it is 22 times more damaging than CO₂ to global warming. This discussion paper outlines the problems associated with CSM extraction and the environmental damage that has already occurred here and in many areas overseas.

Disposal of Waste Water – the industry is still searching for a solution.

CSM extraction is highly water intensive industry. Clean potable water is locally sourced and used throughout the process. As well, the extracted coal seam water has to be disposed of and this has presented huge problems in the gasfields of Queensland - and in many other states of America.² This water usually has an extremely high salt and heavy metal content. The heavy metals include hydrocarbons, carcinogens, radioactivity, mercury, copper, silver, arsenic, tellurium, nickel, boron, lead and selenium and halogenated methanes.³ To date, this water has been left to evaporate in vast shallow ponds ranging from one to 100 hectares. As these ponds have no lining and are held intact by compressed soils, these areas will be extremely difficult, if not impossible, to rehabilitate. Aquifers beneath these ponds will also be subject to the leaching of coal seam water through the compressed earth.

Salinity of CSM water is variable with Total Dissolved Solids (TDS) values varying from 200 to more than 10 000 milligrams/litre. (Plants are affected by water with TDS as low

¹ Coal Seam Gas Water – Queensland’s Water Crisis – TressCox Lawyers – Newsletter Article – 16 December 2008

² Water Issues Associated with Coalbed Methane in the Powder River Basin of Wyoming and Montana – Department of Resources, University of Wyoming, Laramie and Montana Bureau of Mines and Geology, Billings.

³ Coal Seam Gas Water – Queensland’s Water Crisis – TressCox Lawyers – Newsletter Article – 16 December 2008

as 1000mg/l.)

The Queensland government, in its recent discussion paper on the management of coal seam water has assumed a very conservative TDS value of 2500 mg/l. Using projections for the LNG industry in Queensland of an annual volume of 100 GL of CSG water, it is calculated that disposal of this water in two-metre-ponds requires 5000ha in year one and 10 000ha (100km²) by year 15. These estimates are for area only and do not consider design requirements for the maximizing efficiency of brine concentration, safety, allowance for rainfall, nor maintenance or decommissioning requirements. Exploration may also add to the total water produced.⁴ The area of evaporation ponds required for disposal of an annual volume of 100 GL of CSG water over 30 years is roughly two and half times the size of Sydney Harbour. At the end of 30 years, this area could contain more than 7.5 million tons.⁵ Disposal of this vast amount of salt has not been addressed.

As yet, the gas companies have no commercially viable alternatives to evaporation ponds despite their promises of solutions such as using water extracted for tree plantation and application of reverse osmosis. Practices such as reverse osmosis and reinjection are extremely expensive and highly energy intensive. Reinjection in the Liverpool Plains would result in widespread contamination of the complex and interconnected aquifers underlying the plains. The Queensland government has demanded that the use of evaporation ponds to be discontinued as a primary means of disposing of CSM water. Remediation of existing evaporation ponds is to occur within three years.⁶ It would be expected that the NSW state government adopt similar or ideally far more stringent standards.

From a food producer's viewpoint, these evaporation ponds result in highly toxic salt being blown by the wind onto adjoining farmland or leaching into the aquifers beneath them. Vast tracts of arable land are used up hosting these ponds. Many farming communities have successfully dealt with salinity issues to date, but the wind-blown salt only exacerbates these problems. It causes scalding and deterioration of soil quality and promotes the growth of noxious weeds.⁷

Increased Seismic Activity

There is increasing evidence that exploration drilling and the fracking process is directly related to increased seismic activity. The Upper Namoi Catchment is located on the Hunter-Mooki fault line – the same fault line as the disastrous Newcastle earthquakes. There is increasing seismic activity around mines in the Hunter Valley. It is essential that this instability will not be increased by the CSM extraction processes.

However, the evidence from international experience is of concern. In May 2006, an earthquake erupted triggered by exploratory drilling causing mudslides in the East Java province of Sidoarjo. Over 75,000 people were displaced with massive damage to homes

⁴ Management of water produced from coal seam production – Discussion paper – May 2009 – Queensland Government, Department of Infrastructure and Planning.

⁵ Management of water produced from coal seam production – Discussion paper – May 2009 – Queensland Government, Department of Infrastructure and Planning.

⁶ Management of water produced from coal seam production – Discussion paper – May 2009 – Queensland Government, Department of Infrastructure and Planning.

⁷ Coal Bed Methane Hazards in NSW – C.M. Atkinson - January 2005

and infrastructure and the environment. Santos, the gas company operating here in the Upper Namoi Catchment, were the technological lead for a gas project in the area and held an 18% stake in its Indonesian Brantas production sharing contract. Santos has subsequently quit the stake to extricate itself from any potential future penalties for the mudslide disaster.⁸

Since June 2nd 2009, there have been five small earthquakes in Texas Barnett Shale gasfields. In May, earlier this year, three other smaller quakes were also felt at Bedford, a suburb of Dallas and Fort Worth and Grand Prairie. Seismic activity was not recorded in the town's history until the establishment of a rapidly expanding CSM industry. A geologist has subsequently been employed to examine the connection between the fracking process and the earthquakes. Other seismic activity associated with fracking and similar technologies have occurred in Ohio USA, Bazel Switzerland and the Gazli gas fields in Uzbekistan.⁹

Irreparable damage and destruction of aquifers.

Damage to the aquifers occurs during the “fracking process” where water, sand and polymers are forced down well holes at great pressure. Explosives are also used in the fracking process. The fracking process is best described as hitting a plate with a hammer from 10 paces. You will achieve your aim of breaking that plate – but you have no control over the extent of the fracture or the amount or size of the pieces that plate will be broken into.¹⁰ This will irreparably alter the structure and permeability of the aquifers and their water transporting characteristics. After fracking, methane gas, drilling fluids and the highly-toxic saline water extracted from the coal seam beds are able to migrate throughout aquifers and poison water supplies.

Methane migration.

Methane, being highly volatile and soluble, migrates easily and quickly through fractures to the surface or to nearby openings such as water wells.

In September 2004, within a fortnight of initial gas testing, a CSM well north of Newcastle was shutdown as several boreholes up to 300m away began to blow off methane gas. At the time, there was a strong gas flow of 280,000 cubic feet/day even though the water level was still approximately 300 metres above the coal seam. This illustrates that even with only a partial withdrawal of the hydrostatic pressure, methane will migrate quickly and in unpredictable directions.¹¹

In surface methane seepages through the soil, methane displaces the soil oxygen and the soil becomes anoxic leading to soil poisoning and vegetation destruction.¹² These are critical issues for farmers and would seriously affect their production levels as well as contaminating the quality of their produce.

CSM extraction occurs in 31 states of the USA. There are many reports of methane migration and it has now been publically acknowledged by the EPA that there is danger

⁸ Update 1 – Santos exits Indonesia venture, mudflow liability – Reuters – 29/12/2008

⁹ Hunter Valley Protection Alliance Forum 7/09/09

¹⁰ Marcellus Shale Group – website – N.Y. State

¹¹ Coal Bed Methane Hazards in NSW – C.M. Atkinson - January 2005

¹² Jones T.,2005 (Draft) Report on the Hydrological Investigations Dooralong & Yarramalong Valleys Wyong, Central Coast, NSW January.

to human life from contamination and the migration and build up of methane in enclosed areas. The example of one Wyoming rancher who was told by a local gas company to always keep a window open in his house to prevent explosions in enclosed areas is fully documented and not isolated.¹³ Obviously methane migration is a considerable risk to both humans and livestock.

Soil Poisoning.

There is evidence of soil poisoning from CSM extraction in the Murray-Darling Basin is well described. Some examples include incidents at the Bohena well in an area of the Pilliga State Forest when a retaining wall of the salt water pond collapsed after a major rain event. In a separate event, an extensive leakage in a dam (excavated in sandy soil) resulted in the spread of sodic/saline liquid through the subsoil and shallow aquifers. Water from the dam and black sludge showed to have high levels of tannin with a sodium level of 3,700mg/litre. The area of dying vegetation continued to expand until this area covered an area of over 250m and a maximum width of 100 metres. This was considered to be a chronic case of sodic soil poisoning exceeding those previously occurring in the Powder River Basin in the USA.¹⁴

Contamination from Drilling and Fracing Fluids.

Core hole drilling during the exploration process and extraction drilling differs significantly from drilling for water for stock and domestic use. When sinking a water bore in this area, the use of drilling fluids is rare as farmers rely on different drill heads, air and water to sink their wells to levels of around 80 metres. In contrast, CSM drilling rigs drill to and from depths of over 850 metres through many layers of aquifers using more than 30,000 litres of drilling fluids in the exploration phase.¹⁵ Thirty to forty per cent of this drilling fluid is never recovered.¹⁶ These fluids can contain benzene, glycol-ethers, toluene, ethanol and nonylphenols and other contaminants – all have been linked to health disorders.¹⁷

In some areas of Colorado, up to 100 million gallons of fluid is used per “frac” job. Some wells require five to ten “frac” jobs per well resulting in elevated methane and chloride levels in groundwater samples.¹⁸

As of 5th September 2009, this year, the American EPA publically acknowledged the link between drilling fluids and leukaemia, cancer and adrenal tumours.¹⁹ Links have also

¹³ http://i2.democracynow.org/2009/9/3/fracking_and_the_environment_natural_gas

¹⁴ Coal Bed Methane Hazards in NSW – C.M. Atkinson - January 2005

¹⁵ Ralph Mclver – Santos Representative – Roadside meeting Blackville 15th September 2009 – Gunnedah Basin NSW.

¹⁶ Boom in gas drilling fluids contamination concerns in Colorado.

<http://features.csmonitor.com/environment/2009/02/05/boom-in-gas-drilling-fluids-contamination-concerns-in-Colorado>

¹⁷ Boom in gas drilling fluids contamination concerns in Colorado.

<http://features.csmonitor.com/environment/2009/02/05/boom-in-gas-drilling-fluids-contamination-concerns-in-Colorado>

¹⁸ Geoffrey Thyne – University of Wyoming – Boom in gas drilling fluids contamination concerns in Colorado. <http://features.csmonitor.com/environment/2009/02/05/boom-in-gas-drilling-fluids-contamination-concerns-in-Colorado>

¹⁹ http://i2.democracynow.org/2009/9/3/fracking_and_the_environment_natural_gas

been made to damage to kidney, immune systems and reproductive development.

Contamination from Drilling and Fracing Fluids and its effect on agriculture.

There is a limited amount of information on the effects of this type of contamination on agriculture in Australia. However in Garfield County, infertility in breeding herds and sterility in bulls increased dramatically. Pigs and cattle stopped cycling and sheep bred on an organic dairy farm had a rash of inexplicable still births. These animals all grazed close to drilling waste pits, where wastewater that included fracing fluids was misted in the air for evaporation.²⁰

In other states of America there are reports of cattle dying after grazing close to CSM wells. Wildlife, such as deer, have developed cancers and tumors after grazing and drinking around supposedly rehabilitated well sites – clear evidence that agriculture and gas mining cannot successfully coexist.²¹

It is essential for the continued production of quality food and fibre in this area that it is kept pollutant free and the food chain is not affected in this way. This would have dire repercussions on our export industry. Meat and Livestock Australia (MLA) to ensure that Australian meat is clean, safe and free from chemical residues asks (Q7): “Do stock have access to leaking transformers, capacitors, hydraulic equipment or coal mine wastes?” They go on to say that carcinogenic PCBs, very persistent industrial chemicals, “have been found in soil below leaking electrical transformers, in the oil leaking from capacitor starts on larger electric motors, **on former coal mining leases and in materials such as coal washery wastes (chitter)** that have been brought on to farms for use as road base of stockyard surfaces”. The MLA is well aware that toxic residues should not make their way into the food chain.

As some of the proposed methane well sites in this area are located in the headwaters of the Mooki, the contamination of these aquifers will spread to the fertile flood plains below.

Gas Extraction and the lowering of water tables and creation of voids leading to subsidence.

Extraction of one unit of gas results in thirteen and half units of waste water.²² With gas extraction, comes the lowering of water tables and the creation of voids. These voids lead to subsidence causing cracking and draining of rivers, waterways and aquifers long after extraction has finished.

“Dewatering coal seams will allow for groundwater migration towards coal seam voids. This has significant potential to effectively dewater sections of the study area. Dewatering of the coal seams will adversely affect the groundwater system and will have a flow on effect of reduced or lost stream flow.”²³

Dewatering will significantly reduce the quantity and quality of available groundwater.

²⁰ Drill for Natural Gas, Pollute Water – Abrahm Lustgarten and ProPublica

²¹ <http://www.sierraclub.org/scp/chronicles/episode4.aspx>

²² Environmental Aspects of Coalbed Methane Extraction with Emphasis on Water Treatment and Disposal – L.B. Clarke – for NSW National Parks and Wildlife 2001

²³ Jones T.,2005 (Draft) Report on the Hydrological Investigations Dooralong & Yarralong Valleys Wyong, Central Coast, NSW January

Senator Penny Wong, Federal Minister for Climate Change and Water says “Because pumping (from aquifers) can lead to water moving between different levels of an aquifer, it can cause deteriorating groundwater quality either through changing salinity or composition”.²⁴

In the Powder River Basin of Wyoming and Montana, the Bureau of Land Management predicted, in their final Environmental Impacts Statement, that development will lower the water levels by 600 to 800 feet over much of the basin. This drawdown can be expected to reach one or two miles outside the productive fields and distances of up to five to ten miles or more during long term production.²⁵ Potable water supplies will be reduced with significant impact on domestic, stock and commercial irrigation wells.

Coal seam fires are believed to have resulted from fluctuating water levels in gas seams as the underground temperatures rise to ignition level with the extraction of water.²⁶ They are nearly impossible to extinguish and these types of fires can burn underground for years. This greatly increases greenhouse emissions and contributes to eventual subsidence.

The city of New Orleans, Louisiana is an extreme example of subsidence caused by in part, by the excessive removal of groundwater from the various aquifer/aquitard systems beneath it. New Orleans is now below sea level²⁷ and this was a major factor for the damage incurred by the cyclone Katrina.

CSM extraction will result in considerable losses to agriculture as farmers de-stock their land because of reduction to water supplies. Crops, particularly in irrigated areas, will lose their high yielding capabilities.

Environmental Damage from Establishment of Gas Fields.

There are three main steps in establishing a gas field. They are field development, the gas pipeline and a central processing facility. At the Gloucester Coal Seam Gas Project in NSW, quite a small project, the field development was based on establishing 60 wells linked by polyethylene gathering lines. All well sites required clearing, leveling, access roads, power and water. With 600m spacing this field covered approximately 86 acres. Approximately 98 km of buried high pressure steel pipeline from wells to the compressor station was necessary and will affect 150 landowners. A central processing facility, consisting of up to 6-7 reciprocating compressors of 3000hp, as well as a dehydration unit and water treatment facility were to be constructed(as at February 2008).²⁸ This type of industrial activity will result in noise pollution, erosion as areas of land are cleared and loss of native habitat. Further damage to the environment will occur with the establishment of kilometres of pipeline and the resulting erosion and noxious weeds.

Gas fields will result in the loss of food producing land. Large scale disruption of adjoining land will also occur especially during the establishment process.

²⁴ Gaswatch 65 – Who is out of step here? – HBGAG Group Inc.

²⁵ Water Issues Associated with Coalbed Methane (Natural Gas) in the Powder River Basin of Wyoming and Montana – University of Wyoming, Laramie and Montana Bureau of Mines and Geology, Billings 2004

²⁶ Boom in gas drilling fluids contamination concerns in Colorado.

<http://features.csmonitor.com/environment/2009/02/05/boom-in-gas-drilling-fluids-contamination-concerns-in-colorado>

²⁷ <http://en.wikipedia.org/wiki/Groundwater>

²⁸ Gloucester – Coal Seam Project – Project factsheet – March 2008.

Methane and CO2 liberation.

Much methane gas is lost in the capture, storage and handling process. It can easily escape through unsecured pipelines and fittings. During the extraction, and some exploration processes, methane is “flared” to prevent it escaping into the atmosphere resulting. Fossil fuels do not burn effectively, leaving 16-38% of gases intact with CO2 and other toxic chemicals being released into the atmosphere. “Venting” occurs when there is insufficient methane to flare – methane is simply allowed to escape into the atmosphere. Methane is 22 times more destructive than CO2 and stays in the atmosphere for 9 – 15 years.²⁹

Stress on existing infrastructure.

The amount of gas dictates the location of these sites and wells can be as close as 200mtrs apart. There are high levels of noise, dust, heavy machinery and associated activity. The movement of rig and equipment to and from the proposed drill sites is expected to impact upon the sealed and unsealed roads within the district. The rig mobilization, potentially up to 10 trailer loads may require additional preparation of access.³⁰ This will result in not only in increased levels of dust and noise pollution, but soil erosion and compaction and loss of native habitat. Existing infrastructure in isolated country areas simply cannot handle the extra demands of gas exploration and extraction.

The industry is poorly-regulated with little respect shown to the environment or the landholders. Near Broke, in the Hunter Valley, drilling has taken place dangerously close to primary schools and into the main aquifer which provides the town with water. Local council was powerless to intervene.

Gas wells are industrial sites and “consideration should be given to classifying them as industrial chemical sites and as such should be controlled by relevant regulations.”³¹

Economic Impacts on Farmers.

Properties in gas field areas in America have been devalued by approximately 22 %. However farmers receive 12% of royalties as well as money derived from the gas companies leasing their land. This represents a considerable income and explains, in part, why the CSM industry was established with so little resistance from landholders.

This is in stark contrast to the situation in Australia. Gas companies lease the tiny portion of land on which the gas well is located. Gas companies in Australia “are not in the habit of purchasing large tracts of land.”³² This may place some farming families in financial jeopardy as they lose the use of portions of their land and their properties are significantly devalued. Sale of properties would be difficult as few prospective buyers would purchase land in areas located around gas fields.

In the Roma area, Queensland, one farmer was forced off his land because he could not stand the noise and dust associated with CSM production. I believe that he is still awaiting sufficient compensation for loss of his property, livelihood and lifestyle.

Gas leaks, methane and salt scalds, and even well explosions are all part of the methane

²⁹ HBGAG 2008

³⁰ Review of Environmental Factors – PEL 452 – Santos for the DPI -

³¹ Coal Bed Methane Hazards in New South Wales – CM Atkinson – January 2005

³² Kathryn Logan – Santos Representative - Blackville Community Consultation – 20th May 2009

industry. It should be emphasized that the maximum life of a CSM well is around 30 years and many wells last only around 7 years. This is certainly a horrifying contrast to the quiet, sustainable productivity of the Liverpool Plains where farmers expect to hold their land for generations.

Conclusion.

Clearly the CSM industry will destroy the pristine nature of the Mooki/Namoi Catchment and significantly diminish and contaminate our water supplies. Our productivity will be slashed. Our sustainable long term industry will be destroyed in favour of a short-term opportunistic industry that will leave the environment irreparably damaged. Prime farming country all over Australia is under threat from not only urbanisation, but also the extractive industries. Given that there are extensive gas fields in the headwaters of the Murray-Darling Basin in Queensland, similar plans and projections for Narrabri and exploration in the Upper Namoi Catchment, the effects of CSM gas extraction on groundwater in the Murray Darling Basin will be devastating. Put simply it will destroy the Murray-Darling's underground water – the lifeline of Eastern Australia.

It is critical that the Upper Namoi Catchment be preserved for agricultural production and the long term sustainability of the Murray-Darling Basin be protected. We have the opportunity now to preserve agricultural land and save our valuable and essential waterways for future generations from food and water shortages while contributing to the GDP and slowing climate change.